Assessment of Emergency Diesel Generator Emissions at Moderna Harwell

Dispersion Modelling Comparison of Environmental Impacts from BAT Compliant Engines and Non-BAT Compliant Engines

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Revision History

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1.0	2024-03-07	A Danskin and Jemima Hill	G Bollan	G Bollan	Draft for client
1.2	2024-03-11	Jemima Hill	G Bollan	G Bollan	Final for Issue

Contents

Executive Summary

ITPEnergised has undertaken an atmospheric dispersion modelling exercise of the proposed emergency diesel generators (EDGs) at Moderna's new Drug Substance (DS) site on Harwell campus in Oxfordshire. Generators 1, 2 and 3 were considered.

The purpose of this exercise was to compare the effect of two air emission scenarios – one case with emissions of oxides of nitrogen from the EDGs at emissions class 2g and another case at 3g. The emissions classes correspond to flue gas concentrations of oxides of nitrogen (NOx) of 2,000 and 2,800 milligrams per Normal cubic metre respectively. The Environment Agency considers 2g class to represent the Best Available Technology for pollution control from the EDGs.

NOx emissions from each of the three EDGs were modelled for each emissions class using the industry-standard ADMS-6 modelling software and five years of hourly meteorological data from RAF Brize Norton. Environment Agency advice for converting NOx to nitrogen dioxide (NO_2) was followed. Results were compared with the UK limit value for short term NO_2.

Most receptors included in the model represented residential locations; a small number of outdoor locations near the DS site boundary were also selected so that the likely points of maximum NO_2 concentration could be explicitly examined.

The highest results under either emissions class were modelled at a location known as R21 near the DS site boundary. Exposure at the receptor locations R21 is a theoretical possibility as pedestrians are free to use the paths within Harwell campus but exposure for a full hour must reasonably be considered as unlikely.

The hourly NO_2 criterion is expected to be exceeded at R21 under both 2g and 3g scenarios. A further slight exceedance is possible at R22 (another outdoor potential pedestrian location near the DS site boundary) when Generator 1 is operating with 3g emissions.

The results suggest that there is no significant difference in outcome whether 2g or 3g generators are used at the DS building, and the overall performance of the 2g BAT case against the short term NO_2 standard is very similar to the 3g case. This is clearly illustrated in Drawings 5, 6 and 7. The largest differences in the performance was in very close proximity to the EDGs, with the highest concentrations of NOx expected within the site boundary of the DS building.

There were no expected exceedances of the short-term NO_2 limit value from either emissions class at any residential property near the DS building nor the nursery located on the campus. There is no effective difference therefore between 2g and 3g emissions classes and the consequent NO_2 concentrations at any of the inhabited receptors considered.

1. Introduction

ITPEnergised (ITPE) has been appointed by Moderna to undertake an air quality impact assessment (AQIA) to assess the potential environmental impact of short-term emissions of oxides of nitrogen (NO_x) during routine testing of emergency diesel generators at their new Drug Substance (DS) site located on Frome Road, Harwell Industrial Campus, Oxfordshire. A site location plan is provided in Appendix 1 Drawing 1.

The Environment Agency provides guidance on the emission standards required to be considered best available technique (BAT) for emergency backup generators that part of an Industrial Emissions Directive (IED) installation as a directly associated activity[1]. These are:

[1]https://www.gov.uk/guidance/emergency-backup-diesel-engines-on-installations-best-available-techniques-bat

- Approximately 750 mg per m^3 NO_x (as NO_2) at 15% O_2 standard temperature and pressure, dry, 273K and 101.3kPa (equivalent to 2,000 mg per m^3 at 5% O_2 – commonly termed '2g') at a typical emergency load (usually greater than 67% of standby power rating).

The three purchased ElectropaK 4008-30TAG3 generators due for installation at the site have an emission of 2,800 mg per m^3 at 5% as detailed in the manufacturer's data in Appendix 1. These are considered to be 3g compliant.

The purpose of this assessment is to use dispersion modelling to compare the potential environmental impact of emissions from the 3g EDGs with emissions from engines modified with select catalytic reduction (SCR) to make then 2g compliant.

The results of the assessment will be used to prepare a cost-benefit analysis between the 3g and 2g scenarios for consideration by the Environment Agency.

1.1 Scope of Assessment

The scope of the AQIA includes the following:

- Identification of study area and locations of sensitive receptors;
- Desktop evaluation of baseline air quality;
- Calculation of atmospheric emissions for the 3g and 2g scenarios;
- Air dispersion modelling with ADMS 6 to determine the process contribution of NO_2 to ambient air quality at nearby sensitive receptors during short-term testing for comparison with the 1-hour Air Quality Standard;
- Sensitivity modelling to determine worst-case meteorological year per engine, per scenario;
- Report on findings.

This assessment has been informed by the following guidance documents:

- Department for Environment and Rural Affairs (DEFRA) and Environment Agency web-based guidance on Air emissions risk assessment for your environmental permit[2];
- Department for Environment and Rural Affairs (DEFRA) Local Air Quality Management Technical Guidance (TG22)[3].

2. Legislation, Policy, and Guidelines

The UK's legislation and regulatory regime, along with national, regional, and local planning policy, play a key role in the prevention, control and minimisation of atmospheric emissions that are potentially harmful to human health and the environment. Air quality limit values and objectives are quality standards for clean air that are used as assessment criteria for determining the significance of any potential changes in local air quality resulting from development proposals.

2.1 European Legislation

The relevant EU Directive on Ambient Air Quality Assessment and Management[4] came into force in September 1996 and is intended as a strategic framework for tackling air quality consistently, through setting European wide air quality limit values in a series of daughter directives, superseding and extending existing European legislation. The first four daughter directives were placed into national legislation. A new EU air

[2] Defra and EA (2020). https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

[3] Defra (2022). Local Air Quality Management Technical Guidance (TG22)

[4] Council of the European Union. (1996). Council Directive 96/62/EC of 27 September 1996 on ambient air quality assessment and management.

quality directive[5] came into force in June 2008 that was transposed into The Air Quality Standards Regulations[6] in England, Wales, Scotland, and Northern Ireland in June 2010. The directive merged the four daughter directives and one Council decision into a single directive on air quality with Air Quality Limit Values (AQLVs) for seven pollutants and target values for an additional five pollutants.

2.2 UK Legislation

The Environment Act 1995[7] required the preparation of a national air quality strategy setting AQSs and AQOs for specified pollutants and outlining measures to be taken by local authorities through the system of Local Air Quality Management (LAQM) and by others to work in pursuit of the achievement of these objectives. A National Air Quality Strategy (NAQS) was published in 1997 and subsequently reviewed and revised in 2000, and an addendum to the strategy published in 2002. The current strategy for England[8] was published in 2023.

The AQS for the protection of human health for NO_2 are shown in Table 1.

Table 1 - AQS applicable to this study

Pollutant	Air Quality Standard	Criteria
Nitrogen Dioxide (µg/m^3)	200	1 hour mean not to be exceeded more than 18 times per year (99.79th percentile)
	40	Annual mean

LAQM Technical Guidance TG (22)[6] provides advice on where the AQOs for pollutants considered in this study apply, as summarised in Table 2.

Table 2- Examples of Where the Air Quality Objectives Apply

Averaging Period	Objectives Should Apply At	Objectives Should Not Apply At
Annual Mean	All locations where members of the public might be reasonably exposed such as: Building façades of residential properties, schools, hospitals, care homes etc.	Building façades of offices or other places of work where members of the public do not have regular access such as: Hotels, unless people live there as a permanent residence; gardens of residential properties; Kerbside sites (as opposed to locations at the building façade), or any other location where the public exposure is expected to be short-term.
1-hour mean	All locations where the annual mean applies plus: Kerbside sites of busy shopping streets; Parts of car parks, bus and railway stations, etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more; Any outdoor locations where members of the public might reasonably be expected to spend one hour or longer	Kerbside sites where the public would not be expected to have regular access.

[5] European Parliament and Council of the European Union. (2008). Council Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe.
[6] UK Government. (2010). Environmental Protection The Air Quality Standards Regulations 2010.
[7] HM Government. (1995). Environment Act 1995.
[8] Defra (2023). Air Quality Strategy, A Framework for local authority delivery

3. Methodology

Dispersion Model

The Cambridge Environmental Research Consultants' (CERC) Atmospheric Dispersion Modelling System (ADMS) version 6 was used to model the air quality impact of existing and proposed industrial installations. ADMS-6 is a computer based short-range dispersion model that simulates a wide range of buoyant and passive releases from single or multiple sources.

ADMS-6 models the air quality impact of buoyant or passive releases to the atmosphere. The model calculates long-term and short-term deposition fluxes from pollutant sources. It uses 'real-world' hourly meteorological data allowing realistic output to be generated for particular locations. ADMS-6 can take many factors into account, providing a complex, realistic prediction. For example, the effect of the surrounding plant and buildings were taken into account in this exercise.

3.1 Study Area and Sensitive Receptors

The study area for the AQIA included a review of all sensitive receptors within 2 km of the site. Contour maps of the pollution footprint from each generator showed that the area of exceedance of the short-term AQS for either scenario was very close to the site boundary. A detailed calculation grid was therefore defined approximately 300 m in each direction from the modelled point sources with a grid resolution of 5 m.

For the purpose of the AQIA, all sensitive receptors have been selected to represent locations where people are likely to be present for a period of time consistent with the short-term 1-hour AQS and are based on effects on human health. The AQSs have been set at concentrations that provide protection to all members of the public, including more vulnerable groups such as the very young, elderly or unwell. As such, the sensitivity of receptors was considered in the definition of the values and therefore no additional subdivision of human health receptors on the basis of building or location type is necessary.

The sensitive receptors relevant to human health in this assessment include existing residential and commercial properties. Human receptors have been modelled at heights of 1.5 m. The receptors are shown in Appendix 1, Drawing 2 and summarised in Table 3.

Table 3 - Specified Human Health Receptors

ID	Receptor Name	X Coordinate	Y Coordinate	Height (m)
1	Residential House on Spa Street	448301	186123	1.5
2	Residential House on Newbury Road	448519	186087	1.5
3	Residential House on Potteries Lane	448176	186036	1.5
4	Residential House on Baths Road	447996	185956	1.5
5	Residential House on Chiltern Field Way	447858	185875	1.5
6	Residential House on Pegasus Close	449004	186138	1.5
7	Residential House on Pegasus Close	449086	186182	1.5
8	Residential House on Church Hill	449010	185971	1.5

9	Residential House on Main Street	448975	185745	1.5
10	Residential House on Main Street	448906	185638	1.5
11	Chilton County Primary School	448410	185941	1.5
12	Residential House on Isis Close	448359	186061	1.5
13	Residential House on Potteries Lane	448072	186007	1.5
14	Residential House on Chiltern Field Way	447925	185920	1.5
15	Residential House on Chilton Field Way	448131	185945	1.5
16	Residential House on on Chilton Field Way	447974	185670	1.5
17	Residential House on Latton Close	449099	185916	1.5
18	Residential House on Church Hill	449009	185875	1.5
19	Bright Horizons Harwell Day Nursey	447934	187436	1.5
20	Assumed Walking Route	448393	186503	1.5
21	Assumed Walking Route	448161	186485	1.5
22	Assumed Walking Route	448264	186394	1.5
23	Residential House on Spa Street	448238	186067	1.5
24	Residential House on Manor Close	449075	186095	1.5
25	Residential House on Limetrees	449096	186029	1.5

3.2 Background Concentrations

A review of background concentration maps and measured concentrations has been undertaken to derive appropriate background concentrations for each receptor.

The Defra modelled background map NO_2 concentrations[9] corresponding to the grid squares where the identified sensitive receptors are located range from 7.4 µg/m^3 to 9.6 µg/m^3 and are shown in Table 4.

Table 4 – Selected Human Health Receptor Background Concentrations

Receptor Name	X Coordinate	Y Coordinate	Height (m)	NO_2 (µg/m^3)
1	448301	186123	1.5	9.6
2	448519	186087	1.5	9.6
3	448176	186036	1.5	9.6
4	447996	185956	1.5	7.4
5	447858	185875	1.5	7.4
6	449004	186138	1.5	8.8
7	449086	186182	1.5	8.8
8	449010	185971	1.5	7.8
9	448975	185745	1.5	9.4
10	448906	185638	1.5	9.4
11	448410	185941	1.5	9.4
12	448359	186061	1.5	9.6
13	448072	186007	1.5	9.6
14	447925	185920	1.5	7.4
15	448131	185945	1.5	9.4
16	447974	185670	1.5	7.4
17	449099	185916	1.5	7.8
18	449009	185875	1.5	7.8
19	447934	187436	1.5	7.7
20	448393	186503	1.5	9.6
21	448161	186485	1.5	9.6
22	448264	186394	1.5	9.6
23	448238	186067	1.5	9.6
24	449075	186095	1.5	8.8
25	449096	186029	1.5	8.8

[9] Defra (2020). https://uk-air.defra.gov.uk/data/laqm-background-home

3.3 Generator Emissions Data

The EDGs will emit pollutants to the air from two exhaust gas ducts per generator (six sources in total).

Only one generator will be tested at a time for a period of 30-minutes every 2 weeks, plus an annual 4-hour test.

Pollutants emitted will be NO_x, particulates (PM_{10}), carbon monoxide (CO) and Hydrocarbons (HC). Only emissions of NO_x have been modelled as the peak predicted 1-hour concentrations can be compared to a 1-hour AQS.

The engine emissions data were provided by the manufacturer (Perkins) and are included in Appendix 2.

The emissions data were provided at 5% O_2 and ambient temperature of 25 °C.

The provided emissions for the 3g scenario were calculated at actual operating conditions for the Prime Power data from the manufacturer at 473 °C (746.15K). This is shown in Appendix 3.

The 3g concentration of NO_x was converted to BAT reference conditions @ 15% O_2, 0°C (273.15K) in order to calculate the NO_x reduction required to meet the 2g compliance emission concentration of 750 mg/Nm^3.

The 2g compliance would be met by the inclusion of SCR on the purchased 3g EDGs. The NO_x reduction curve for a given dose of ammonia (NH_3) was provided by the manufacturer and is included in Appendix 3. It is noted that the operational temperature range is from 360 °C - 427°C. The change in operational exhaust gas temperature from 473 °C to 427°C resulted in a change in volume flow rate from 3.38 m^3/s (data sheet) to 3.17m^3/s. This lowered the exit velocity per duct from 79m/s to 74 m/s. These calculations are all included in Appendix 3.

The impacts of emissions from each EDG are different and influenced by their position in relation to the surrounding plant and buildings. The concentrations of emitted pollutants from each generator in turn (hereafter referred to as the Process Contribution (PC)), were predicted and combined with the background concentration at each receptor to obtain the total Predicted Environmental Concentration (PEC).

In accordance with EA guidance, the PEC has been derived as follows:

- PEC for short-term concentrations: PC + twice the background.

Additional source data considered are presented in Table 5.

Table 5 – Model Inputs

Variables	ADMS Model Input
Pollutants	NO_x
Model Output	Long-term annual mean NO_2 concentrations 99.79th and 100th Percentiles of 1-hour mean NO_2 concentrations
Emission Inputs	Exhaust Duct Locations: Name / X (m) / Y (m) EDG1-exhaust1 448213.26 186509.01 EDG1-exhaust2 448214.34 186509.41 EDG2-exhaust1 448218.47 186511.01 EDG2-exhaust2 448219.49 186511.43 EDG3-exhaust1 448223.52 186513.09 EDG3-exhaust2 448224.55 186513.52 Internal Stack Diameter: 0.165m Stack Height: 2.8 m

3.4 ADMS Model Operations

3.4.1 Meteorological Data

The study has used meteorological data representative of the local area to calculate atmospheric conditions and therefore the dispersion of emissions from the Proposed Development. The Brize Norton meteorological site, situated approximately 27 km north-east of the Proposed Development site, has been used in this assessment. Five years of meteorological data (2019 to 2023) have been modelled in a sensitivity analysis to determine the worst-case meteorological year (see Appendix 4). Based on the results of the sensitivity analysis, the contour maps of 100th percentile concentrations for EDGs 1 and 2 have been based on 2020 data as this resulted in the maximum off-site predicted concentration, while the contour plots for EDG3 show the results for 2021 data for the 3g scenario. For the 2g scenario the worst-case year was 2021 for all generators. Wind roses for all five years are shown in Appendix 1, Drawing 4.

3.4.2 Treatment of Nitrogen Dioxide

Emissions of NO_x comprise both NO_2 and NO (nitric oxide). Emissions of NO_x will undergo oxidation in the atmosphere to form NO_2, however the rate of conversion will depend on a number of factors before equilibrium in the atmosphere is reached.

This assessment has considered NO_x emissions as 35% NO_2 when considering compliance with the short-term (1-hour mean) AQSs. Using these proportions is considered to be a worst-case assessment in accordance with EA guidance.

3.4.3 Buildings

Buildings can have a significant effect on the dispersion of pollutants from sources in close proximity of the buildings. The main potential 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. As a consequence, concentrations near the buildings can be increased, with downwind concentrations decreased.

According to EA guidance buildings within five times the selected stack height of the stack locations should be included in the air quality model. This study has included some items of proposed plant outside this threshold but are considered to have a potential influence on the immediate dispersion climate for the exhaust gases. The buildings that have been included in the model are summarised in Figure 1 below and shown in Appendix 1, Drawings 2 and 3.

Figure 1- Modelled Buildings

Main	Name	Shape	X (m)	Y (m)	Height (m)	Length / Diameter (m)	Width (m)	Angle (°)
✓	Main DS Building	Rectangular	448247.83	186532.83	12.892	37.313	123.69	68
	EDG1	Rectangular	448214.97	186506.35	2.793	2.26	7.4	68
	EDG2	Rectangular	448220.09	186508.35	2.793	2.26	7.4	68
	EDG3	Rectangular	448225.16	186510.49	2.793	2.26	7.4	68
	ASHP1	Rectangular	448225.2	186500.23	4	7.352	2.535	68
	ASHP2	Rectangular	448227.34	186494.43	4	7.352	2.535	68
	ASHP3	Rectangular	448229.5	186488.71	4	7.352	2.535	68
	Fire Water Tank	Circular	448223.91	186475.61	10.61	9.24	9.24	0
	Chiller	Rectangular	448217.89	186490.92	4.3	2.54	14.115	68
	DS Building	Rectangular	448245.73	186477.15	12.892	7.724	22	247
	DS Building Entrance	Rectangular	448271.55	186547.98	6.315	17.65	114.05	68

3.4.4 Surface Roughness and Minimum Monin-Obukhov Length

A surface roughness of 1 m is representative of cities/woodlands in the ADMS model. Given the amount of plant, buildings and infrastructure on the Moderna and neighbouring sites, this is considered to best represent the area around the EDGs and has therefore been used in this study.

A surface roughness of 0.2 m was used for the Brize Norton meteorological station site.

Monin-Obukhov length (L_{MO}) is used to describe the minimum stability of the atmosphere. The minimum L_{MO} at the dispersion site and at the meteorological site are calculated by the model for each hour of meteorological data as there are no urban heat island effects restricting the formation of very stable conditions.

4. Assessment Results

The maximum predicted 1-hour concentration at each receptor has been calculated for each EDG and both the 3g and 2g emission scenarios.

The results are summarised in Appendix 4.

There are no exceedances of the short-term 1-hour AQS at any residential receptor or nursery for the 3g scenario except for at 2 receptors selected close to the site boundary assumed to be walking routes and where members of the public *may* spend an hour for EDG1. For EDGs 2 and 3, the exceedance is only at one receptor.

For the 2g scenario, the results show that there is only one receptor for each EDG where the predicted 1-hour concentration exceeds the 1-hour AQS.

The table in Appendix 4 compares the PC and PEC at each receptor and summarises the reduction achieved when changing from the 3g to the 2g scenario.

The contour maps in Appendix 1, Drawings 5-7 show the area of exceedance of the 1-hour AQS of 200 µg/m^3 for both the 3g and 2g scenarios for each EDG.

The second table in Appendix 4 shows the number of hours per year where there is a predicted exceedance of the AQS at the closest receptor location to the EDGs (Receptor 21). This is presented for all possible hours

of the worst-case year and for limited hours that represent the situation where testing would only occur between 8am and 5pm on a weekday.

5. Conclusion

ITPEnergised has undertaken an atmospheric dispersion modelling exercise of the proposed emergency diesel generators (EDGs) at Moderna's new Drug Substance (DS) site on the Harwell campus in Oxfordshire.

The assessment has considered Generators 1, 2 and 3 and has compared the effects of two air emission scenarios – one case with emissions of oxides of nitrogen from the EDGs at emissions class 2g and another case at 3g. The emissions classes correspond to flue gas concentrations of oxides of nitrogen (NOx) of 2,000 and 2,800 milligrams per Normal cubic meter respectively. Use of the 2g class is considered to represent the Best Available Technology for pollution control from the EDGs, in accordance with guidance from the Environment Agency.

NOx emissions from each of the three EDGs were modelled for each emissions class using the industry-standard ADMS-6 modelling software and five years of hourly meteorological data from RAF Brize Norton. Once modelled, NOx was converted to nitrogen dioxide (NO_2), using recommended Environment Agency methodology. Results were compared with the UK limit value for short term NO_2.

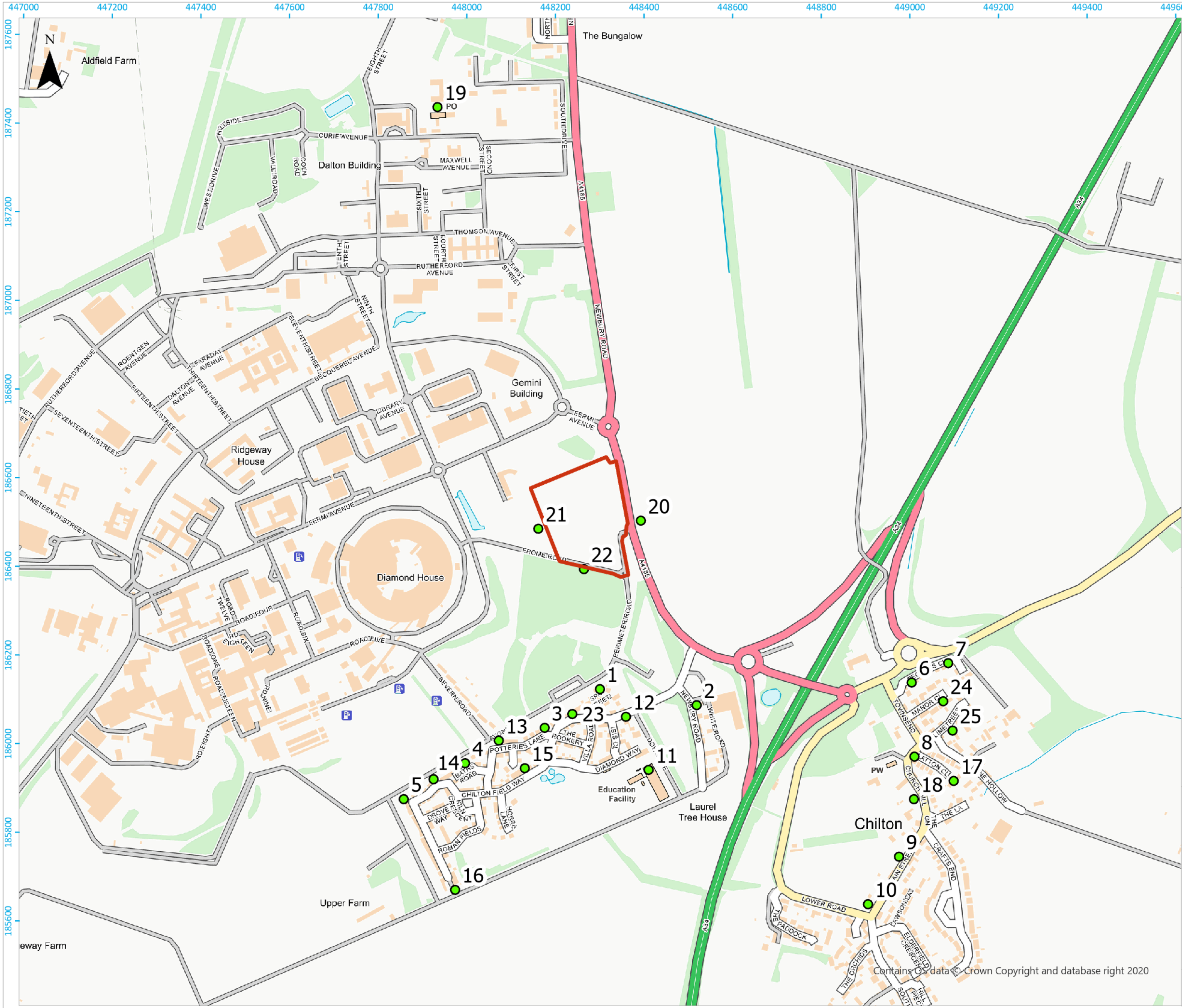
NOx concentrations were measured at residential receptors located in Chilton south of the Harwell Campus, a nursery located to the north and areas of public access in the immediate area surrounding the Campus itself.

A public access location, R21, recorded the highest modelled concentrations under both emissions classes, exceeding the hourly NO_2 criterion in 2g and 3g scenarios, however it is considered unlikely that pedestrians using the footpaths would experience a full hour of exposure in this location. A further slight exceedance is possible at R22 (another outdoor potential pedestrian location near the DS site boundary) when Generator 1 is operating with 3g emissions.

The outcome of the assessment indicates that there are no significant differences between the use of 2g and 3g generators at the DS building and the overall performance of the 2g BAT case against the short term NO_2 standard is very similar to the 3g case, which has been visualized in Drawings 5, 6 and 7. Any differences in performance were observed in close proximity to the EDGs with the highest concentrations of NOx found to be within the site boundary itself.

There were no expected exceedances of the short-term NO_2 limit value from either emissions class at any residential property near the DS building nor the nursery located on the campus. There is no effective difference therefore between 2g and 3g emissions classes and the consequent NO_2 concentrations at any of the inhabited receptors considered.

Appendix 1 - Drawings



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Aldfield Farm
The Bungalow
Dalton Building
Gemini Building
Ridgeway House
Diamond House
Education Facility
Laurel Tree House
Upper Farm
Chilton
PW
PO
CURIE AVENUE
MAXWELL AVENUE
THOMSON AVENUE
RUTHERFORD AVENUE
FERMI AVENUE
LIBRARY AVENUE
BECQUEREL AVENUE
FARADAY AVENUE
DALTON AVENUE
ROENTGEN AVENUE
RUTHERFORD AVENUE
NEWBURY ROAD
FROME ROAD
PERIMETER ROAD
SEVERN ROAD
POTTERIES LANE
CHILTON FIELD WAY
DIAMOND WAY
LOWER ROAD
THE PADDOCK
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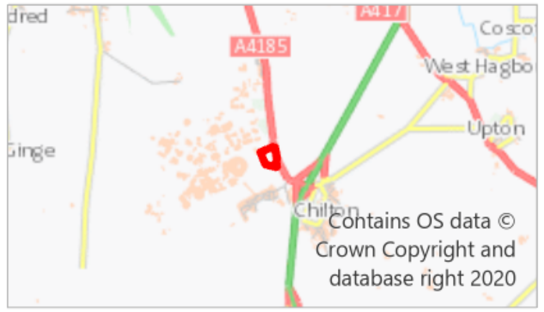
Contains OS data © Crown Copyright and database right 2020

KEY

Red Line

Modelled Receptors



Coordinate System: British National Grid
Projection: Transverse Mercator

0 50 100 200 300 400 500 m

1:8,000

ITPENERGISED PART OF SLR

Moderna EDGS Harwell - 7042
Air Quality Impact Assessment

Drawing 1
Site Location and Modelled Receptors

Date:	Lead:	Review:	Version:
07/03/2024	JH	A.D	1.0

448150 448200 448250 448300 448350 448400 448450

186650 186600 186550 186500 186450 186400

N

DS Building

DS Building Entrance

EDG 3

EDG 2

EDG 1

ASHPs

Chiller

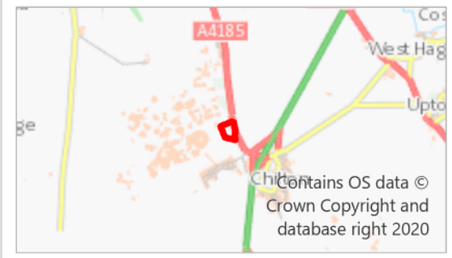
Fire & Water Tank

FROME ROAD

A4185

KEY

- Red Line
- Modelled EDG Exhaust
- Modelled Buildings



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Projection: Transverse Mercator

0 12.5 25 50 75 m

1:1,150

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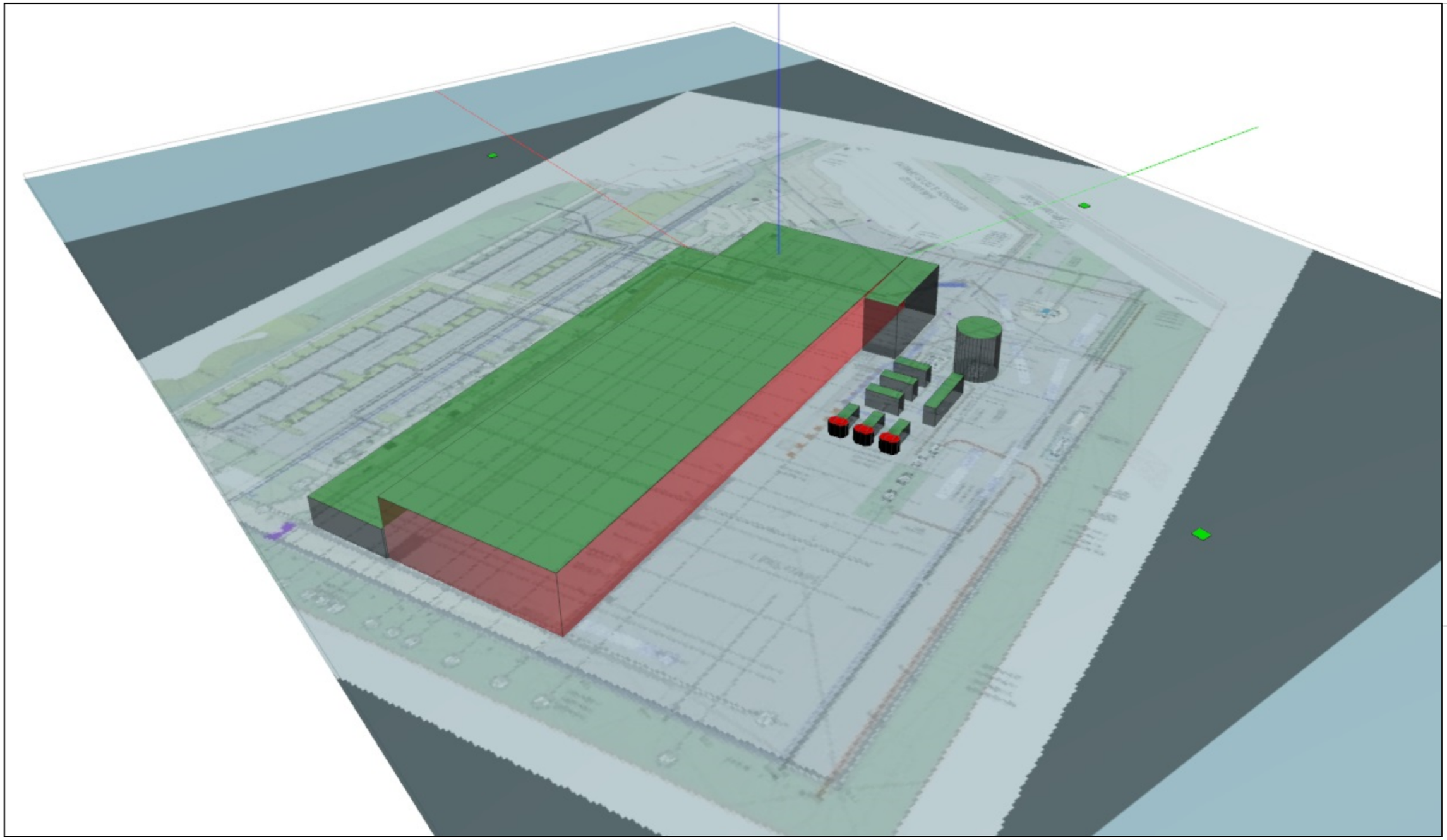
PART OF SLR

Moderna EDGS Harwell - 7042
Air Quality Impact Assessment

Drawing 2
Modelled Sources and Buildings

Date:	Lead:	Review:	Version:
07/03/2024	JH	A.D	1.0



MB stack diameter not to scale

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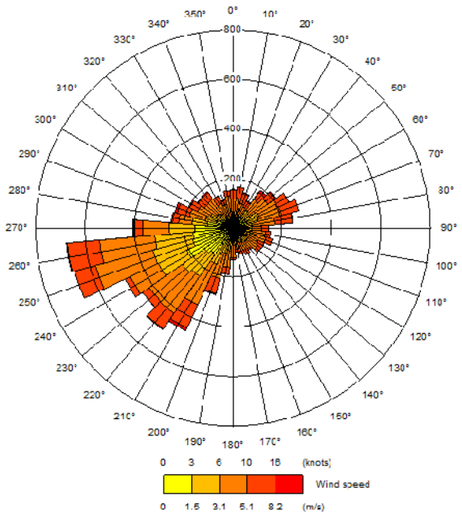
Moderna EDGS Harwell - 7042
Air Quality Impact Assessment
Drawing 3
3D Modelled Input

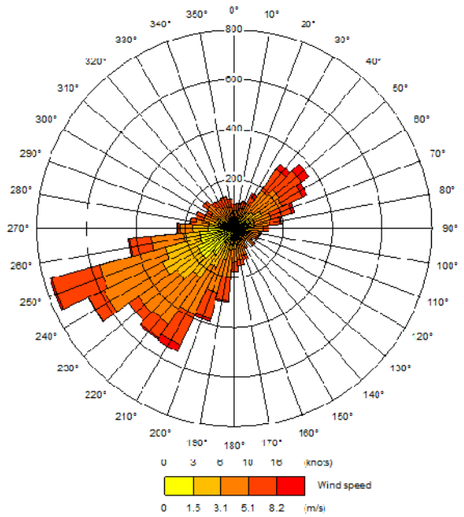
Date:	Lead:	Review:	Version:
07/03/2024	JH	A.D	1.0

N

Hourly Meteorological Data - Brize Norton



2019



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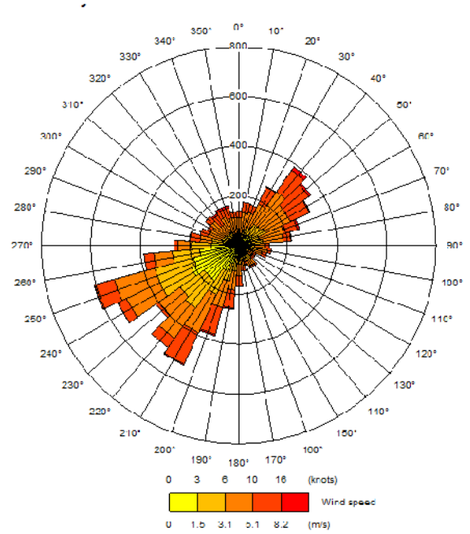

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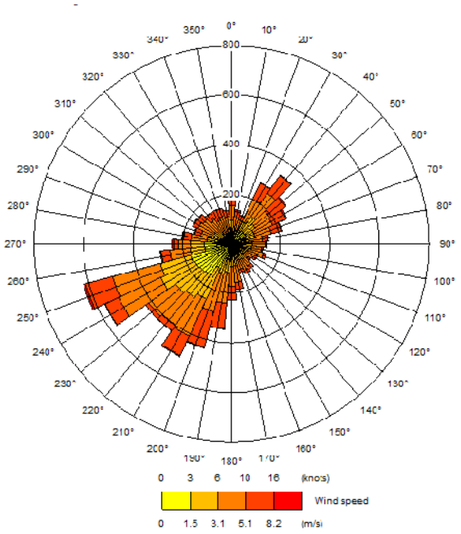

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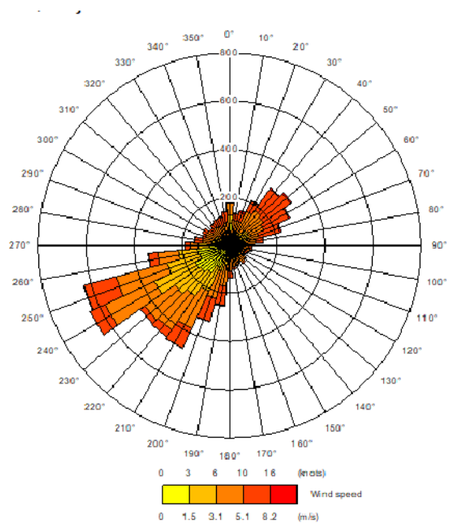

2023

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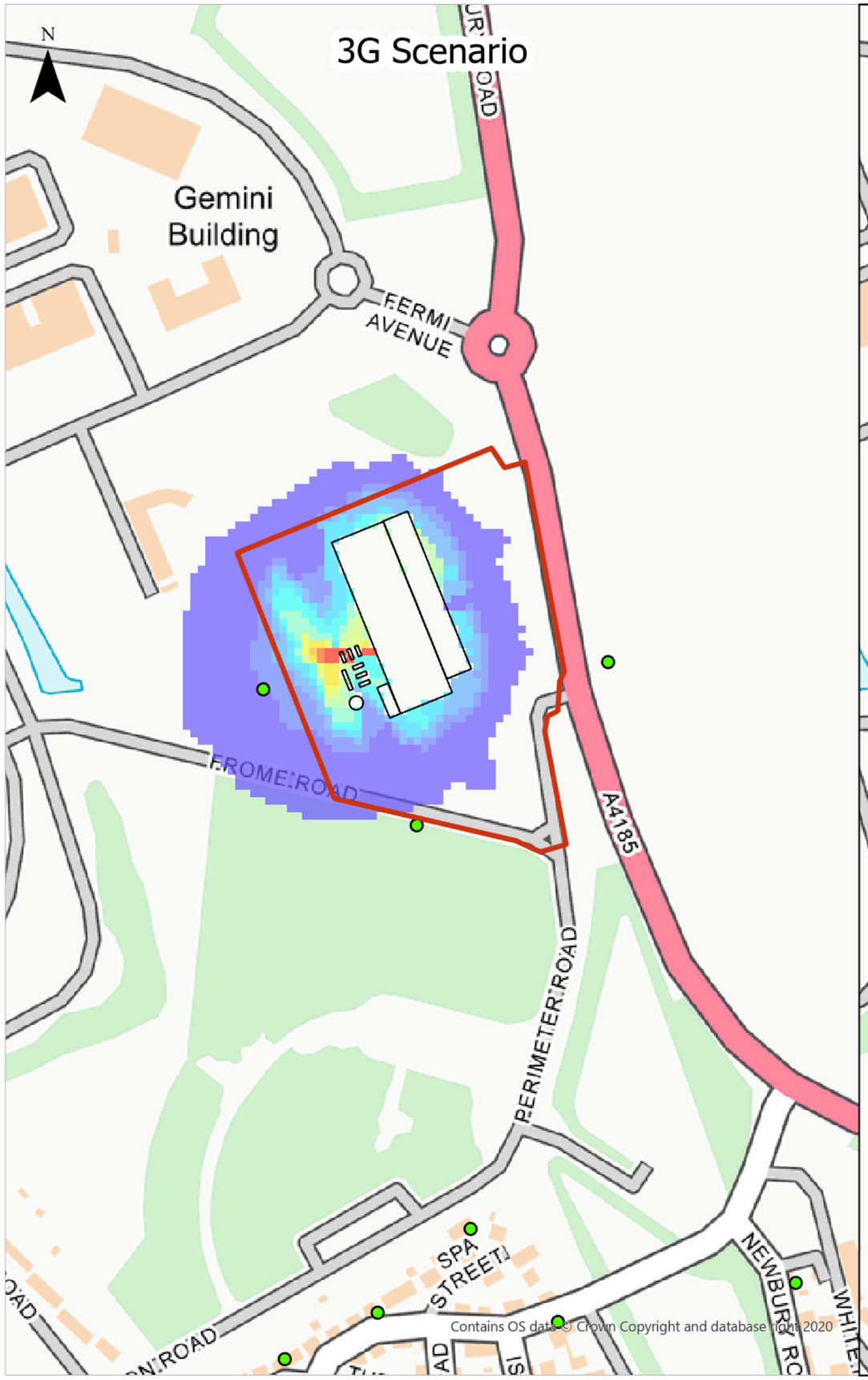
Moderna EDGS Harwell - 7042
Air Quality Impact Assessment

Drawing 4
Wind Roses for Brize Norton
Hourly Meteorological Data 2019 - 2023

Date:	Drawn by:	Checked by:	Version:
07/03/2024	JH	AD	V1

Project Number: 7042



KEY

- Red Line
- Modelled Buildings
- Modelled Receptors

100th Percentile Values for NOx (ug/m³)

Value

- 1 - 200
- 200 - 400
- 400 - 600
- 600 - 800
- 800 - 1,000
- 1,000 - 1,200
- 1,200 - 1,400
- 1,400 - 1,600
- 1,600 - 1,800
- 1,800 - 2,000
- 2,000 - 3,000
- 3,000 - 4,000
- 4,000 - 5,000
- 5,000 - 6,000
- 6,000 - 7,000

Coordinate System: British National Grid
Projection: Transverse Mercator

0 25 50 100 150 200 m

1:3,300

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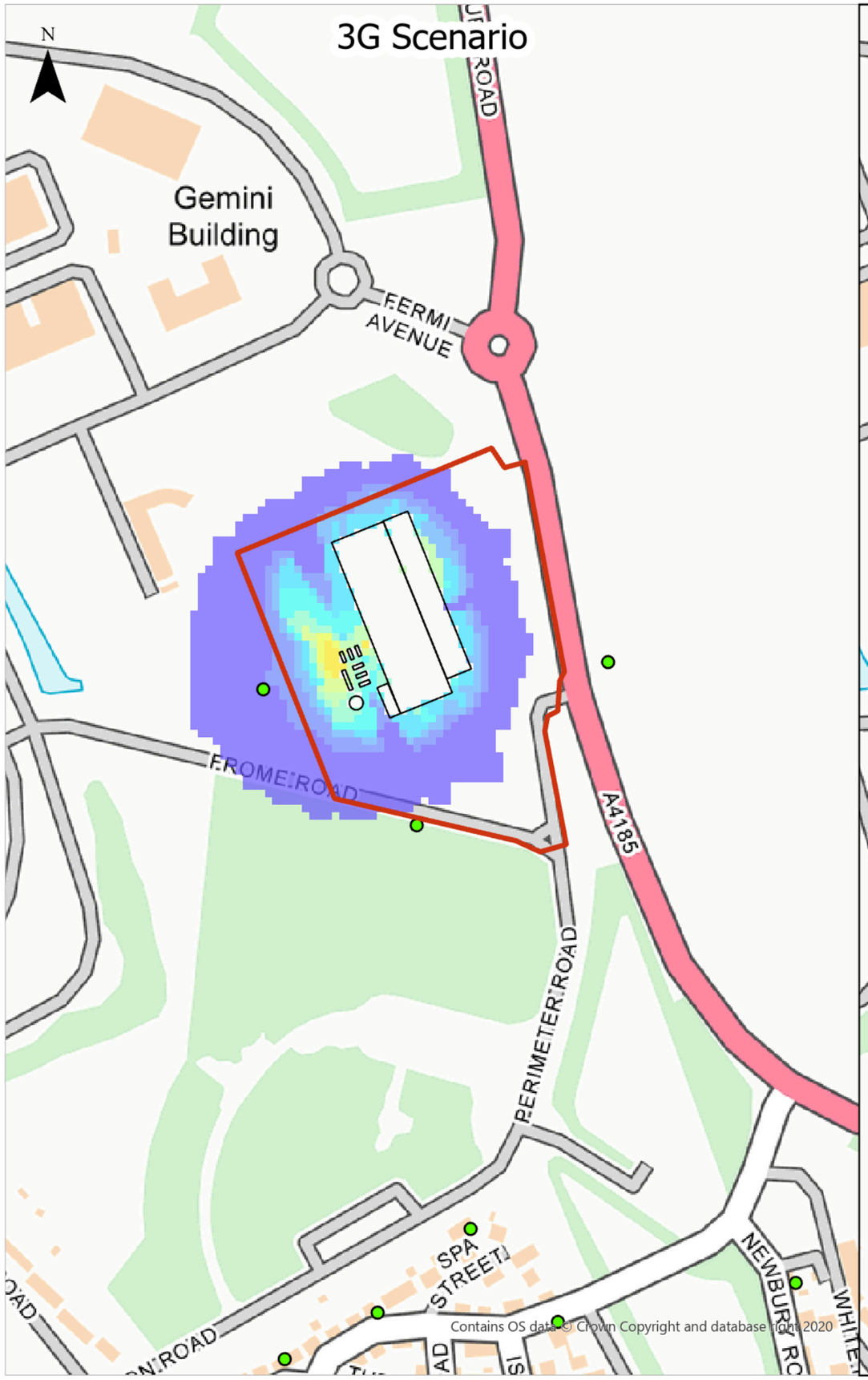
Moderna EDGS Harwell - 7042
Air Quality Impact Assessment
Drawing 5
Comparison of 3G and 2G Scenarios for Generator 1

Date:	Lead:	Review:	Version:
08/03/2024	JH	A.D	1.0



KEY

- Red Line
- Modelled Buildings
- Modelled Receptors

100th Percentile Values for NOx (ug/m³)

Value

- <200
- 200 - 400
- 400 - 600
- 600 - 800
- 800 - 1,000
- 1,000 - 1,200
- 1,200 - 1,400
- 1,400 - 1,600
- 1,600 - 1,800
- 1,800 - 2,000
- 2,000 - 3,000
- 3,000 - 4,000
- 4,000 - 5,000
- 5,000 - 6,000
- 6,000 - 7,000

Coordinate System: British National Grid
Projection: Transverse Mercator

0 25 50 100 150 200 m

1:3,300

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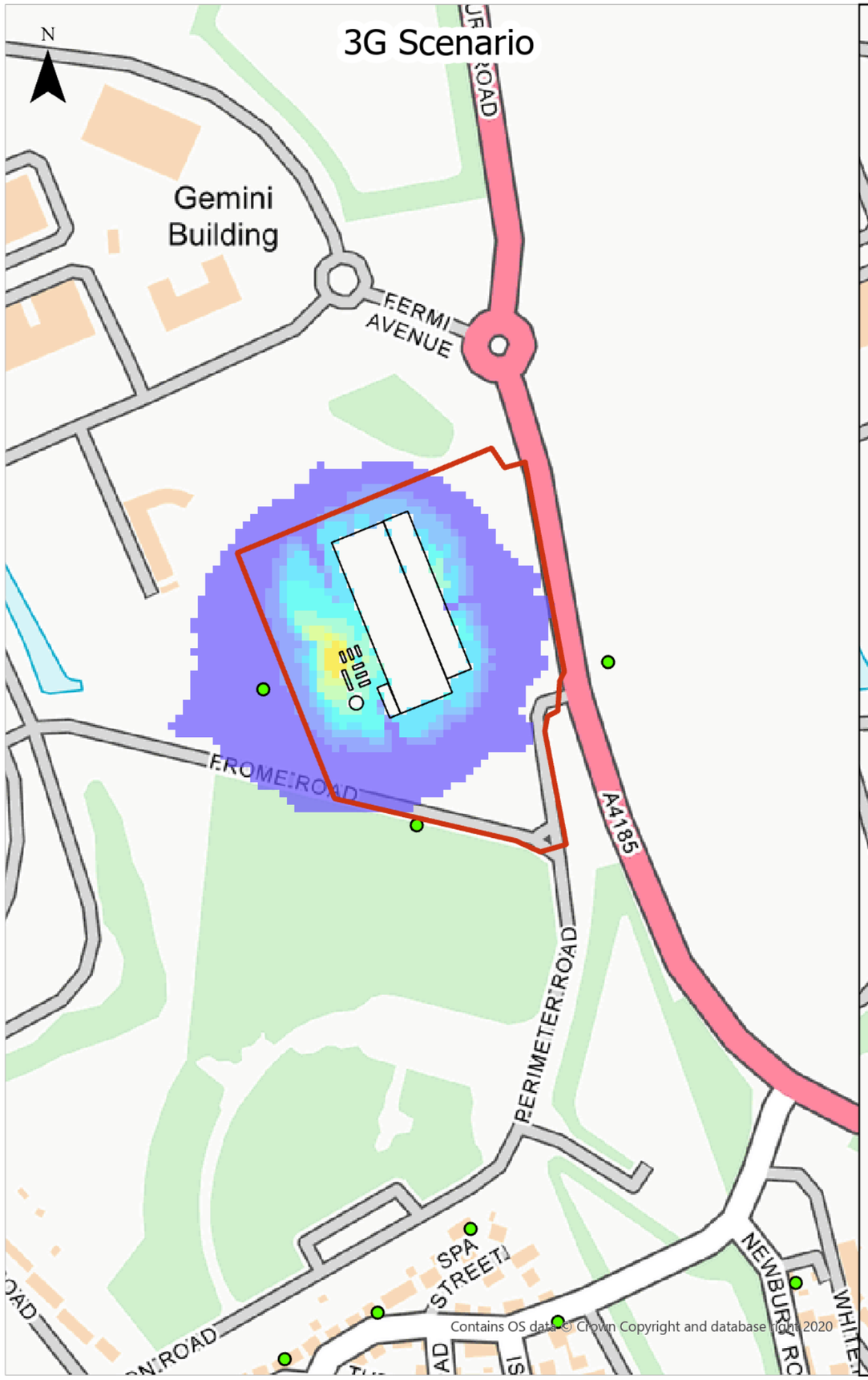
PART OF SLR

Moderna EDGS Harwell - 7042
Air Quality Impact Assessment
Drawing 6
Comparison of 3G and 2G Scenarios for Generator 2

Date:	Lead:	Review:	Version:
08/03/2024	JH	A.D	1.0



KEY

- Red Line
- Modelled Buildings
- Modelled Receptors

100th Percentile Values for NOx (ug/m³)

Value

- <200
- 200 - 400
- 400 - 600
- 600 - 800
- 800 - 1,000
- 1,000 - 1,200
- 1,200 - 1,400
- 1,400 - 1,600
- 1,600 - 1,800
- 1,800 - 2,000
- 2,000 - 3,000
- 3,000 - 4,000
- 4,000 - 5,000
- 5,000 - 6,000
- 6,000 - 7,000

Coordinate System: British National Grid
Projection: Transverse Mercator

0 25 50 100 150 200 m

1:3,300

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PART OF SLR

Moderna EDGS Harwell - 7042
Air Quality Impact Assessment
Drawing 7
Comparison of 3G and 2G Scenarios for Generator 3

Date:	Lead:	Review:	Version:
08/03/2024	JH	A.D	1.0

Appendix 2 - Manufacturer Emissions Data

Perkins Engines Company Limited
Tixall Road
Stafford
ST16 3UB United Kingdom

Tel: +44 (0)1785 215700
Fax: +44 (0)1785 214022

Engine Emissions Information for the Perkins 4008-30TAG3 (with 14° spill timing)

1. The information provided herein applies to the Perkins engines designed and manufactured (a) at the Perkins facilities identified below and (b) for use in electric power generator sets:

Perkins Engines Company Ltd	Perkins India Private Ltd
Tixall Road	Plot No. G-1
Stafford	Additional Shendra
ST16 3UB	Aurangabad
United Kingdom	India, 431007

2. This emissions information provided herein applies to the following build lists, all for the Perkins 4008-30TAG3 with 14° spill timing:

DGDH0150 DGDH0154 DGDH0155 DGDH0156 DGDH0157 DGDH0162 DGDH0176
DGDH0342 DGDH1272

3. The following emissions information for the Perkins 4008-30TAG3 are optimised for fuel consumption and do not conform to Harmonised International Regulation Emission Limits. As non-regulated specifications, Perkins reserves the right to make product changes without notice. These changes may affect engine emissions.

a. When engines of the above build lists are run at reference conditions (25°C ambient temperature, 10.71g/kg_dry air specific humidity, 101.3 kPa barometric pressure, 2.5kPa intake restriction, and 3 kPa exhaust back pressure) using fuel with an LHV of 44MJ/kg, a cetane number of 49 and fuel inlet temperature of 40°C, the exhaust emissions at Prime Power (997 bkW) will be as follows:

NOx:	< 2,800 mg/Nm^3 corrected to 5% O_2
CO:	< 400 mg/Nm^3 corrected to 5% O_2
HC:	< 150 mg/Nm^3 corrected to 5% O_2
Particulates:	< 80 mg/Nm^3 corrected to 5% O_2

b. The above figures are measured in accordance with ISO 8178-1:2017 and corrected in accordance with ISO 8178-4:2017 to 5% O_2, 10.71 g/kg specific humidity, 101.3 kPa barometric pressure, and 25°C ambient temperature.

c. The above figures are valid for the engine as a brand-new product supplied by Perkins. The emissions levels will increase with use of the engine. No estimated deterioration factor is available for a brand-new engine; the deterioration factor will depend on the duty cycle.

4. Nothing provided herein constitutes a performance guarantee or a representation of any kind. It is provided at your request for informational purposes. Actual performance may vary and is dependent upon various conditions including but not limited to: the installation of the engine into the finished product, the fuel used to run the engine, and the ambient conditions at the installation site.

5. The information provided herein is current as of the date of this communication.

6. All installations should follow published Perkins Applications & Installation guidelines. Failure to do so will impact the performance and emissions of the product.

7. Where this information is to be used for the sizing of retrofit after-treatment equipment it is recommended that on-site/in application measurements are taken in order to account for any variation in emissions levels arising from installation or environmental factors.

8. Failure to properly maintain or operate the engine as per the Operation & Maintenance Manual guidelines will result in an increase in measured emissions.

9. Nothing provided herein supersedes, nullifies or in any way modifies the Perkins Standard Terms and Conditions of Sale.

Registered Number 2089227 England and Wales
Registered Office Eastfield Peterborough PE1 5NA

4008-30TAG3

1105 kWm Standby @ 1500 rpm

Diesel engine - ElectropaK

4000 Series

Basic technical data

Number of cylinders ... 8
Cylinder arrangement ... Inline
Cycle ... 4 stroke
Induction system ... Turbocharged
Combustion system ... Direct injection
Compression ratio ... 13:1 nominal
Bore ... 160 mm
Stroke ... 190 mm
Cubic capacity ... 30.561 litres
Direction of rotation ... Anticlockwise viewed on flywheel
Firing order ... 1, 4, 7, 6, 8, 5, 2, 3
Cylinders ... 1 furthest from flywheel

Total weight of ElectropaK

Dry ... 4217 kg
Wet ... 4473 kg

Overall dimensions

Height ... 1920 mm
Length ... 3468 mm
Width ... 2194 mm

Moments of inertia

Flywheel ... 9.60 kgm²
Engine ... 6.02 kgm²

Cyclic irregularity, engine/flywheel maximum

4008-30TAG3 at 1500 rev/min ... 1.67

Ratings

Steady state speed stability at constant load ... ± 0.25%

Electrical ratings are based on average alternator efficiency and are for guidance only (0.8 power factor being used).

Operating point

Engine speed ... 1500 rev/min
Static injection timing ... 14° btdc
Cooling water exit temperature ... < 98°C

Fuel data

To conform to BS2869 class A2;BS EN590

Performance

All data based on operation to ISO 3046/1, BS5514 and DIN 6271 standard reference conditions

Noise

Estimated sound pressure level at 1 metre ... 111 dB(A)

Note: Noise level represents highest recorded at 1500 rev/min.

Test conditions

Air temperature ... 25°C
Barometric pressure ... 100 kPa
Relative humidity ... 30%
Air inlet restriction at maximum power (nominal) ... 2.5 kPa
Fuel temperature (inlet pump) ... 58°C (maximum)
Exhaust back pressure (at maximum power) ... 3.0 kPa

Note: For test conditions relevant to data on load acceptance, refer to page 4 of this document

Publication No. TPD2011E3, Issue 2, June 2018.

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Fax: +44 (0)1733 582240
www.perkins.com

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General installation

4008-30TAG3

Designation	Units	Type of operation and application		
		50 Hz @ 1500 rev/min		
		Baseload	Prime power	Standby power
Gross engine power	kWm	850	997	1105
Fan and battery charging alternator power typical (tropical)	kWm		50	
Nett engine power	kWm	800	947	1055
Brake mean effective pressure - gross	kPa	2191	2570	2848
Combustion air flow at ISO conditions	m^3/min	73	84	96
Exhaust gas temperature (after turbo) - maximum	°C	460	473	482
Exhaust gas flow - maximum at atmosphere pressure	m^3/min	180	203	240
Boost pressure ratio	:1	3.20	3.86	4.20
Mechanical efficiency	%	90.0	93.0	93.0
Overall thermal efficiency (nett)	%	39	39	39
Friction and pumping power losses	kWm		70	
Mean piston speed	m/s		9.5	
Engine coolant flow	l/min		630	
Typical GenSet electrical output (0.8pf)	kVA	950	1125	1250
	kWe	760	900	1000
Assumed alternator efficiency	%		95	

Note: All quoted gross engine powers include an allowance of 1.5% for installation variances. Not to be used for CHP design purposes (indicative figures only). Consult Perkins Engines Stafford Limited. Assumes complete combustion.

Rating definitions

Baseload power
Unlimited hours usage with an average load factor of 100% of the published baseload power rating. No overload is permitted on baseload power.

Prime power
Unlimited hours usage with an average load factor of 80% of the published prime power over each 24 hour period. A 10% overload is available for 1 hour in every 12 hours operation.

Standby power
Limited to 500 hours annual usage with an average load factor of 80% of the published standby power rating over each 24 hour period. Up to 300 hours of annual usage may be run continuously. No overload is permitted on standby power

Emissions capability
All 4008-30TAG3 ratings are optimised for the best fuel consumption and do not comply to Harmonised International Regulation Emission Limits. More information may be obtained by contacting the Applications Department at Perkins Engine Company Limited

Energy balance

4008-30TAG3

Designation	Units	Baseload	Prime power	Standby power
Energy in fuel	kWt	2030	2418	2736
Energy in power output (gross)	kWb	850	997	1105
Energy to cooling fan (typical)	kWm		50	
Energy in power output (nett)	kWm	800	947	1055
Energy to exhaust	kWt	660	785	896
Energy to coolant and oil	kWt	270	300	331
Energy to radiation	kWt	50	58	74
Energy to charge cooler	kWt	200	278	330

Note: Not to be used for combined heat and power (CHP) purposes (indicative figures only). If necessary, consult Perkins Engines Company Limited.

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Cooling system

Recommended coolant: 50% inhibited ethylene glycol or 50% inhibited propylene glycol and 50% clean fresh water. For CHP systems and where there is no likelihood of ambient temperature below 10°C, then clean soft water may be used, treated with 1% by volume of Perkins inhibitor in the cooling system. The inhibitor is available in 1 litre bottles from Perkins, part number 21825 735.

Maximum pressure in crankcase water jacket ... 170 kPa
Maximum top tank temperature (standby) ... 98°C
Maximum static pressure on pump ... 70 kPa

Total coolant capacity

Electrounit (engine only) ... 48 litres
ElectropaK - Tropical (engine/radiator) ... 140 litres
Maximum permissible restriction to coolant pump flow ... 20 kPa
Thermostat operating range ... 84-93°C
Ambient cooling clearance (standby power) based on air temperature at fan of 5°C above the ambient ... 50°C
Temperature rise across the engine (standby power) with inhibited coolant @ 1500 rev/min ... 8-12°C (depending on rating)

Radiator - side by side vertical type

Radiator face area ... 2.6 m^2
Material ... aluminium
Width of matrix (total both cores) ... 1936 mm
Height of matrix ... 1347 mm
Weight of radiator ... 940 kg
Pressure cap setting (minimum) ... 70 kPa
Overall dimensions (approximate)
Height ... 1810 mm
Width ... 2194 mm

Water jacket cooling data 1500 rpm

Coolant flow ... 630 l/min
Coolant exit temperature (maximum) ... 98°C
Coolant inlet temperature (minimum) ... 70°C
Coolant inlet temperature (maximum) ... 86°C

Coolant pump -1 off

Speed ... 1.4 x rev/min
Method of drive ... Engine driven

Fan 4008-30TAG3

Power ... 50 kWm
Fan ... Truflo
Type ... Axial flow
Diameter ... 1250 mm
Number of blades ... 9
Material ... Hybrid
Drive ratio ... 0.94*engine

Duct allowance

Maximum additional restriction to cooling airflow and resultant minimum airflow (standby power application)		
Ambient clearance 50% Glycol	Duct allowance (Pa)	Airflow m^3/sec
50°	250	1104
	125	1140
	0	1176

Lubrication system

Recommended SAE viscosity:

Multigrade oil conforming to the following must be used API CG 15W/40

Note: For additional notes on lubricating oil specifications, refer to the OMM manual

Total system capacity:

Maximum sump capacity ... 153 litres
Minimum sump capacity ... 127 litres
Oil temperature at normal operating conditions ... 95ºC
Oil temperature (in rail) - Maximum continuous operation ... 105ºC

Lubrication oil pressure

At rated speed ... 340 kPa
Minimum ... 240 kPa
Oil filter screen spacing ... 40 microns
Sump drain plug tapping size ... G1
Oil pump speed and drive method ... 1.4 x rev/min engine driven gear
Shutdown switch - pressure setting (where fitted) ... 193 (falling) kPa

Oil consumption prime power

4008-30TAG3

Oil consumption prime power	Units	1500 rev/min
After running in (1)	g/kWhr	0.4
Oil flow rate from pump	litres/sec	3.7

1. Typically after 250 hours

Fuel system

Note: Recommended fuel to conform to BS2869 1998 class A1, A2 or BS EN590

Injection system ... Direct injection

Fuel injection pump

Injector type ... Unit injector
Injector pressure ... 23.4 MPa
Lift pump type ... Gerotor
Fuel delivery ... 660 litres/hour
Heat retained in fuel to tank ... 4.5 kWt
Fuel inlet temperature ... < 58ºC
Delivery pressure ... 300 kPa
Maximum suction head at pump inlet ... 2.5 metres
Maximum static pressure head ... See manual
Fuel filter spacing ... 10 microns
Governor type ... Electronic
Governing ... To ISO 8528-5 2005
Torque at the governor output shaft ... 1 kgm
Tolerance on fuel consumption ... To ISO 8528-1 1993

Fuel consumption

4008-30TAG3 @ 1500 rpm		
Designation	g/kWh	litres/hr
Standby	210	269
Prime power	206	244
Baseload power	202	200
At 75% of prime power	202	188
At 50% of prime power	204	120

Note: All based on assumed density of 0.862

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Induction system

Maximum air intake restriction of engine .. 1500 rpm
Clean filter .. 1.3 kPa
Dirty filter .. 5.0 kPa
Air filter type .. Paper element

Exhaust system

Exhaust outlet size (internal) .. 1 x 270 mm
Exhaust outlet flange size .. BS10 table D
Back pressure for total system 1500 rpm at standby power .. 7.0 kPa

Electrical system

Alternator type .. Insulated return
Alternator voltage .. 24 volts
Alternator output .. 55 amps
Starter type .. Electric
Starter motor voltage .. 24 volts
Starter motor power .. 8.2 kW
Number of teeth on flywheel .. 190
Number of teeth on starter pinion .. 12
Minimum cranking speed (0°C) .. 120 rev/min
Starter solenoid pull-in current @ -25°C maximum .. 30 amps
Starter solenoid hold-in current @ -25°C maximum .. 9 amps
Stop solenoid hold-in current .. 1.1 amps
Engine stop solenoid voltage .. 24 volts

Cold start recommendations

Temperature range down to 0°C (32 °F)

Oil .. API CG 15W/40 SAE grade
Starter .. 1 x 24 volts
Battery .. 2 x 12 volts x 178 Ah
Maximum breakaway current .. 1400 amps
Cranking current .. 750 amps
Minimum mean cranking speed .. 120 rev/min

Notes:

- battery capacity is defined by the 20 hour rate
- the oil specification should be for the minimum ambient temperature as the oil will not be warmed by the immersion heater
- breakaway current is dependent on the battery capacity available. Cable should be capable of handling transient currents which may be up to double the steady state cranking current

Engine mounting

Maximum static bending moment at rear face of block .. 1356 Nm
Maximum additional load applied to flywheel due to all rotating components .. 650 kg

Centre of gravity (bare engine - wet)

Forward of rear face of cylinder block .. 900 mm
Above crankshaft centre line .. 140 mm

Load acceptance cold

Initial load acceptance when engine reaches rated speed

15 seconds maximum after engine starts to crank	Units	
Prime power	%	52
Nett load	kWm	495
	kWe	470
Transient frequency deviation	%	≤ 10
Frequency recovery time	sec	5

Second load application immediately after engine has recovered to rated speed

5 seconds after initial load application	Units	
Prime power	%	48
Nett load	kWm	947
	kWe	900
Transient frequency deviation	%	≤ 10
Frequency recovery time	sec	5

Test conditions

The figure shown in the tables above were obtained under the following test conditions		
	Units	
Engine block temperature (cold)	°C	45
Ambient temperature	°C	25
Governing mode	Isochronous	
Alternator inertia (typical)	kgm^2	50
Under frequency roll off (UFRO) point set to 1500 rpm	Hz	49
UFRO rate set to (approximately)	V/Hz	16
LAM on/off		On

Notes:

- all tests were conducted using an engine installed and serviced to Perkins Engine Company Limited recommendations
- applied load is a percentage of generator electrical output efficiencies as published in the general installation section of this data sheet
- the information given on this technical data sheet is for standard ratings only
- for ratings other than those shown, contact Perkins Engines Limited Stafford
- the information given in this document is for guidance only

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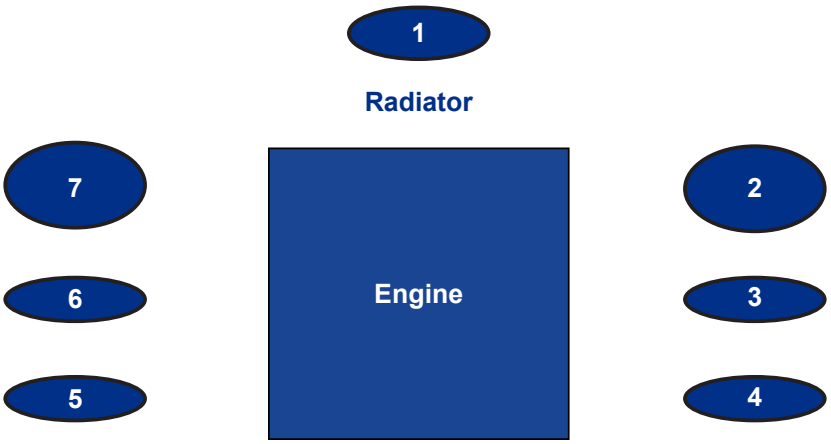
Noise data

Noise measured in semi reverberant environment and measured at a distance of one metre from the periphery of the engine

Ambient Noise .. .. 77 dBa



1500 rpm	
Noise measured at points 1 - 7 at standby power	SPL
Position	dBA
1	110.0
2	111.0
3	110.0
4	112.8
5	113.0
6	113.5
7	113.0

Frequency analysis at point 6 standby power	
Frequency (Hz)	dB
31.5	92.7
63	92.3
125	102.7
250	110.6
500	101.7
1K	104.0
2K	99.5
4K	110.0
8K	105.8
16k	92.3

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Appendix 3 – Calculation of Modelled Emissions at Actual Release Temperature

Figure 3.1 – Conversion of Manufacturer Reference Conditions to Operational Conditions -3g

Stack Parameters				Reference #
Grid Location (X & Y)		&		See AQIA Table 5
Stack Height (m)	2.8			From CAD and 3D model
Effective Internal Diameter (m)	0.165			Shentons email 06/03/24
Stack Area (m^2)	0.021			
Normal Conditions				
Normal Temperature of Exhaust Gas (deg C)	25	in K:	298.15	
Normal $\%O_2$	5			
Normal % H_2O	0			
Normal Volume Flow Rate (Nm^3/s)	1.78			
Normal Pollutant Emission Concentration (mg/Nm^3) at 5% O_2 25°C				
Nox	2800			Perkins see Appendix 2
PM10	80			Perkins see Appendix 2
CO	400			Perkins see Appendix 2
HC	150			Perkins see Appendix 2
Total Pollutant Mass Emission Rate (g/s)				
Nox	4.971			
PM10	0.142			
CO	0.710			
HC	0.266			
Actual Conditions Prime Power				
Actual Exit Velocity (m/s)	158.1			
Actual Temperature of Exhaust Gas (deg C)	473	in K:	746.15	4008-30TAG3 Perkins Data Sheet Appendix 2
Actual $\%O_2$				
Actual % H_2O				
Actual Volume Flow Rate (m^3/s)	3.38			4008-30TAG3 Perkins Data Sheet Appendix 2
Actual Pollutant Emission Concentration (mg/m^3)				
Nox	1470.7			
PM10	42.0			
CO	210.1			
HC	78.8			
Total Pollutant Mass Emission Rate (g/s)				
Nox	4.971			
PM10	0.142			
CO	0.710			
HC	0.266			

Figure 3.2 – Conversion of Manufacturer Reference Conditions to Operational Conditions -3g-PER DUCT

Stack Parameters				Reference #
Grid Location (X & Y)		&		See AQIA Table 5
Stack Height (m)	2.8			From CAD and 3D model
Effective Internal Diameter (m)	0.165			Shentons email 06/03/24
Stack Area (m^2)	0.021			
Normal Conditions				
Normal Temperature of Exhaust Gas (deg C)	25	in K:	298.15	
Normal $\%O_2$	5			
Normal % H_2O	0			
Normal Volume Flow Rate (Nm^3/s)	0.89			**Per Duct**
Normal Pollutant Emission Concentration (mg/Nm^3) at 5% O_2 25°C				
Nox	2800			Perkins see Appendix 2
PM10	80			Perkins see Appendix 2
CO	400			Perkins see Appendix 2
HC	150			Perkins see Appendix 2
Total Pollutant Mass Emission Rate (g/s)				
Nox	2.485			
PM10	0.071			
CO	0.355			
HC	0.133			
Actual Conditions Prime Power				
Actual Exit Velocity (m/s)	79.0			**Per Duct**
Actual Temperature of Exhaust Gas (deg C)	473	in K:	746.15	4008-30TAG3 Perkins Data Sheet Appendix 2
Actual $\%O_2$				
Actual % H_2O				
Actual Volume Flow Rate (m^3/s)	1.69			4008-30TAG3 Perkins Data Sheet Appendix 2
Actual Pollutant Emission Concentration (mg/m^3)				
Nox	1470.7			
PM10	42.0			
CO	210.1			
HC	78.8			
Total Pollutant Mass Emission Rate (g/s)				
Nox	2.485			
PM10	0.071			
CO	0.355			
HC	0.133			

Calculation of BAT Reference Conditions and Reduction Required to meet 2g Compliance

Convert Concentration at 5% O_2 , 25°C to Concentration at BAT Ref 15% O_2, 0°C

$$C_{15\%} = C_{5\%} * \frac{100 - H_2O_{15\%}}{100 - H_2O_{5\%}} * \frac{20.9 - O_{2_{15\%}}}{20.9 - O_{2_{5\%}}} * \frac{273.15 + T_{5\%}}{273.15 + T_{15\%}}$$

C @ 5%	2800	mg/Nm^3
H2O @5%	0	
H2O @15%	0	
O2@5%	5	
O2@15%	15	
T@5% C	25	
T@5%K	298.15	
T@15% C	0	
T@15%K	273.15	

C@15% O2, 0°C	1134.1	mg/Nm^3
2G Compliance at 15% O2, 0°C	750.0	mg/Nm^3
Concentration at Engine ref conditions to meet BAT	=2800/1134.1 x 750	mg/Nm^3
	1852	mg/Nm^3

2G compliant operational temperature reduced to 427°C as per graph from SCR suppliers (Volume flow reduced from 3.38 to 3.17 m^3/s)

NOx is formed from high in-cylinder temperatures – the higher the in-cylinder temperatures the higher the NOx levels. The optimum temperature window for the SCR Technology to provide the highest NOx reductions is between 350-450C.
When setting our adblue (Ammonia NH3) dosing strategy we would usually set the ANR (Ammonia to NOx Ratio) to between 0.9-1.0 which as you can see from the graph belo would provide 90-95% NOx reductions at the above mentioned exhaust gas temperatures.

Note: If the engine is operated at a load level greatly below the 100% (say 10% - 25%) then the space velocity and the exhaust gas temperatures will be considerably lower, both of which will impact on the NOx reductions that can be achieved.
Although it should be noted that at the lower combustion temperatures the Raw NOx produced by the engine is considerably less."

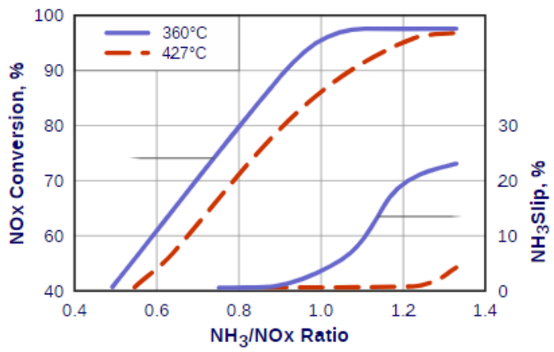

Figure 3.3 – Conversion of Manufacturer Reference Conditions to Operational Conditions -2g

Stack Parameters				Reference #
Grid Location (X & Y)		&		
Stack Height (m)	2.8			
Effective Internal Diameter (m)	0.165			
Stack Area (m^2)	0.021			
Normal Conditions				
Normal Temperature of Exhaust Gas (deg C)	25	in K:	298.15	
Normal $\%O_2$	5			
Normal % H_2O	0			
Normal Volume Flow Rate (Nm^3/s)	1.774			
G2 Compliant Normal Pollutant Emission Concentration (mg/Nm^3)				
Nox	2469			=(2800/1134.1)*1000
PM10	80			
CO	400			
HC	150			
Total Pollutant Mass Emission Rate (g/s)				
Nox	4.381			
PM10	0.142			
CO	0.710			
HC	0.266			
Actual Conditions with SCR				
Actual Exit Velocity (m/s)	148.3			
Actual Temperature of Exhaust Gas (deg C)	427	in K:	700.15	
Actual $\%O_2$				
Actual % H_2O				
Actual Volume Flow Rate (m^3/s)	3.17			=V@746.16K * 700.15/746.15K
G2 Compliant Emission Concentration (mg/Nm^3) at Actual Conditions with SCR				
Nox	1382.0			
PM10	44.8			
CO	223.9			
HC	84.0			
Total Pollutant Mass Emission Rate (g/s)				
Nox	4.381			
PM10	0.142			
CO	0.710			
HC	0.266			

Figure 3.4 – Conversion of Manufacturer Reference Conditions to Operational Conditions -2g-PER DUCT

Stack Parameters				Reference #
Grid Location (X & Y)		&		
Stack Height (m)	2.8			
Effective Internal Diameter (m)	0.165			
Stack Area (m^2)	0.021			
Normal Conditions				
Normal Temperature of Exhaust Gas (deg C)	25	in K:	298.15	
Normal $\%O_2$	5			
Normal % H_2O	0			
Normal Volume Flow Rate (Nm^3/s)	0.887			**per duct**
G2 Compliant Normal Pollutant Emission Concentration (mg/Nm^3)				
Nox	1852			=(2800/1134.1)*1000
PM10	80			
CO	400			
HC	150			
Total Pollutant Mass Emission Rate (g/s)				
Nox	1.643			
PM10	0.071			
CO	0.355			
HC	0.133			
Actual Conditions with SCR				
Actual Exit Velocity (m/s)	74.1			**per duct**
Actual Temperature of Exhaust Gas (deg C)	427	in K:	700.15	
Actual $\%O_2$				
Actual % H_2O				
Actual Volume Flow Rate (m^3/s)	1.59			=V@746.16K * 700.15/746.15K x 50% per duct
G2 Compliant Emission Concentration (mg/Nm^3) at Actual Conditions with SCR				
Nox	1036.7			
PM10	44.8			
CO	223.9			
HC	84.0			
Total Pollutant Mass Emission Rate (g/s)				
Nox	1.643			
PM10	0.071			
CO	0.355			
HC	0.133			

Appendix 4 - Detailed Results

Receptors		3G Generator Specification						2G Compliant Generator Specification						Environmental Improvement	
ID	Background Concentration NO_2 ($\mu g/m^3$)	Maximum 1-hour Generator PC NO_x ($\mu g/m^3$)	Maximum 1-hour Generator PC NO_2 ($\mu g/m^3$) (35% of NO_x)	Maximum 1-hour PEC NO_2 ($\mu g/m^3$) (PC + 2 x Background)	AQS	PC as % of AQS	PEC as % of AQS	Maximum 1-hour Generator PC NO_x ($\mu g/m^3$)	Maximum 1-hour Generator PC NO_2 ($\mu g/m^3$) (35% of NO_x)	Maximum 1-hour PEC NO_2 ($\mu g/m^3$) (PC + 2 x Background)	AQS	PC as % of AQS	PEC as % of AQS	Reduction in PEC (ug/m^3)	Reduction in PEC as Percentage of AQS
		Generator 1						Generator 1						Generator 1	
1	9.6	187.3	65.6	84.8	200	32.8%	42.4%	134.6	47.1	66.4	200	23.6%	33.2%	18.5	9.2%
2	9.6	165.0	57.7	77.0	200	28.9%	38.5%	114.9	40.2	59.5	200	20.1%	29.7%	17.5	8.8%
3	9.6	176.0	61.6	80.9	200	30.8%	40.4%	123.5	43.2	62.5	200	21.6%	31.3%	18.4	9.2%
4	7.4	143.6	50.3	65.0	200	25.1%	32.5%	98.6	34.5	49.3	200	17.3%	24.6%	15.7	7.9%
5	7.4	113.3	39.6	54.4	200	19.8%	27.2%	77.4	27.1	41.8	200	13.5%	20.9%	12.6	6.3%
6	8.8	96.6	33.8	51.5	200	16.9%	25.7%	66.4	23.3	40.9	200	11.6%	20.5%	10.6	5.3%
7	8.8	92.5	32.4	50.0	200	16.2%	25.0%	63.4	22.2	39.9	200	11.1%	19.9%	10.2	5.1%
8	7.8	87.0	30.4	46.0	200	15.2%	23.0%	59.2	20.7	36.3	200	10.4%	18.1%	9.7	4.8%
9	9.4	75.3	26.3	45.1	200	13.2%	22.6%	51.1	17.9	36.7	200	8.9%	18.3%	8.5	4.2%
10	9.4	72.0	25.2	44.0	200	12.6%	22.0%	48.8	17.1	35.9	200	8.5%	17.9%	8.1	4.1%
11	9.4	143.8	50.3	69.1	200	25.2%	34.6%	99.1	34.7	53.5	200	17.3%	26.7%	15.6	7.8%
12	9.6	175.2	61.3	80.6	200	30.7%	40.3%	123.3	43.1	62.4	200	21.6%	31.2%	18.2	9.1%
13	9.6	162.0	56.7	76.0	200	28.4%	38.0%	113.6	39.7	59.0	200	19.9%	29.5%	17.0	8.5%
14	7.4	128.4	44.9	59.7	200	22.5%	29.8%	87.2	30.5	45.3	200	15.3%	22.6%	14.4	7.2%
15	9.4	150.6	52.7	71.5	200	26.4%	35.8%	104.0	36.4	55.2	200	18.2%	27.6%	16.3	8.2%
16	7.4	93.9	32.9	47.6	200	16.4%	23.8%	64.3	22.5	37.3	200	11.3%	18.6%	10.4	5.2%
17	7.8	77.1	27.0	42.5	200	13.5%	21.3%	52.4	18.3	33.9	200	9.2%	16.9%	8.7	4.3%
18	7.8	80.1	28.1	43.6	200	14.0%	21.8%	54.5	19.1	34.6	200	9.5%	17.3%	9.0	4.5%
19	7.7	83.4	29.2	44.6	200	14.6%	22.3%	57.1	20.0	35.4	200	10.0%	17.7%	9.2	4.6%
20	9.6	347.8	121.7	141.0	200	60.9%	70.5%	243.6	85.3	104.5	200	42.6%	52.3%	36.5	18.2%
21	9.6	1146.0	401.1	420.3	200	**200.5%**	**210.2%**	788.1	275.8	295.1	200	**137.9%**	**147.5%**	125.3	62.6%
22	9.6	526.4	184.2	203.5	200	92.1%	**101.7%**	353.0	123.5	142.8	200	61.8%	71.4%	60.7	30.3%
23	9.6	183.2	64.1	83.4	200	32.1%	41.7%	130.0	45.5	64.8	200	22.8%	32.4%	18.6	9.3%
24	8.8	86.5	30.3	47.9	200	15.1%	24.0%	59.3	20.7	38.4	200	10.4%	19.2%	9.5	4.8%
25	8.8	81.7	28.6	46.3	200	14.3%	23.1%	56.2	19.7	37.3	200	9.8%	18.7%	9.0	4.5%
		Generator 2						Generator 2						Generator 2	
1	9.6	186.6	65.3	84.6	200	32.7%	42.3%	134.1	46.9	66.2	200	23.5%	33.1%	18.4	9.2%
2	9.6	164.3	57.5	76.8	200	28.8%	38.4%	114.5	40.1	59.3	200	20.0%	29.7%	17.4	8.7%
3	9.6	174.6	61.1	80.4	200	30.6%	40.2%	122.4	42.8	62.1	200	21.4%	31.0%	18.3	9.1%
4	7.4	142.7	50.0	64.7	200	25.0%	32.4%	98.2	34.4	49.1	200	17.2%	24.5%	15.6	7.8%
5	7.4	113.7	39.8	54.5	200	19.9%	27.3%	77.7	27.2	41.9	200	13.6%	21.0%	12.6	6.3%
6	8.8	96.4	33.8	51.4	200	16.9%	25.7%	66.3	23.2	40.9	200	11.6%	20.4%	10.5	5.3%
7	8.8	92.9	32.5	50.2	200	16.3%	25.1%	63.7	22.3	40.0	200	11.2%	20.0%	10.2	5.1%
8	7.8	87.2	30.5	46.1	200	15.3%	23.0%	59.4	20.8	36.3	200	10.4%	18.2%	9.7	4.9%
9	9.4	75.0	26.2	45.0	200	13.1%	22.5%	51.1	17.9	36.7	200	8.9%	18.3%	8.4	4.2%
10	9.4	71.8	25.1	43.9	200	12.6%	22.0%	48.7	17.0	35.8	200	8.5%	17.9%	8.1	4.0%
11	9.4	143.1	50.1	68.9	200	25.1%	34.4%	98.7	34.5	53.3	200	17.3%	26.7%	15.6	7.8%
12	9.6	173.4	60.7	80.0	200	30.3%	40.0%	121.9	42.7	61.9	200	21.3%	31.0%	18.0	9.0%
13	9.6	163.3	57.1	76.4	200	28.6%	38.2%	113.3	39.7	58.9	200	19.8%	29.5%	17.5	8.7%
14	7.4	130.9	45.8	60.6	200	22.9%	30.3%	89.0	31.1	45.9	200	15.6%	22.9%	14.7	7.3%
15	9.4	148.8	52.1	70.9	200	26.0%	35.4%	102.7	35.9	54.7	200	18.0%	27.4%	16.1	8.1%
16	7.4	93.2	32.6	47.4	200	16.3%	23.7%	63.7	22.3	37.0	200	11.1%	18.5%	10.3	5.2%
17	7.8	77.3	27.1	42.6	200	13.5%	21.3%	52.6	18.4	33.9	200	9.2%	17.0%	8.7	4.3%
18	7.8	79.9	27.9	43.5	200	14.0%	21.7%	54.3	19.0	34.5	200	9.5%	17.3%	8.9	4.5%
19	7.7	83.1	29.1	44.5	200	14.5%	22.3%	56.9	19.9	35.3	200	10.0%	17.7%	9.2	4.6%
20	9.6	349.3	122.3	141.5	200	61.1%	70.8%	244.9	85.7	105.0	200	42.9%	52.5%	36.5	18.3%
21	9.6	1040.0	364.0	383.3	200	**182.0%**	**191.6%**	729.5	255.3	274.6	200	**127.7%**	**137.3%**	108.7	54.3%
22	9.6	509.6	178.3	197.6	200	89.2%	98.8%	341.9	119.7	138.9	200	59.8%	69.5%	58.7	29.3%
23	9.6	183.7	64.3	83.5	200	32.1%	41.8%	130.3	45.6	64.8	200	22.8%	32.4%	18.7	9.3%
24	8.8	86.4	30.2	47.9	200	15.1%	23.9%	59.1	20.7	38.3	200	10.3%	19.2%	9.6	4.8%
25	8.8	81.6	28.6	46.2	200	14.3%	23.1%	56.2	19.7	37.3	200	9.8%	18.7%	8.9	4.4%
		Generator 3						Generator 3						Generator 3	
1	9.6	183.8	64.3	83.6	200	32.2%	41.8%	132.0	46.2	65.5	200	23.1%	32.7%	18.1	9.1%
2	9.6	163.4	57.2	76.4	200	28.6%	38.2%	113.9	39.9	59.1	200	19.9%	29.6%	17.3	8.7%
3	9.6	172.7	60.4	79.7	200	30.2%	39.9%	121.2	42.4	61.7	200	21.2%	30.8%	18.0	9.0%
4	7.4	140.9	49.3	64.1	200	24.7%	32.0%	96.9	33.9	48.7	200	17.0%	24.3%	15.4	7.7%
5	7.4	114.8	40.2	54.9	200	20.1%	27.5%	77.6	27.2	41.9	200	13.6%	21.0%	13.0	6.5%
6	8.8	96.1	33.7	51.3	200	16.8%	25.7%	66.2	23.2	40.8	200	11.6%	20.4%	10.5	5.2%
7	8.8	93.2	32.6	50.3	200	16.3%	25.1%	63.9	22.4	40.0	200	11.2%	20.0%	10.3	5.1%
8	7.8	87.3	30.5	46.1	200	15.3%	23.0%	59.5	20.8	36.4	200	10.4%	18.2%	9.7	4.9%
9	9.4	74.6	26.1	44.9	200	13.1%	22.5%	51.0	17.8	36.6	200	8.9%	18.3%	8.3	4.1%
10	9.4	71.4	25.0	43.8	200	12.5%	21.9%	48.4	17.0	35.7	200	8.5%	17.9%	8.0	4.0%
11	9.4	141.9	49.7	68.5	200	24.8%	34.2%	97.6	34.2	53.0	200	17.1%	26.5%	15.5	7.8%
12	9.6	174.3	61.0	80.3	200	30.5%	40.1%	122.1	42.7	62.0	200	21.4%	31.0%	18.3	9.1%
13	9.6	163.6	57.3	76.5	200	28.6%	38.3%	113.5	39.7	59.0	200	19.9%	29.5%	17.6	8.8%
14	7.4	132.6	46.4	61.1	200	23.2%	30.6%	90.2	31.6	46.3	200	15.8%	23.2%	14.8	7.4%
15	9.4	147.9	51.8	70.5	200	25.9%	35.3%	101.2	35.4	54.2	200	17.7%	27.1%	16.3	8.2%
16	7.4	93.3	32.7	47.4	200	16.3%	23.7%	63.7	22.3	37.1	200	11.2%	18.5%	10.4	5.2%
17	7.8	77.5	27.1	42.7	200	13.6%	21.3%	52.7	18.4	34.0	200	9.2%	17.0%	8.7	4.3%
18	7.8	79.5	27.8	43.4	200	13.9%	21.7%	54.1	18.9	34.5	200	9.5%	17.2%	8.9	4.4%
19	7.7	82.7	29.0	44.4	200	14.5%	22.2%	56.6	19.8	35.2	200	9.9%	17.6%	9.1	4.6%
20	9.6	363.1	127.1	146.4	200	63.5%	73.2%	245.4	85.9	105.2	200	43.0%	52.6%	41.2	20.6%
21	9.6	968.8	339.1	358.3	200	**169.5%**	**179.2%**	683.3	239.2	258.4	200	**119.6%**	**129.2%**	99.9	50.0%
22	9.6	486.3	170.2	189.5	200	85.1%	94.7%	331.3	116.0	135.2	200	58.0%	67.6%	54.2	27.1%
23	9.6	182.9	64.0	83.3	200	32.0%	41.6%	126.5	44.3	63.5	200	22.1%	31.8%	19.7	9.9%
24	8.8	87.1	30.5	48.1	200	15.2%	24.1%	59.4	20.8	38.5	200	10.4%	19.2%	9.7	4.8%
25	8.8	81.4	28.5	46.1	200	14.2%	23.1%	56.2	19.7	37.3	200	9.8%	18.7%	8.8	4.4%

Generator	Generator operating every hour (annually)		Generator operating weekdays 8am-5pm (no weekends)	
	3g	2g	3g	2g
	Number of Hours per year of offsite exceedance of 200 µg/m^3			
Generator 1	885	471	393	152
Generator 2	800	316	357	102
Generator 3	725	178	258	48

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Key

- 3m Easement
- Thames Water Rising Main
- 3m allowance
- Application site red line
- Other land owned by the applicant, close to or adjoining the site.
- Building positions
- **Site installation boundary**

P7	Boundary indicated	20/02/24	BN

SCOTT BROWNRIGG

HARWELL

PROJECT RESILIENCE

DEDICATED BOUNDARY PLAN (1:500)

1 : 500 @A0

20157-SBR-SW-ZZ-DR-A-00110

P7

Application for an environmental permit
Part B3 – New bespoke installation permit

If you are applying for a new bespoke permit for an installation, fill in this part of the form, together with parts A, B2 and F1.

Please check that this is the latest version of the form available from our website.

Please read through this form and the guidance notes that go with it.

If you are applying for a permit for an intensive farm do not use this form, but complete application form part B3.5 instead.

The form can be:

1) saved onto a computer and then filled in. Please note that the form follows a logic that means questions will open or stay closed depending on a previous answer. So you may not be able to enter text in some boxes.
2) printed off and filled in by hand. Please write clearly in the answer spaces.

It will take less than three hours to fill in this part of the application form.

Contents

1 What activities are you applying for?

Fill in Table 1a below with details of all the activities listed in schedule 1 or other references (see note 1) of the Environmental Permitting Regulations (EPR) and all directly associated activities (DAAs) (in separate rows), that you propose to carry out at the installation.

Fill in a separate table for each installation you are applying for. Use a separate sheet if you have a long list and send it to us with your application form. Tell us below the reference you have given the document.

Document reference: Supporting Information Document Sections 1.3 & 1.4

1 What activities are you applying for?, continued

Table 1a – Types of activities

Schedule 1 listed activities						
Installation name	Schedule 1 or other references (See note 1)	Description of the activity (See note 2)	Activity capacity (See note 3)	Annex I (D codes) and Annex II (R codes) and descriptions	Hazardous waste treatment capacity (if this applies) (See note 3)	Non-hazardous waste treatment capacity (if this applies) (See note 3)
If there are not enough rows, send a separate document and give the document reference number here	Put your main activity first			For installations that take waste only	For installations that take waste only	For installations that take waste only
Supporting Information						
Document Section 1.3						

Directly associated activities (See note 4) Also note: if the DAA is a Medium Combustion Plant or Specified Generator (MCP/SG) please also fill in part B2.5, (see https://www.gov.uk/government/publications/application-for-an-environmental-permit-part-b25-new-bespoke-medium-combustion-plant-and-specified-generator-permit)		
Name of DAA If there are not enough rows, send a separate document and give the document reference number here	Description of the DAA (please identify the schedule 1 activity it serves)	
Supporting Information Document Section 1.4		
For installations that take waste (See note 5 below)	Total storage capacity	
	Annual throughput (tonnes each year)	

1 What activities are you applying for?, continued

Notes

1. Quote the section number, part A1 or A2 or B, then paragraph and sub-paragraph number as shown in EPR part 2 of schedule 1, schedule 13 and 14 for Local Authority regulated activities, or schedule 25/25B for Medium Combustion Plant or Specified Generators.
2. Use the description from the relevant schedule of the regulations. Include any extra detail that you think would help to accurately describe what you want to do.
3. By 'capacity', we mean:

- the total incineration capacity (tonnes every hour) for waste incinerators
- the total landfill capacity (cubic metres) for landfills
- the total capacity (cubic metres) for the recovery of hazardous waste on land
- the total treatment capacity (tonnes each day) for waste treatment operations
- the total storage capacity (tonnes) for waste storage operations
- the processing and production capacity for manufacturing operations, or
- the thermal input capacity for combustion activities

Fill each listed activity as a separate line and give an accurate description of any other activities associated with your schedule 1 activities. You cannot have Directly Associated Activities (DAAs) as part of a mobile plant application. If the DAA is a Medium Combustion Plant or Specified Generator (MCP/SG) please fill in the table in appendix 1 question 13.

By 'total storage capacity', we mean the maximum amount of waste, in tonnes, you store on the site at any one time.

Types of waste accepted

For those installations that take waste, for each line in Table 1a (including DAAs), fill in a separate document to list those wastes you will accept on to the site for that activity. Give the List of Wastes catalogue code and description (see https://www.gov.uk/government/publications/waste-classification-technical-guidance).

If you need to exclude waste from your activity or facility by restricting the description, quantity, physical nature, hazardous properties, composition or characteristic of the waste, include these in the document. Send it to us with your application form.

Please provide the reference for each document.

You can use Table 1b as a template.

If you want to accept any waste with a code ending in 99, you must provide more information and a full description of the waste in the document, (for example, detailing the source, nature and composition of the waste). Where you only want to receive specific wastes within a waste code you can provide further details of the waste you want to receive. Where a waste is dual coded you should use both codes for the waste.

Document reference of this extra information

1 What activities are you applying for?, continued

Table 1b – Template example – types of waste accepted and restrictions

Waste code	Description of the waste
Example	Example
02 01 08*	Agrochemical waste containing hazardous substances
18 01 03*	Infectious clinical waste, not contaminated with chemicals or medicines – human healthcare (may contain sharps) for alternative treatment
17 05 03*/17 06 05*	Non-hazardous soil from construction or demolition contaminated with fragments of asbestos cement sheet

1c Recovery of hazardous waste on land

Are you applying for a waste recovery activity involving the permanent deposit of inorganic hazardous waste on land for construction or land reclamation?

No ☑ Now go to question 2

Yes ☐

Have you written a waste recovery plan (WRP) that shows that you will use waste to perform the same function as non waste materials you would have used?

No You must write a WRP to support your application.

Yes

Have we advised you during pre-application discussions that we believe the activity is waste recovery?

No

Yes

Have there been any changes to your proposal since the discussions?

No

Yes

Please send us a copy of your current waste recovery plan that complies with our guidance at https://www.gov.uk/government/publications/deposit-for-recovery-operators-environmental-permits/waste-recovery-plans-and-deposit-for-recovery-permits. You need to highlight any changes you may have made since your pre-application discussions.

Document reference

Please note that there is an additional charge for the assessment or re assessment of a waste recovery plan that must be submitted as part of this application. For the charge see https://www.gov.uk/government/publications/environmental-permitting-charges-guidance/environmental-permitting-charges-guidance

2 Point source emissions to air, water and land

Fill in Table 2 below with details of the point source emissions that result from the operating techniques at each of your installations.

Fill in one table for each installation, continuing on a separate sheet if necessary.

Table 2 – Emissions (releases)

Installation name	Moderna Drug Substance Manufacturing Facility			
Point source emissions to air				
Emission point reference and location	Source	Parameter	Quantity	Unit
Supporting Information Document				
Section 4.1				
Point source emissions to water (other than sewers)				
Emission point reference and location	Source	Parameter	Quantity	Unit
Supporting Information Document				
Section 4.2				
Point source emissions to sewers, effluent treatment plants or other transfers off site				
Emission point reference and location	Source	Parameter	Quantity	Unit
Supporting Information Document				
Section 4.3				
Point source emissions to land				
Emission point reference and location	Source	Parameter	Quantity	Unit
Supporting Information Document				
Section 4.4				

You will also need to complete application form part B6 if your installation includes a point source emission(s) to:

- water
- groundwater or
- sewer

Supporting information

3 Operating techniques

3a Technical standards

Fill in Table 3a for each activity at the installation you refer to in Table 1a above and list the 'Best Available Techniques' you are planning to use. If you use the standards set out in the relevant BAT conclusion(s), BAT reference document(s) (BREF) and/or technical guidance(s) (TGN) there is no need to justify using them within your documents in Table 3a.

For Part A(2) activities refer to https://www.gov.uk/government/collections/integrated-pollution-prevention-and-control-sector-guidance-notes and for Part B and Schedule 14 activities see https://www.gov.uk/government/collections/local-air-pollution-prevention-and-control-lappc-process-guidance-notes

You must justify your decisions in a separate document if:

- there is no technical standard
- the technical guidance provides a choice of standards, or
- you plan to use another standard

This justification could include a reference to the Environmental Risk Assessment provided in part B2 (General bespoke permit) of the application form.

For each of the activities listed in Table 1a, the documents in Table 3a should summarise:

- the operations undertaken
- the measures you will use to control the emissions from your process, as identified in your risk assessment or the relevant BAT conclusions, BREF or technical guidance
- how you will meet other standards set out in the relevant BAT conclusions document, BREF or technical guidance

Table 3 – Technical standards

Fill in a separate table for each activity at the installation.

Installation name	Moderna Drug Substance Manufacturing Facility	
Description of the schedule 1 activity or directly associated activity	Best available technique (BATC, BREF or TGN reference) (see footnote below)	Document reference (if appropriate)
See Supporting Information Document Section 5		

* Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control)

In all cases, describe the type of facility or operation you are applying for and provide site infrastructure plans, location plans and process flow diagrams or block diagrams to help describe the operations and processes undertaken. Give the document references you use for each plan, diagram and description.

Document reference: Supporting Information Document Section 3

3b General requirements

Fill in a separate Table 4 for each installation.

Table 4 – General requirements

Name of the installation	Moderna DS Manufacturing Facility
If the technical guidance or your risk assessment shows that emissions of substances not controlled by emission limits are an important issue, send us your plan for managing them	Document reference or references N/A
Where the technical guidance or your risk assessment shows that odours are an important issue, send us your odour management plan	Document reference or references N/A see Supporting Doc Section 12
If the technical guidance or your risk assessment shows that noise or vibration are important issues, send us your noise or vibration management plan (or both)	Document reference or references N/A - See Supporting Doc Section 11

For guidance on risk assessments for your environmental permit see https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit

3c Types and amounts of raw materials

Fill in Table 5 for all schedule 1 activities. Fill in a separate table for each installation.

Table 5 – Types and amounts of raw materials

Name of the installation		Moderna Drug Substance Manufacturing Facility		
Capacity (See note 1 below)				
Schedule 1 activity	Description of raw material and composition	Maximum amount (tonnes) (See note 2 below)	Annual throughput (tonnes each year)	Description of the use of the raw material including any main hazards (include safety data sheets)
Supporting Information				
Document Section 8				

Notes

1 By 'capacity', we mean the total storage capacity (tonnes) or total treatment capacity (tonnes each day).

2 By 'maximum amount', we mean the maximum amount of raw materials on the site at any one time.

Use a separate sheet if you have a long list of raw materials, and send it to us with your application form. Please also provide the reference of this extra sheet.

Document reference: Supporting Information Document Section 8

3d Information for specific sectors

For some of the sectors, we need more information to be able to set appropriate conditions in the permit. This is as well as the information you may provide in sections 5, 6 and 7. For those activities listed below, you must answer the questions in the related document.

Table 6 – Questions for specific sectors

Sector	Appendix
Combustion	See the questions in appendix 1
Chemicals	See the questions in appendix 2
Incinerating waste	See the questions in appendix 3
Landfill and recovery of hazardous waste on land	See the questions in appendix 4

General information

4 Monitoring

4a Describe the measures you use for monitoring emissions by referring to each emission point in Table 2 above

You should also describe any environmental monitoring. Tell us:

- how often you use these measures
- the methods you use
- the procedures you follow to assess the measures

Document reference: Supporting Information Document Section 13

4b Point source emissions to air only

4b1 Has the sampling location been designed to meet BS EN 15259 clause 6.2 and 6.3?

No ☐
Yes ☐

4b2 Are the sample ports large enough for monitoring equipment and positioned in accordance with section 6 and appendix A of BS EN 15259?

No ☐
Yes ☐

4b3 Is access adjacent to the ports large enough to provide sufficient working area, support and clearance for a sample team to work safely with their equipment throughout the duration of the test?

No ☐
Yes ☐

4b4 Are the sample location(s) at least 5 HD from the stack exit

No ☐
Yes ☐

4b5 Are the sample location(s) at least 2 HD upstream from any bend or obstruction?

No ☐
Yes ☐

4b6 Are the sample location(s) at least 5 HD downstream from any bend or obstruction?

No ☐
Yes ☐

4b7 Does the sample plane have a constant cross sectional area?

No ☐
Yes ☐

4b8 If horizontal, is the duct square or rectangular (unless it is less than or equal to 0.35 m in diameter)

No ☐
Yes ☐

4b9 If you have answered 'No' to any of the questions 4b1 to 4b8 above, provide an assessment to how the standards in BS EN 15259 will be met.

Document reference of the assessment

5 Environmental impact assessment

5a Have your proposals been the subject of an environmental impact assessment under Council Directive 85/337/EEC of 27 June 1985 [Environmental Impact Assessment] (EIA)?

No ☑ Now go to question 6

Yes ☐ Please provide a copy of the environmental statement and, if the procedure has been completed:

- a copy of the planning permission
- the committee report and decision on the EIA

Document reference of the copy

6 Resource efficiency and climate change

If the site is a landfill or a recovery of hazardous waste on land activity, you only need to fill in this section if the application includes gas engines.

6a Describe the basic measures for improving how energy efficient your activities are

Document reference of the description: Supporting Information Document Section 9

6b Provide a breakdown of any changes to the energy your activities use up and create

Document reference of the description: Supporting Information Document Section 9

6c Have you entered into, or will you enter into, a climate change levy agreement?

No ☑ Describe the specific measures you use for improving your energy efficiency

Document reference of the description: Supporting Information Document Section 9

Yes ☐ Please give the date you entered (or the date you expect to enter) into the agreement (DD/MM/YYYY)

Please also provide documents that prove you are taking part in the agreement.

Document reference of the proof

6d Explain and justify the raw and other materials, other substances and water that you will use

Document reference of the justification: Supporting information Document Section 8

6e Describe how you avoid producing waste in line with Council Directive 2008/98/EC on waste

If you produce waste, describe how you recover it. If it is technically and financially impossible to recover the waste, describe how you dispose of it while avoiding or reducing any effect it has on the environment.

Document reference of the description: Supporting Information Document Section 7

7 Installations that include a combustion plant (excluding waste incinerators)

7a List all your combustion plant at the site and provide thermal input and operating hours for each

Document reference: Supporting Information Document Section 3.3.4

7b Do any of your combustion plants have a net rated thermal input of 1 or more MW and is not an excluded MCP?

No ☐ Go to 7c

Yes ☑ Please fill in the table in appendix 1 question 13

7c Is the aggregated net thermal input of your combustion plant more than 20 MW?

No ☑

Yes ☐ Please go to appendix 1 question 11

8 How to contact us

If you need help filling in this form, please contact the person who sent it to you or contact us as shown below.

General enquiries: 03708 506 506 (Monday to Friday, 8am to 6pm)

Textphone: 03702 422 549 (Monday to Friday, 8am to 6pm)

Email: enquiries@environment-agency.gov.uk

Website: https://www.gov.uk/government/organisations/environment-agency

If you are happy with our service, please tell us. It helps us to identify good practice and encourages our staff. If you're not happy with our service, please tell us how we can improve it.

Please tell us if you need information in a different language or format (for example, in large print) so we can keep in touch with you more easily.

Feedback

(You don't have to answer this part of the form, but it will help us improve our forms if you do.)

We want to make our forms easy to fill in and our guidance notes easy to understand. Please use the space below to give us any comments you may have about this form or the guidance notes that came with it.

How long did it take you to fill in this form?

We will use your feedback to improve our forms and guidance notes, and to tell the Government how regulations could be made simpler.

Would you like a reply to your feedback?

Yes please ☐

No thank you ☐

Crystal Mark 19107
Clarity approved by Plain English Campaign

For Environment Agency use only

Date received (DD/MM/YYYY)

Payment received?

No ☐

Yes ☐ Amount received

Our reference number

£

Plain English Campaign's Crystal Mark does not apply to appendices 1 to 4.

Appendix 1 – Specific questions for the combustion sector

1 Identify the type of fuel burned in your combustion units (including when your units are started up, shut down and run as normal). If your units are dual fuelled (that is, use two types of fuel), list both the fuels you use

Fill in a separate table for each installation.

Installation reference	Emergency Diesel Generators		
Type of fuel	When run as normal	When started up	When shut down
Coal	☐	☐	☐
Gas oil	☑	☑	☑
Heavy fuel oil	☐	☐	☐
Natural gas	☐	☐	☐
WID waste	☐	☐	☐
Biomass (see notes 1 and 2 below)	☐	☐	☐
Biomass (see notes 1 and 2 below)	☐	☐	☐
Biomass (see notes 1 and 2 below)	☐	☐	☐
Biomass (see notes 1 and 2 below)	☐	☐	☐
Biomass (see notes 1 and 2 below)	☐	☐	☐
Landfill gas	☐	☐	☐
Other	☐	☐	☐

Notes

1. Not covered by Industrial Emissions Directive 2010/75/EU.
2. 'Biomass' is referred to The Renewables Obligation Order 2002 (https://www.legislation.gov.uk/uksi/2002/914/contents/made)

Give extra information if it helps to explain the fuel you use.

Document reference: N/A - Diesel fuel only.

Appendix 1 – Specific questions for the combustion sector, continued

2 Give the composition range of any fuels you are currently allowed to burn in your combustion plant

Fill in a separate table for each installation, continuing on a separate sheet if necessary

Fuel use and analysis					
Installation reference					
Parameter	Unit	Fuel 1	Fuel 2	Fuel 3	Fuel 4
Maximum percentage of gross thermal input	%				
Moisture	%				
Ash	% wt/wt dry				
Sulphur	% wt/wt dry				
Chlorine	% wt/wt dry				
Arsenic	% wt/wt dry				
Cadmium	% wt/wt dry				
Carbon	% wt/wt dry				
Chromium	% wt/wt dry				
Copper	% wt/wt dry				
Hydrogen	% wt/wt dry				
Lead	% wt/wt dry				
Mercury	% wt/wt dry				
Nickel	% wt/wt dry				
Nitrogen	% wt/wt dry				
Oxygen	% wt/wt dry				
Vanadium	mg/kg dry				
Zinc	mg/kg dry				
Net calorific value	MJ/kg				

Appendix 1 – Specific questions for the combustion sector, continued

3 If NOx factors are necessary for reporting purposes (that is, if you do not need to monitor emissions), please provide the factors associated with burning the relevant fuels

Fill in a separate table for each installation.

Installation reference	N/A - no reporting
Fuel	NOx factor (kgt^{-1})
Fuel 1	N/A - no reporting
Fuel 2	
Fuel 3	
Fuel 4	

Note: kgt^{-1} means kilograms of nitrogen oxides released for each tonne of fuel burned.

4 Will your combustion plant be subject to Chapter III of the Industrial Emissions Directive 2010/75/EU?

No ☑ Now fill in application form part F

Yes ☐

5 What is your plant?

an existing one ☐ A plant licensed before 1 July 1987

a new one ☐ A plant licensed on or after 1 July 1987 but before 27 November 2002, or a plant for which an application was made before 27 November 2002 and which was put into operation before 27 November 2003

a new-new one ☑ A plant for which an application was made on or after 27 November 2002

6 If you run more than one type of plant or a number of the same type of plant on your installation, please list them in the table below

Fill in a separate table for each installation.

Installation reference	Moderna Drug Substance Manufacturing Facility
Type of plant	Number within installation
Existing	
New	
New-new	3
Gas turbine (group A)	
Gas turbine (group B)	

Appendix 1 – Specific questions for the combustion sector, continued

7 If you run an existing plant, have you submitted a declaration for the 'limited life derogation' set out in Article 33 of Chapter III of the Industrial Emissions Directive?

No ☐ Now go to question 9

Yes ☐

8 Have you subsequently withdrawn your declaration?

No

Yes

9 List the existing large combustion plants (LCPs) which have annual mass allowances under the National Emission Reduction Plan (NERP), and those with emission limit values (ELVs) under the LCPD

Installation reference	
LCPs under NERP	LCPs with ELVs

10 Do you meet the monitoring requirements of Chapter III of the Industrial Emissions Directive?

No ☐

Yes ☐ Document reference

11 Have you carried out a cost–benefit assessment (CBA) of opportunities for cogeneration (combined heat and power) or district heating under Article 14 of the Energy Efficiency Directive?

No ☐ Please provide supporting evidence of why a CBA is not required (for example, an agreement from us)

Document reference of this evidence

Yes ☐ Please submit a copy of your CBA

Document reference of the CBA

Appendix 1 – Specific questions for the combustion sector, continued

12 Does your installation need to be combined heat and power-ready (CHP-ready)?

No ☐ Please provide supporting evidence of why a CHP-ready assessment is not required (for example, an agreement from us)

Document reference of this evidence

Yes ☐ Please provide a copy of your CHP-ready assessment

Document reference of the CHP-ready assessment

13 Information to be provided by the operator to the competent authority for each Medium Combustion Plant as identified in Annex I of Medium Combustion Plant Directive (EU/2015/2193)

MCP specific identifier*	See form B2.5
12-digit grid reference or latitude/longitude	See form B2.5
Rated thermal input (MW) of the MCP	See form B2.5
Type of MCP (diesel engine, gas turbine, other engine or other MCP)	See form B2.5
Type of fuels used: gas oil (diesel), natural gas, gaseous fuels other than natural gas, landfill gas	See form B2.5
Date when the new MCP was first put into operation	See form B2.5
Sector of activity of the MCP or the facility in which it is applied (NACE code)	See form B2.5
Expected number of annual operating hours of the MCP and average load in use	See form B2.5

Where the option of exemption under Article 6(8) is used the operator (as identified on Form A) should sign a declaration here that the MCP will not be operated more than the number of hours referred to in this paragraph	Nic Chornet SVP Resilience 20Feb24

* identifier – the MCP must be traceable via a serial number or other unique identifier, name plate, manufacturer and or model

NACE code means Nomenclature of Economic Activities and is the European statistical classification of economic activities (http://www.export.gov.il/files/EEN/ListNACEcodes.pdf).

To find out the 12-digit grid reference you can search on the UK Grid Reference Finder website at https://gridreferencefinder.com/

Appendix 2 – Specific questions for the chemical sector

1 Please provide a technical description of your activities

- The description should be enough to allow us to understand:
- the process
- the main plant and equipment used for each process
- all reactions, including significant side reactions (that is, the chemistry of the process)
- the material mass flows (including by products and side streams) and the temperatures and pressures in major vessels
- the all emission control systems (both hardware and management systems), for situations which could involve releasing a significant amount of emissions – particularly the main reactions and how they are controlled
- a comparison of the indicative BATs and benchmark emission levels standards: technical guidance notes (TGNs) (see https://www.gov.uk/government/collections/technical-guidance-for-regulated-industry-sectors-environmental-permitting); additional guidance 'The production of large volume organic chemicals' (EPR 4.01); 'Speciality organic chemicals sector' (EPR 4.02); 'Inorganic chemicals sector' (EPR 4.03); and best available techniques reference documents (BREFs) for the chemical sector

Document reference: Supporting Information Document Section 3

2 If you are applying for a multi-purpose plant, do you have a multi-product protocol in place to control the changes?

No ☑

Yes ☐ Provide a copy of your protocol to accompany this application

Document reference

3 Does Chapter V of the Industrial Emissions Directive (IED) apply to your activities?

No ☑

Yes ☐ Fill in the following

3a List the activities which are controlled under the IED

Installation reference	
Activities	

3b Describe how the list of activities in question 3a above meets the requirements of the IED

Document reference

Appendix 3 – Specific questions for the waste incineration sector

If you are proposing to accept clinical waste, please complete your answer to question 3a 'Technical standards' with reference to relevant parts of our healthcare waste appropriate measures guidance (see https://www.gov.uk/guidance/healthcare-waste-appropriate-measures-for-permitted-facilities)

1a Do you run incineration plants as defined by Chapter IV of the Industrial Emissions Directive (IED)?

No ☐ You do not need to answer any other questions in this appendix

Yes ☐ IED applies

1b Are you subject to IED as

An incinerator? ☐

A co-incinerator? ☐

2 Do any of the installations contain more than one incineration line?

No ☐ Now go to question 4

Yes ☐

3 How many incineration lines are there within each installation?

Fill in a separate table for each installation.

Installation reference		
Number of incineration lines within the installation		
Reference identifiers for each line		

You must provide the information we ask for in questions 4, 5 and 6 below in separate documents. The information must at least include all the details set out in section 2 ('Key Issues') of S5.01 'Incineration of waste: additional guidance' (under the sub heading 'European legislation and your application for an EP Permit'). See https://www.gov.uk/government/collections/technical-guidance-for-regulated-industry-sectors-environmental-permitting.

You must answer questions 7 to 13 on the form below.

4 Describe how the plant is designed, equipped and will be run to make sure it meets the requirements of IED, taking into account the categories of waste which will be incinerated

Document reference

5 Describe how the heat created during the incineration and co-incineration process is recovered as far as possible (for example, through combined heat and power, creating process steam or district heating)

Document reference

Appendix 3 – Specific questions for the waste incineration sector, continued

6 Describe how you will limit the amount and harmful effects of residues and describe how they will be recycled where this is appropriate

Document reference

For each line identified in question 3, answer questions 7 to 13 below

Question 3 identifier, if necessary

7 Do you want to take advantage of the Article 45 (1)(f) allowance (see below) if the particulates, CO or TOC continuous emission monitors (CEM) fail?

No ☐

Yes ☐ This allows 'abnormal operation' of the incineration plant under certain circumstances when the CEM for releases to air have failed. Annex VI, Part 3(2) sets maximum half hourly average release levels for particulates (150 mg/m3), CO (normal ELV) and TOC (normal ELV) during abnormal operation.

Describe the other system you use to show you keep to the requirements of Article 13(4) (for example, using another CEM, providing a portable CEM to insert if the main CEM fails, and so on).

8 Do you want to replace continuous HF emission monitoring with periodic hydrogen fluoride (HF) emission monitoring by relying on continuous hydrogen chloride (HCl) monitoring as allowed by IED Annex VI, Part 6 (2.3)?

Under this you do not have to continuously monitor emissions for hydrogen fluoride if you control hydrogen chloride and keep it to a level below the HCl ELVs.

No ☐

Yes ☐ Please give your reasons for doing this

Appendix 3 – Specific questions for the waste incineration sector, continued

9 Do you want to replace continuous water vapour monitoring with pre-analysis drying of exhaust gas samples, as allowed by IED Annex VI, Part 6 (2.4)?

Under this you do not have to continuously monitor the amount of water vapour in the air released if the sampled exhaust gas is dried before the emissions are analysed.

No ☐

Yes ☐ Please give your reasons for doing this

10 Do you want to replace continuous hydrogen chloride (HCl) emission monitoring with periodic HCl emission monitoring, as allowed by IED Annex VI, Part 6 (2.5), first paragraph?

Under this you do not have to continuously monitor emissions for hydrogen chloride if you can prove that the emissions from this pollutant will never be higher than the ELVs allowed.

No ☐

Yes ☐ Please give your reasons for doing this

Appendix 3 – Specific questions for the waste incineration sector, continued

11 Do you want to replace continuous HF emission monitoring with periodic HF emission monitoring, as allowed by IED Annex VI, Part 6 (2.5), first paragraph?

Under this you do not have to continuously monitor emissions for hydrogen fluoride if you can prove that the emissions from this pollutant will never be higher than the ELVs allowed.

No ☐

Yes ☐ Please give your reasons for doing this

12 Do you want to replace continuous SO2 emission monitoring with periodic sulphur dioxide (SO2) emission monitoring, as allowed by IED Annex VI, Part 6 (2.5), first paragraph?

Under this you do not have to continuously monitor emissions for sulphur dioxide if you can prove that the emissions from this pollutant will never be higher than the ELVs allowed.

No ☐

Yes ☐ Please give your reasons for doing this

Appendix 3 – Specific questions for the waste incineration sector, continued

13 If your plant uses fluidised bed technology, do you want to apply for a derogation of the CO WID ELV to a maximum of 100 mg/m³ as an hourly average, as allowed by IED Annex VI, Part 3?

No ☐

Does not apply ☐

Yes ☐ Please give your reasons for doing this

14 Have you carried out a cost–benefit assessment (CBA) of opportunities for cogeneration (combined heat and power) or district heating under Article 14 of the Energy Efficiency Directive?

No ☐ Please provide supporting evidence of why a CBA is not required (for example, an agreement from us)

Document reference of this evidence

Yes ☐ Please submit a copy of your CBA

Document reference of the CBA

15 Does your installation need to be combined heat and power-ready (CHP-ready)?

No ☐ Please provide supporting evidence of why a CHP-ready assessment is not required (for example, an agreement from us)

Document reference of this evidence

Yes ☐ Please provide a copy of your CHP-ready assessment

Document reference of the CHP-ready assessment

Appendix 4 – Specific questions for the landfill sector and recovery of hazardous waste on land activities

1. For the landfill sector, provide your Environmental Setting and Installation Design (ESID) report and any other risk assessments to control emissions.

For recovery of hazardous waste on land activities, provide your Environmental Setting and Site Design (ESSD) report and any other risk assessments to control emissions

Document reference

2. For recovery of hazardous waste on land activities, provide your Waste Acceptance Procedures (including Waste Acceptance Criteria)

Document reference

Refer to our guidance at

https://www.gov.uk/government/publications/deposit-for-recovery-operators-environmental-permits/waste-acceptance-procedures-for-deposit-for-recovery

3. Provide your hydrogeological risk assessment (HRA) for the site

Document reference

4. Provide your outline engineering plan for the site

Document reference

5. Provide your stability risk assessment (SRA) for the site

Document reference

6. Provide your landfill gas risk assessment (LFGRA) for the site

Document reference

We have developed guidance on these assessments and their reports which can be found at https://www.gov.uk/government/collections/environmental-permitting-landfill-sector-technical-guidance

7. For recovery of hazardous waste on land activities, have you completed a monitoring plan for the site?

No ☐ Please refer to the section of your ESSD that explains why this is unnecessary for your site

Document reference of this evidence

Yes ☐ Document reference

Appendix 4 – Specific questions for the landfill sector and recovery of hazardous waste on land activities, continued

8. Have you completed a proposed plan for closing the site and your procedures for looking after the site once it has closed?

No ☐ If you have answered 'no' for recovery of hazardous waste on land activities, refer to the section of your ESSD that explains why this is unnecessary for your site

Document reference of this evidence

Yes ☐ For landfill you must provide a closure and aftercare plan

Document reference

Moderna Harwell Discharge

Discharge Supporting Information

Client:	Moderna
Project/Proposal No:	7042
Version:	1
Date:	20/02/2024

Document Information

Project Name:	Moderna Harwell Discharge
Document Title:	Discharge Supporting Information
Client Name:	Moderna
Client Contact:	Stephen Panton
Client Address:	By e-mail
Document Status:	Final for Issue
Author:	T Hatch
Reviewed:	G Bollan
Approved:	G Bollan
Date:	20/02/2024
Version:	1
Project/Proposal Number:	7042

Revision History

Version	Date	Authored	Reviewed	Approved	Notes
1.0	20/02/2024	T Hatch	G Bollan	G Bollan	Final for Issue

Contents

1. Surface Water Discharge, Environmental Permit Application Form B6, Further Information

1.1.1 This section of the document provides information to be read alongside Form B6 for the surface water discharge where more details were required or there was insufficient space to fully answer.

1.2 Question 3b What is the maximum volume of effluent you will discharge in a day?

1.2.1 Figure 1-1 shows the Hydraulic Calculations for the Site from the Flood Risk Assessment (FRA) and Drainage Strategy Report submitted for planning.

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m^3)	Status
30 min Winter	118.094	0.869	2.7	84.7	O K
60 min Winter	118.505	1.280	2.7	103.5	FLOOD
120 min Winter	118.521	1.296	2.7	119.4	FLOOD
180 min Winter	118.528	1.303	2.7	126.6	FLOOD
240 min Winter	118.531	1.306	2.7	129.7	FLOOD
360 min Winter	118.531	1.306	2.7	129.1	FLOOD
480 min Winter	118.526	1.301	2.7	123.8	FLOOD
600 min Winter	118.519	1.294	2.7	117.7	FLOOD
720 min Winter	118.514	1.289	2.7	112.1	FLOOD
960 min Winter	118.254	1.029	2.7	100.4	Flood Risk
1440 min Winter	118.018	0.793	2.7	77.3	O K
2160 min Winter	117.709	0.484	2.7	47.0	O K
2880 min Winter	117.475	0.250	2.7	24.1	O K
4320 min Winter	117.273	0.048	2.6	4.2	O K
5760 min Winter	117.263	0.038	2.0	3.3	O K
7200 min Winter	117.257	0.032	1.7	2.7	O K
8640 min Winter	117.253	0.028	1.5	2.3	O K
10080 min Winter	117.250	0.025	1.4	2.0	O K

Figure 1-1 Hydraulic Calculation

1.2.2 The model shown in Figure 1-1 identified that a 240 min Winter Storm Event would generate the largest volume of surface water which is 129.7m^3. This is therefore the worst-case scenario and will be used as the maximum volume of effluent that may be discharged in a day. This volume is representative of the whole site. However, the whole site isn't subject to the installation permit application. It is estimated that 60% of the site area is within the installation boundary. 60% of 129.7m^3 equates to 77.82m^3 which has been calculated as the maximum daily discharge of surface water from the Installation.

1.3 Question 6a – Do you treat your effluent?

1.3.1 Effluent from the site is not treated as it consists of clean rainwater that has not come into contact with any pollutants. More information on the surface water discharge is provided in section 1.4.

1.4 Question 7 – What will be in the effluent?

1.4.1 It has been determined that the effluent is not likely to contain specific substances. This is due to the nature of the discharge, the activities that take place at the site and the absence of connection between stormwater and the process.

1.4.2 The effluent is rainwater runoff from the site and will therefore not contain any specific substances. The activities at the site all take place within buildings and therefore will not impact the surface water runoff. Furthermore, good housekeeping at the site will ensure that no pollutants will enter the surface water. There are also no specific risks from the activities at the installation. The site only receives a small number of vehicle movements around the site. The risk of pollutants entering groundwater via the attenuation pond is considered very low.

1.5 Question 8d Discharge to Groundwater

1.5.1 It has been determined that a groundwater quantitative risk assessment is not required for this surface water runoff discharge. This is due to the surface water runoff consisting of just stormwater which will not contain any specified substances. The risks to groundwater will not be dissimilar to the risk from any impermeable surfacing. The surface water runoff will not be contaminated by any activity at the site as they take place under a roof within a building. Therefore, there are no risks from the installation.

1.5.2 Furthermore, the site at which the discharge is to be made is not near or within a Source Protection Zone (as per the FRA).

1.6 Appendix 2 – Discharge into land

1.6.1 The SUDS system/ attenuation pond has been designed and the requisite technical information for this appendix will be provided later in Q1 2024, in good time for the detailed determination of the permit application. The system has been designed to manage the entire site hardstanding runoff and is not expected to present any issues.

2. Discharge to Sewer, Environmental Permit Application Form B6,Further Information

2.1.1 This section of the document provides information to be read alongside Form B6 for the Discharge to Sewer from the Drug Substance building where more details were required or there was insufficient space to fully answer.

2.2 6C – Provide details of the final effluent discharge quality that the treatment system is designed to achieve.

2.2.1 The targeted pH range is 6-11 and the temperature is a maximum of 40°C. This is based on standard Thames Water conditions.

2.3 7b – Are any specific substances within the discharge

2.3.1 Document *H1 Moderna Water Emissions FINAL 14.12.23* listed the substances expected within the discharge.

2.3.2 The substances identified are predicted based on the raw materials that are used during the drug manufacturing processes.

2.4 7c – Have any of the specific substances in your effluent been detected in samples

2.4.1 No sampling has been undertaken as the site is not operational; the composition has been estimated from process parameters. Furthermore, there are no specific substances within the discharge.

2.5 7d – Are there any other harmful or specific substances in the effluent not mentioned in 'Risk assessment for treated sewage or trade effluent discharges to surface water or groundwater'?

2.5.1 There are no other harmful substances within the effluent as detailed in document *H1 Moderna Water Emissions FINAL 14.12.23.*

2.6 10 – Where will the effluent discharge to?

2.6.1 Table 3 does not contain an option for discharge to sewer. Form B6 does not fit a discharge to sewer exactly but nonetheless has been provided as per the Environment Agency's request.

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Environmental Permit Application reference: EPR/TP3822SV/A001

Operator: MODERNA BIOTECH MANUFACTURING UK LTD

Facility: Moderna Drug Substance Manufacturing Facility, Rutherford Avenue, Harwell, OX11 0RL

Justification for Use of 3g Emergency Diesel Generators

Executive Summary

This document outlines Moderna's justification for the use of three non-BAT compliant emergency generators to provide standby power capability at the Moderna vaccine manufacturing facility at Harwell, UK. The generators meet 3g NOx standard but do not meet Best Available Techniques (BAT) because their exhaust gas concentration exceeds 2g NOx standard.

It is Moderna's view that proceeding with the installation of the 3g standard generators should be permitted because:

1. Dispersion modelling of the three 3g standard EDGs and the 2g case if they were retrofitted with Selective Catalytic Reduction (SCR) technology, indicates that the overall environmental performance of the 3g standard is very similar to the 2g case.

2. The site mains power supply has been engineered with 2 ring mains providing network resilience against an on-site power failure, minimising the likelihood of power outage and therefore generator run-time. The generators are standby use only and it is likely that each generator will only operate for 30 minute testing every two weeks and one four-hour annual load bank test.

A requirement to purchase and commission 2g BAT standard generators could result in the following risk and impact:

3. The facility is confirmed as critical national infrastructure and the requirement to modify the generators to 2g standard jeopardizes the facility go-live date of 4th Dec 24. The earliest date the generators could be fitted with SCR technology is after first the engineering run which would therefore have no emergency power supply. A power outage would require the engineering run to be repeated which would mean government agreed targets were not met.

4. Cost benefit analysis has been conducted using Defra tools, to examine the difference in NOx damage costs between 3g and 2g scenarios. The financial costs of upgrading the 3g specification generators significantly outweigh the benefits in terms of obviated damage costs – by an order of magnitude.

5. The 3g generators have been purchased already and the retrofitment of SCR technology to these would incur a significant total additional cost of more than £400,000, which does not include additional running costs.

6. The use of 2g generators employing SCR would introduce the additional environmental risks from ammonia slippage.

Background Information

The Moderna UK Drug Substance (DS) installation requires three emergency diesel generators (EDGs) to provide standby power supply to minimize the impact of a mains supply failure. Three 2.9MWth Perkins 4008-30TAG3 generators were ordered in July 2023. The generators have been built and are awaiting factory acceptance testing.

The generators are fuel optimized with higher thermal efficiency, lower greenhouse gas emissions (GHG) per unit of electricity generated. They also benefit from high reliability and low maintenance requirements, with lower lifetime resource and energy consumption. The EDG's performance levels are 3g with an exhaust gas concentration of approximately 2800 milligrams per Normal cubic metre (mg/Nm^3) of oxides of nitrogen (NOx) concentration, corrected to 5% flue gas oxygen (O_2). This is around 40% higher than the BAT guidance of 2000 mg/Nm^3 NOx at 5% O_2.

1. Dispersion Modelling and Near Equivalent Performance

An atmospheric dispersion modelling exercise has been undertaken to assess the potential environmental impact of short-term emissions of oxides of nitrogen (NOx) during routine testing of emergency diesel generators at emissions class 3g and the same generators modified with select catalytic reduction to make then 2g compliant. The NOx emissions from each of the three EDGs were modelled for each emissions class using the industry-standard ADMS-6 modelling software and five years of hourly meteorological data from RAF Brize Norton. Environment Agency advice for converting NOx to nitrogen dioxide (NO_2) was followed and results were compared with the UK limit value for short term NO_2.

The results suggest that there is no significant difference in outcome whether 2g or 3g generators are used at the DS building, and the overall performance of the 2g BAT case against the short term NO_2 standard is very similar to the 3g case.

2. Power Network Redundancy and Generator Uptime

The site mains power supply distribution around site has been engineered with 2 No. Ring Main Units (RMU) providing a high level of resilience against on-site power outage. Accordingly**,** it is likely that each generator will only operate for routine testing purposes, comprising 30 minute tests every two weeks and one four-hour annual load bank test.

3. Facility Go-Live Risk

The lead time from order placement to beneficial use of generators fitted with SCR technology is 40 weeks. If the order were placed on 22 Mar 24 the earliest the generators would be available for use is 27 Dec 24**.** This would jeopardize the facility go-live activity (first engineering run) scheduled to start on the 4th December 24 which requires back-up power supplies to be in place. The risk is correspondingly increased by any delay in order placement date after 22 March 24.

4. Cost benefit analysis

The Defra air quality damage cost calculation toolkit (February 2023 version) was used to examine the difference in NOx damage costs between 3g and 2g scenarios. The results of the analysis are contained in the attached file.

The mass emission rates for 3g was based on an achievable NOx concentration of 2800 mg/Nm^3, calculated in the preparation of the dispersion modelling inputs as 4.971 grams per second (g/s). A pro-rata adjustment to 2000 mg/Nm^3 for the 2g case gave an emission rate of 3.551 g/s.

A 16-hour run programme for each generator was assumed, based on fortnightly half-hour tests and one four-hour load bank test per year.

The difference between 2g and 3g mass emissions of NOx on the above basis were 81.7 kilograms per year per generator; 245 kg in total.

A 10 year appraisal period was assumed (from 2024 to 2033) as is standard, based on a 2020 price base year. The EDGs were assumed as a Part A Category 1 source.

The central present value for NOx damage costs was £6,817.

The low sensitivity present value for NOx damage costs was £2,259.

The high sensitivity present value for NOx damage costs was £20,600.

This is a small fraction of the net present value for the NOx abatement system to achieve 2g NOx emissions. The exact NPV has not been calculated as operating costs and consumables are uncertain; however, the capital expenditure alone is costed at over £406,000. The financial costs of upgrading the 3g specification generators therefore significantly outweigh the benefits – by an order of magnitude.

5. Sourcing of BAT Compliant Generators and Cost of Upgrade to 2g Standard

The generator supplier has confirmed that the only means of achieving BAT compliance with the existing generators is by retrofitting each of them with a Selective Catalytic Reduction System (SCR). This would use urea injections into the exhaust to catalytically reduce the NOx to nitrogen.

The total budget cost including necessary slab and framework modifications for retrofitting the 3 generators with SCRs is £406,000.

This is in addition the cost of the procured generators which is £1.11M. The estimated total construction cost for the Drug Substance (DS) facility is £78.6M.

6. Ammonia Slippage

Urea injection is not a 100% efficient process for NOx removal. Unreacted urea will decompose to ammonia, with its associated environmental effects on air quality, perception of odour and nitrogen flux. This ammonia slippage is highlighted as a potential adverse effect of the 2g EDGs, along with increased resource consumption of consumable chemicals.

Concluding Statement

it is Moderna's view that the 3g standard generators installation should be permitted due to the potential risk to the facility start-up, the similarity in environmental impact of the two EDG cases, and the disparity in cost and benefit.

Application for an environmental permit Part B6 – New bespoke water discharge activity or groundwater activity (point source discharge) or point source emission to water from an installation

Environment Agency

Fill in this part of the form, together with parts A, B2 and F1, if you are applying for a new bespoke permit for a water discharge activity or a point source discharge groundwater activity.

Fill in this part of the form, together with parts A, B2, B3 and F1, if you are applying for a new bespoke permit for an installation where a point source emission to water, groundwater or sewer forms part of the operation.

Please check that this is the latest version of the form available from our website.

Please read through this form and the guidance notes that came with it. The form can be:

1) saved onto a computer and then filled in. Please note that the form follows a logic that means questions will open or stay closed depending on a previous answer. So you may not be able to enter text in some boxes.

2) printed off and filled in by hand. Please write clearly in the answer spaces.

If you want to apply for a standalone discharge of treated domestic sewage effluent of up to fifteen cubic metres (15 m^3) a day to ground or up to twenty cubic metres (20 m^3) a day to surface water, please fill in form B6.5.

It will take less than three hours to fill in this part of the application form.

Contents

1 About the effluent – details and type

From the list below, choose which type of effluent you are applying for on this form and answer the questions shown in Table 1.

You must fill in a separate copy of this form and the appropriate appendix or appendices for each type of effluent you plan to discharge.

Table 1 – About the effluent

Type of effluent	Charge band	Please tick box	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Sewage effluent (non-water company)	1.3.8 Sewage effluent discharge with a volume greater than 15 m^3/day to groundwater (not requiring specific substances assessment)	☐	All	a, b, c, d	b, f	-	a, b	All	-	d, f*	a, b, c, d*, e*, f*, h, i	All
	1.3.9 Sewage effluent discharge to groundwater requiring specific substances assessment (any volume)	☐	All	a, b, c, d	b, f	-	a, b	All	b, c, d, e	d, f*	a, b, c, d*, e*, f*, h, i	All
	1.3.10 Sewage effluent discharge with a volume greater than 5 m^3/day up to and including 50 m^3/day to surface water (not requiring specific substances assessment)	☐	All	a, b, c, d	b, f	-	a, b	All	-	b*, f*	a, b, c, f*, h, i	All
	1.3.11 Sewage effluent discharge with a volume greater than 50 m^3/day to surface water (not requiring specific substances assessment)	☐	All	a, b, c, d	b, f	-	a, b	All	-	b*, f*	a, b, c, d*, e*, f*, h, i	All
	1.3.11 Sewage effluent discharge to surface water requiring specific substances assessment (any volume)	☐	All	a, b, c, d	b, f	-	a, b	All	b, c, d, e	b*, c, f*	a, b, c, d*, e*, f*, h, i	All

Type of effluent	Charge band	Please tick box	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Water company WwTW treated sewage effluent	1.3.8 Sewage effluent discharge with a volume greater than 15 m^3/day to groundwater (not requiring specific substances assessment)	☐	All	a, b	a, f (b is optional)	-	-	All	-	a, d, f*	a, b, c, d*, e*, f*, h, i	All
	1.3.9 Sewage effluent discharge to groundwater requiring specific substances assessment (any volume)	☐	All	a, b	a, f (b is optional)	-	-	All	a, b, c, d, e	a, d, f*	a, b, c, d*, e*, f*, h, i	All
	1.3.10 Sewage effluent discharge with a volume greater than 5 m^3/day up to and including 50 m^3/day to surface water (not requiring specific substances assessment)	☐	All	a, b	a, f (b is optional)	-	-	All	-	a, b*, f*	a, b, c, f*, h, i	All
	1.3.11 Sewage effluent discharge with a volume greater than 50 m^3/day to surface water (not requiring specific substances assessment)	☐	All	a, b	a, f (b is optional)	-	-	All	-	a, b*, f*	a, b, c, d*, e*, f*, h, i	All
	1.3.11 Sewage effluent discharge to surface water requiring specific substances assessment (any volume)	☐	All	a, b	a, f (b is optional)	-	-	All	a, b, c, d, e	a, b*, c, f*	a, b, c, d*, e*, f*, h, i	All

Type of effluent	Charge band	Please tick box	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Settled storm sewage	1.3.19 Combined sewer overflow	☐	All	a, b	-	a, b, c, d, f, g, h, i, j, k	-	All	-	a, b*, d*, f*	b, g, h, i	All
Storm sewage	1.3.19 Combined sewer overflow	☐	All	a, b	-	a, b, c, e, f, g, h, i, j, k	-	All	-	a, b*, d*, f*	b, g, h, i	All
Emergency overflow	1.3.20 Emergency overflows	☐	All	a, b	-	a, l, m, n, o	-	All	-	a, b*, d*, f*	b, g, h, i	All
Trade and/or non-sewage – known volume	1.3.12 Trade and/or non-sewage effluent discharge to surface water or groundwater with a volume up to and including 5 m^3/ day (not requiring specific substances assessment)	☐	All	a, b, c, d	b, c, f	-	a, b	All	b, c, d, e	b*, d*, f*	b, f*, h, i	All
	1.3.13 Trade and/or non-sewage effluent discharge to surface water or groundwater with a volume greater than 5 m^3/ day (not requiring specific substances assessment)	☐	All	a, b, c, d	b, c, f	-	a, b	All	b, c, d, e	b*, d*, f*	b, d*, e*, f*, h, i	All
	1.3.14 Trade and/or non-sewage effluent discharge to surface water or groundwater requiring specific substances assessment (any volume)	☐	All	a, b, c, d	b, c, f	-	a, b	All	b, c, d, e	b*, d*, f*,c*	b, d*, e*, f*, h, i	All

Type of effluent	Charge band	Please tick box	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Trade and/or non-sewage – rainfall-dependent	1.3.12 Trade and/or non-sewage effluent discharge to surface water or groundwater with a volume up to and including 5 m^3/day (not requiring specific substances assessment)	☐	All	a, b	b, e, f	-	-	All	b, c, d, e	b*, d*, f*	b, f*, h, i	All
	1.3.13 Trade and/or non-sewage effluent discharge to surface water or groundwater with a volume greater than 5 m^3/day (not requiring specific substances assessment)	✔	All	a, b	b, e, f	-	-	All	b, c, d, e	b*, d*, f*	b, d*, e*, f*, h, i	All
	1.3.14 Trade and/or non-sewage effluent discharge to surface water or groundwater requiring specific substances assessment (any volume)	☐	All	a, b	b, e, f	-	-	All	b, d, e	b*, c, d*, f*	b, d*, e*, f*, h, i	All
Mixed effluent (sewage combined with trade and/or non-sewage) – known volume	1.3.8 Sewage effluent discharge with a volume greater than 15 m^3/day to groundwater (not requiring specific substances assessment	☐	All	a, b, c, d	b, c, f	-	a, b	All	b, c, d, e	d, f	a, b, c, d*, e*, f*, h, i	All
	1.3.9 Sewage effluent discharge to groundwater requiring specific substances assessment (any volume)	☐	All	a, b, c, d	b, c, f	-	a, b	All	b, c, d, e	d,f*	a, b, c, d*, e*, f*, h, i	All

Type of effluent	Charge band	Please tick box	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Mixed effluent (sewage combined with trade and/or non-sewage) – known volume	1.3.10 Sewage effluent discharge with a volume greater than 5 m^3/day up to and including 50 m^3/day to surface water (not requiring specific substances assessment)	☐	All	a, b, c, d	b, c, f	-	a, b	All	b, c, d, e	b*, f*	a, b, c, f*, h, i	All
	1.3.11 Sewage effluent discharge with a volume greater than 50 m^3/day to surface water (not requiring specific substances assessment)	☐	All	a, b, c, d	b, c, f	-	a, b	All	b, c, d, e	b*, f*	a, b, c, d*, e*, f*, h, i	All
	1.3.11 Sewage effluent discharge to surface water requiring specific substances assessment (any volume)	☐	All	a, b, c, d	b, c, f	-	a, b	All	b, c, d, e	b, c, d	a, b, c, d*, e*, f*, h, i	All
Mixed effluent (sewage combined with trade and/or non-sewage) containing rainfall-dependent effluent	1.3.8 Sewage effluent discharge with a volume greater than 15 m^3/day to groundwater (not requiring specific substances assessment)	☐	All	a, b	b, c, d, e, f	-	a, b	All	b, c, d, e	d, f*	a, b, c, d*, e*, f*, h, i	All
	1.3.9 Sewage effluent discharge to groundwater requiring specific substances assessment (any volume)	☐	All	a, b	b, c, d, e, f	-	a, b	All	b, c, d, e	d, f*	a, b, c, d*, e*, f*, h, i	All

Type of effluent	Charge band	Please tick box	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
	1.3.10 Sewage effluent discharge with a volume greater than 5 m^3/ day up to and including 50 m^3/ day to surface water (not requiring specific substances assessment)	☐	All	a, b	b, c, d, e, f	- a, b		All	b, c, d, e	b*, f*	a, b, c, f*, h, i	All
Mixed effluent (sewage combined with trade and/or non-sewage) containing rainfall-dependent effluent	1.3.11 Sewage effluent discharge with a volume greater than 50 m^3/ day to surface water (not requiring specific substances assessment)	☐	All	a, b	b, c, d, e, f	-	a, b	All	b, c, d, e	b*, f*	a, b, c, d*, e*, f*, h, i	All
	1.3.11 Sewage effluent discharge to surface water requiring specific substances assessment (any volume)	☐	All	a, b	b, c, d, e, f	-	a, b	All	b, c, d, e	b*, c, f*	a, b, c, d*, e*, f*, h, i	All
Trade – returned abstracted water (including ground source heating and cooling)	1.3.15 Cooling water or thermal discharge to surface water or groundwater (not requiring specific substances assessment)	☐	All	a, b, c, d	b, c, f	-	-	All	b, c, d, e, f, g	b*, d*, f*	a*, b, d*, e*, f*, h, i	All
	1.3.16 Cooling water or thermal discharge to surface water or groundwater requiring specific substances assessment	☐	All	a, b, c, d	b, c, f	-	-	All	b, c, d, e, f, g	b*, c, d*, f*	a*, b, d*, e*, f*, h, i	All

Type of effluent	Charge band	Please tick box	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
	1.3.17 Aquaculture (not requiring specific substances assessment)	☐	All	a, b, c, d	b, c, f	-	-	All	b, c, d, e	b*, d*, f*	a*, b, d*, e*, f*, h, i	All
Trade – returned abstracted water (including ground source heating and cooling)	1.3.18 Aquaculture requiring specific substances assessment	☐	All	a, b, c, d	b, c, f	-	-	All	b, c, d, e	b*, c, d*, f*	a*, b, d*, e*, f*, h, i	All
Effluent and/or contaminated surface water run-off arising from the operation of an installation	No additional charge, as already included as part of the installation permit application charge	☐	a, b, d	c	b, c, d, f	--	a, b2	a, b, c	b, c, d, e, f, g	b, d, e, f	a, b, d, e, f, h, i	a, b, c

* Check the relevant question and our guidance notes on part B6 to see if you need to give an answer.

1 About the effluent – details and type, continued

1a Give a brief description of the effluent discharge you want a permit for, for example, treated domestic sewage effluent

The effluent that is being discharged to groundwater is surface water runoff from the site. The runoff is expected to be clean and not contaminated. The surface water goes to an attenuation pond where it soaks away to groundwater.

1b Give this effluent a unique name

Surface Water Runoff

You must use this name to identify this effluent throughout this application and all associated documents.

1c Is this a release from a dam, weir or sluice ('reservoir release') under Schedule 21 of the EPR meaning of water discharge activity?

Yes ☐

No ☑

1d Have you obtained all the necessary permissions in addition to this environmental permit to be able to carry out the discharge (see B6 guidance notes for more details)?

Yes ☐

No ☐

N/A ☑

2 About the effluent – how long will you need to discharge the effluent for?

2a What date do you want the permit for this effluent to start? 01/09/2024 (DD/MM/YYYY)

Please note that this is the date that your annual subsistence charges will start, even if you have not started to discharge, unless you contact us to change (delay) the start date (see the guidance notes on part B6). The start date cannot be before the permit is issued and cannot be changed (delayed) after it has already passed.

2b Is the discharge time limited?

Yes ☐ Please give the date you expect the discharge to end but please note that your permit will not end on that date and you will still need to notify us to surrender the permit _____ (DD/MM/YYYY)

No ☑

2c Will the discharge take place all year?

Yes ☐

No ☐ Please give details of the months when you will make the discharge _____

2d Will the discharge take place on more than six days in any year?

Yes ☐

No ☐

3 How much do you want to discharge?

3a What is the daily dry weather flow? N/A cubic metres

3b What is the maximum volume of effluent you will discharge in a day? 77.82 cubic metres

Show how you calculated the figure given in the box below and continue on a separate sheet if necessary, giving a reference for the extra sheet

Calculations within Moderna Discharge Application Pack - Section 1.2

Document reference Moderna Discharge Application Pack Section 1.2

3c What is the maximum rate of discharge? N/A litres a second

3d What is the maximum volume of non-rainfall dependent effluent you will discharge in a day? N/A cubic metres

3e What is the maximum rate of rainfall dependent discharge? TBC litres a second

3f For each answer in question 3, show how you worked out the figure on a separate sheet

Document reference Moderna Discharge Application Pack - Section 1.2

4 Intermittent sewage discharges

4a For each answer to 4b to 4o below, show how you worked out the figure on a separate sheet

Document reference Supporting Information Document Section 13

4b What is the total volume of the off-line/storm tank storage? cubic metres

4c What is the total volume of on-line storage? cubic metres

4d What is the pass forward flow at the settled storm overflow setting? litres a second

4e What is the pass forward flow at the storm overflow setting? litres a second

4f Is the discharge screened?

Yes ☐ Answer the relevant questions from 4g to 4j

No ☐ Now go to 4k

4g What is the mesh screen spacing? ⌊_____⌋ millimetres

4h What is the minimum screen capacity flow through the mesh screen? ⌊_____⌋ litres a second

4i What is the bar screen spacing? ⌊_____⌋ millimetres

4j What is the minimum screen capacity flow through the bar screen? ⌊_____⌋ litres a second

4k Is the overflow constructed to good engineering design?

Yes

No On a separate sheet explain what standards the overflow has been constructed to

Document reference ⌊_____⌋

4l What is the emergency storage capacity of the sewer and wet well? ⌊_____⌋ cubic metres

4m What is the storage time within the sewer and the wet well above the top water level at dry weather flow? ⌊_____⌋ hours and minutes

4n What is the pass forward flow at the pumping station? ⌊_____⌋ litres a second

4o For intermittent emergency overflows you must provide a document setting out the key protection measures you will provide

Document reference for pumping station key protection measures ⌊_____⌋

5 Should your discharge be made to the foul sewer?

Foul sewer means public or private foul sewer.

Before answering these questions, you must read the guidance notes to part B6.

You will also need to contact your sewerage undertaker (usually your local water company) and you may need to check if it is possible to connect to a private foul sewer.

5a How far away is the nearest foul sewer from the boundary of the premises? N/A metres

5b To assess whether it is reasonable to discharge your effluent into the foul sewer, please answer 5b1 or 5b2

5b1 Discharges from domestic properties

Multiply the number of properties served by the sewage treatment system by 30 metres.

Number of domestic properties served by the sewage treatment system metres [ ] × 30 metres = [ ] metres

5b2 Discharges from all other premises including trade effluent

Divide the volume of the discharge (in cubic metres) by 0.75 and then multiply this figure by 30 metres.

Volume of the discharge (answer to question 3b) [ ] cubic metres / 0.75 = [ ] × 30 = [ ] metres

Is your answer to question 5b1 or 5b2 above greater than the distance to the nearest foul sewer (answer to 5a)?

No ☐ You do not need to explain why you cannot discharge your effluent into the foul sewer at this point. However, we may request this information from you when we determine your application. Now go to question 6.

Yes ☐ You must explain on a separate sheet why you cannot discharge your effluent into the foul sewer, giving a reference for the extra sheet. Before you submit the application, you must explore the possibility of connecting to the foul sewer, and send us evidence that you have approached the sewerage undertaker, including their formal response regarding connection, if relevant. You must also show the extra cost of connecting to a sewer compared with the treatment system you propose, and details of any physical obstacles such as roads, railways, rivers or canals.

We will only agree to the use of private treatment systems within sewered areas if you can demonstrate that:

- the additional cost of connecting to the foul sewer would be unreasonable
- connection is not practically feasible, or
- the proposed private treatment system can be shown to significantly benefit the environment

We are unlikely to grant a permit for a discharge of treated domestic sewage in circumstances where a private sewerage system is being proposed due to a lack of capacity in the nearest public sewerage network.

The guidance notes to part B6 will help you understand what information you need to provide in order to answer this question.

Document reference for where you have given this justification [ ]

6 How will the effluent be treated?

6a Do you treat your effluent?

Yes ☐ Now go to question 6b

No ☑ You must explain why the effluent will not be treated

Document reference for where you have given this justification: Supporting Information Document Section 9

6b Fill in Table 2 for each stage of the treatments carried out on your effluent in the order in which they are carried out

For installations with point source emission to water or sewer, there is no need to duplicate information already provided in part B3 form. Where this information is already provided, give the document reference and go to question 7.

Document reference

Table 2 – Treatments carried out on your effluent

Order of treatment	Code number	Description
First		
Second		
Third		
Fourth		

Continue on a separate sheet if you need more rows. If you prefer, you can also send us an overall design for the whole treatment process.

Document reference

6c You must provide details on a separate sheet of the final effluent discharge quality that the overall treatment system is designed to achieve

Document reference

7 What will be in the effluent?

For all applications, whether to surface water, or onto or into ground, you should still check to see if your discharge is likely to contain any of the specific substances listed in the guidance documents on 'Risk assessment for treated sewage or trade effluent discharges to surface water or groundwater' (see https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit)

Answer the relevant questions for your discharge below.

7a Are any of the specific substances listed in 'Risk assessment for treated sewage or trade effluent discharges to surface water or groundwater' likely to enter the sewerage system upstream of the discharge through any authorised or known inputs?

Yes ☐

No ☐

7b Are any of the specific substances listed in 'Risk assessment for treated sewage or trade effluent discharges to surface water or groundwater' added to or present in the effluent as a result of the activities on the site?

Yes ☑

No ☐

7c Have any of the specific substances listed in 'Risk assessment for treated sewage or trade effluent discharges to surface water or groundwater' been detected in samples of the effluent or in the sewerage catchment upstream of the discharge?

Yes ☐

No ☑

7d Are there any other harmful or specific substances in your effluent not mentioned in 'Risk assessment for treated sewage or trade effluent discharges to surface water or groundwater'?

Yes ☐

No ☑

7e If you have answered 'No' to any of questions 7a to 7d provide details on a separate sheet of how you have established that the effluent is not likely to contain specific substances.

Document reference: Moderna Discharge Application Pack Section 1.4

7f What is the maximum temperature of your discharge?

N/A degrees Celsius

7g What is the maximum expected temperature change compared to the incoming water supply?

N/A increase in degrees Celsius

N/A decrease in degrees Celsius

8 Environmental risk assessments and modelling

You may need to carry out an environmental risk assessment or modelling to support your application. Please answer all the questions that are relevant to your discharge. If an environmental risk assessment or modelling is required, you must send it to us with your application.

8a Sewer modelling report (for discharges of final effluent from a water company WwTW or intermittent sewage discharges)

You must carry out sewer modelling following the guidance 'Surface water pollution risk assessment for your environmental permit' (see https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit). Send us details of how the modelling was carried out and the outcome.

Document reference for the sewer modelling report

8b Discharges to lakes, estuaries, coastal waters or bathing waters

You must carry out modelling following the guidance 'Surface water pollution risk assessment for your environmental permit' (see https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit). Send us details of how the modelling was carried out and the outcome.

Document reference for the modelling report

8c Discharges to freshwater (non-tidal) rivers

If the discharge contains, or potentially contains, any specific substances, you must carry out screening following the guidance (see https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit). The guidance notes on part B6 outline the information you must provide.

Have you answered yes to any of 7a to 7d?

Yes ☐ Send us the completed screening tool, along with the raw data used to create the summary statistics

Document reference for the screening tool and raw data

No ☐

8d Discharges to groundwater

You must carry out a groundwater quantitative risk assessment following the guidance in 'Groundwater risk assessment for your environmental permit' (see https://www.gov.uk/guidance/groundwater-risk-assessment-for-your-environmental-permit).

Send us details of how the modelling was carried out and the outcome.

For groundwater remediation schemes you must send us a site-specific remediation strategy that has been agreed with the local Environment Agency Groundwater and Contaminated Land Team.

Document reference for the groundwater remediation report

Moderna Discharge Application Pack Section 1.5

8e Discharges to freshwater (non-tidal) rivers from an installation, including discharges via sewer

If the discharge contains, or potentially contains, any specific substances, you must carry out screening following the guidance (see https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit). The guidance notes on part B6 outline the information you must provide.

Have you answered yes to any of 7a to 7d?

Yes ☐ Send us the completed screening tool, along with the raw data used to create the summary statistics. Where the discharge is via sewer, include sewage treatment reduction factors in the calculations.

Document reference for the screening tool and raw data

There is no need to duplicate information already provided in part B3 form. Where this information is already provided, give the document reference above.

No ☐

8f Environmental impact assessment

Have you carried out an environmental impact assessment?

Yes ☐ Send us details of how the assessment was carried out and the outcome

Document reference for the environmental impact assessment

No ☑

9 Monitoring arrangements

Note: If your effluent has a maximum volume of no more than 50 cubic metres a day you do not need to complete question 9d or 9e.

9a What is the national grid reference of the inlet sampling point? (for example, SJ 12345 67890)

N/A

9b What is the national grid reference of the effluent sample point?

SU 48265 86616

9c Do you have an Urban Waste Water Treatment Directive final effluent sampling point?

Yes ☐ Please provide the national grid reference

No ☐

9d What is the national grid reference of the flow monitoring point?

SU 48265 86616

9e Does the flow monitor have an MCERTS certificate?

Yes ☑ Please give the certificate number

TBC - exact model yet to be specified

No ☐

9f Do you have a UV disinfection efficacy monitoring point?

Yes ☐ Please provide the national grid reference

No ☑

9g Do you have an event duration monitoring point(s)?

Yes ☐ Please provide the national grid reference

No ☐

9h You should clearly mark on the plan the locations of any of the above that apply to this effluent

Document reference for the plan

plan to be produced

9i Do you intend to do your own effluent monitoring?

Yes ☑

No ☐

10 Where will the effluent discharge to?

10a Mark in Table 3 where this effluent discharges to and fill in the relevant appendix or appendices.

You must use the name you gave to this effluent in answer to question 1b of this form when filling in your relevant appendix or appendices.

Table 3 – Where the effluent discharges to

Receiving environment		Relevant appendix
Borehole or well	☐	1
Into land (for example, through a drainage system)	☑	2
Onto land	☐	3
Tidal river, tidal stream, estuary or coastal waters	☐	4
Non-tidal river, stream or canal	☐	5
Lake or pond	☐	6

10b Is this effluent discharged through more than one outlet?

Yes ☐ Give details, on a separate sheet, of the circumstances under which each outlet would be used by this effluent

Document reference

No ☑

10c If you answered yes to question 10b above make sure you show clearly on your discharge point appendix or appendices and site plan that this one effluent can discharge to more than one discharge point.

You must give us all the details we need for each of the discharge points used by this effluent.

11 How to contact us

If you need help filling in this form, please contact the person who sent it to you or contact us as shown below.

General enquiries: 03708 506 506 (Monday to Friday, 8am to 6pm)

Textphone: 03702 422549 (Monday to Friday, 8am to 6pm)

Email: enquiries@environment-agency.gov.uk

Website: www.gov.uk/government/organisations/environment-agency

If you are happy with our service, please tell us. It helps us to identify good practice and encourages our staff. If you're not happy with our service, please tell us how we can improve it.

Please tell us if you need information in a different language or format (for example, in large print) so we can keep in touch with you more easily.

Feedback

(You don't have to answer this part of the form, but it will help us improve our forms if you do.)

We want to make our forms easy to fill in and our guidance notes easy to understand. Please use the space below to give us any comments you may have about this form or the guidance notes that came with it.

How long did it take you to fill in this form?

We will use your feedback to improve our forms and guidance notes, and to tell the Government how regulations could be made simpler.

Would you like a reply to your feedback?

Yes please ☐

No thank you ☐

Crystal Mark 19107 Clarity approved by Plain English Campaign

For Environment Agency use only

Date received (DD/MM/YYYY)

Payment received?

No ☐

Yes ☐ Amount received

Our reference number

£

Plain English Campaign's Crystal Mark does not apply to appendices 1 to 6.

Appendix 1 – Discharges to a borehole or well (or other deep structure)

If you are discharging the effluent to a borehole or well or other deep structure (such as concrete rings, natural swallow hole or deep soakage pit) you must ensure that the discharge is indirect to groundwater. Direct discharges to groundwater cannot be permitted. We will undertake a groundwater quantitative risk assessment on your behalf in line with the guidance 'Groundwater risk assessment for your environmental permit' (see https://www.gov.uk/guidance/groundwater-risk-assessment-for-your-environmental-permit)

For us to do this you must answer the following questions relevant to your application and provide us with additional information as summarised in Table 4.

Without this information we will be unable to complete the risk assessment and it is likely your application will be rejected.

Answer all the questions below. Use a separate line for each effluent if more than one effluent discharges using this discharge point. Remember, when linking your effluent to a discharge point you must use the name you gave to your effluent in answer to question 1b in the effluent form.

1.1 Give the discharge point a unique name

For example, 'Outlet 1' (you must use this name to identify the discharge point on the plan) ⌊_____⌋

1.2 Give the national grid reference of the discharge point ⌊_____⌋

1.3 Is the discharge to ground via a

Well ☐

Borehole ☐

Other deep structure ☐ Please give details (e.g. concrete ring structure, shaft, natural swallow hole, soakage pit etc.)

1.4 What is the diameter of the borehole, well or other deep structure that the effluent will be discharged into? ⌊_____⌋ metres

1.5 Is the borehole, well or other structure already constructed?

Yes ☐ Now answer questions 1.6 to 1.9

No ☐ Now answer questions 1.10 to 1.12

Appendix 1 – Discharges to a borehole or well (or other deep structure) continued

Existing borehole, well or other deep structure

1.6 What is the total depth to the bottom of the existing well, borehole or other structure? _____ metres below ground level

If you are unaware of the actual depth please estimate the depth based on the following categories:

- 0–5 metres ☐
- 5–10 metres ☐
- Greater than 10 metres ☐
- Uncertain ☐

What evidence is the estimated depth above based on? _____

1.7 Does the well, borehole or other structure extend into groundwater?

- Yes – always contains water ☐
- Sometimes – water is present occasionally ☐
- No – never contains water ☐

If groundwater is always, or sometimes, present, what is the highest level that the standing water reaches?

- Measured ☐ _____ metres below ground level
- Estimated ☐ _____ metres below ground level

1.8 Please provide any records, diagrams or borehole logs you may have that could help us understand:

- the method of construction (including any solid casings or linings used)
- the likely depth of the deep structure
- the local groundwater conditions

Please provide photocopies where possible. If it is not possible (for example, if the documents are large or bulky) please summarise any additional information you have on a separate sheet.

Document reference for the records, diagrams or borehole logs _____

1.9 If any maintenance has been carried out on your well, borehole or other deep structure (for example, to aid effective drainage), please give details below

Please now answer question 1.13

Appendix 1 – Discharges to a borehole or well (or other deep structure), continued

Proposed borehole, well or other deep structure that has not yet been constructed

1.10 Please tell us why you are unable to install a shallow engineered drainage system. This information forms an important part of our permit determination process. Which methods of shallow disposal have you considered, and why did you decide these were not feasible to take forward? Please answer questions 1.10a and 1.10b to provide the results of soakage tests and summarise in the box any relevant information supporting your decisions (for example, permission refusals from landowners or physical constraints, or land availability or proximity to buildings).

1.10a What was your percolation value (Vp) result? ⌊_____⌋ seconds per millimetre

You must show in Table 4 how you worked out the percolation value.

Table 4 – Percolation value

	Trial 1	Trial 2	Trial 3	Average
Hole 1				
Hole 2				
Hole 3				
Hole 4				

1.10b If a shallow engineered drainage system were feasible, what would be the required surface area of your infiltration system? ⌊_____⌋ square metres

Supporting information to explain why you are unable to install a shallow engineered drainage system can be appended to your application.

Document reference for these details ⌊_____⌋

1.11 Please tell us the type of deep structure (for example, borehole, well, deep soakage pit) you propose to install

What will the total depth be? ⌊_____⌋ metres below ground level

Appendix 1 – Discharges to a borehole or well (or other deep structure) continued

1.12 Please tell us the reason this depth has been selected and, if you are aware of any relevant existing information on local water levels, please also tell us the depth to groundwater (in metres below ground level). What measures will you undertake to ensure the discharge is not direct into groundwater? If the discharge will be direct to groundwater explain why you cannot make it indirect. Direct discharges to groundwater cannot be permitted.

Proximity of your discharge to other receptors

1.13 Is the borehole, well or other deep structure where the discharge is being/will be made within 50 metres of any other well, spring or borehole used to supply water for drinking water or food production purposes?

Yes ☐ Please show the location of the well, spring or borehole you identified in answer to question 1.13 on the plan you have provided for section 4 of the main application form. Please now answer question 1.14

No ☐ Please now answer question 1.15

1.14 Please tell us about the water supply (or supplies) used for drinking water or food production purposes identified in question 1.13 above; for example, the name of the property or properties served by the water supply, what they use the water for (drinking water, food production) and where they are in relation to your discharge

Appendix 1 – Discharges to a borehole or well (or other deep structure) continued

1.15 What is the distance to the nearest watercourse

(for example, surface water, river, stream or ditch)? |_____| metres

Please tell us whether you have considered discharging to surface water and why this is not feasible

In Table 5 please provide any further information required for us to complete a groundwater quantitative risk assessment on your behalf in line with the guidance 'Groundwater risk assessment for your environmental permit' at

https://www.gov.uk/guidance/groundwater-risk-assessment-for-your-environmental-permit. Without this information we will be unable to carry out a hydrogeological risk assessment on your behalf.

Table 5 summarises the information required to allow us to undertake a hydrogeological risk assessment of your discharge to a deep infiltration system. Without this information your application will be rejected. You will already have provided some of this information earlier in this application form. **We also need you to provide additional information indicated by a tick (✔) in Table 5**. For further guidance on the additional information required see https://www.gov.uk/guidance/groundwater-risk-assessment-for-your-environmental-permit and the guidance notes on part B6. You may require the advice of an environmental consultant to collate this information.

For some of the risk assessment inputs we are better placed to provide the information and will do so for those parameters indicated by an asterisk (*) as far as possible. However, if you wish to provide site-specific information for those parameters with an asterisk you are welcome to do so.

Table 5 – Further information required for the Environment Agency to complete a groundwater quantitative risk assessment on your behalf

Information	Description	Existing structure	Proposed structure	Information supplied?
Information supplied by the applicant This has already been requested earlier in the application form				Information you have already supplied on the application form
National grid reference of the discharge point		Appendix 1 Q2	Appendix 1 Q2	
Volume of effluent (m^3 per day)		Q3b	Q3b	
Type of effluent treatment	Septic tank, package treatment plant, other	Q6	Q6	
Type of deep infiltration system	Borehole, well, concrete ring structure, other	Appendix 1 Q3	Appendix 1 Q3	
Diameter of deep infiltration system (metres)		Appendix 1 Q4	Appendix 1 Q4	
Depth to the base of deep infiltration structure (metres)		Appendix 1 Q6	Appendix 1 Q11	
Depth to water table (metres)	Is discharge above or below water table?	Appendix 1 Q7, Q8	Appendix 1 Q12	
Justification for a deep infiltration system	Why are you unable to install a shallow infiltration system? What other options for disposal have been considered? Provide full details of the infiltration tests undertaken plus results	Appendix 1 Q8 if available	Appendix 1 Q10	
Information supplied by the applicant This is additional information we need from you that is not provided elsewhere on the application form. Site data should be given where it is already available. If not, you can submit the relevant literature values quoting the source of the data and justification of the values you have selected. Please tick the right-hand column to confirm you have provided this essential information.				

Appendix 1 – Discharges to a borehole or well (or other deep structure) continued

Information	Description	Existing structure	Proposed structure	Information supplied?
Concentration of relevant substances entering the infiltration system	For discharges of domestic effluent we will routinely assess the concentration of nitrogen species, particularly the ammonium concentration	✓	✓	☐
Length of screened borehole section below the water table (metres)	Depth in metres of the borehole screened section that is below the water table (This applies only to boreholes that have groundwater in the base)	✓	✓	☐
Calculated area of infiltration system (square metres)	Explain how the area of the infiltration system has been calculated – this is especially relevant if a non-circular system is used	✓	✓	☐
Unsaturated zone parameters	The following represent the strata above the water table: • hydraulic conductivity (metres per day) • water-filled porosity (per cent) • bulk density (grammes per cubic centimetre)	✓	✓	☐
Saturated zone parameters	The following represent the strata below the water table: hydraulic conductivity (metres per day) water-filled porosity (per cent) bulk density (grammes per cubic centimetre) hydraulic gradient of the water table (fraction)	✓	✓	☐
Information provided by the Environment Agency where possible You are free to provide this information if you wish, or in some specific cases we may need to ask for this at a later stage. Please tick if you have provided this information (optional).				

Appendix 1 – Discharges to a borehole or well (or other deep structure) continued

Information	Description	Existing structure	Proposed structure	Information supplied?
Environmental standard	The relevant environmental standard or compliance value against which we will assess your effluent discharge	*	*	☐
Half-life for degradation of the substance (days)	If you wish to know more about these parameters see 'Groundwater risk assessment for your environmental permit' at https://www.gov.uk/guidance/groundwater-risk-assessment-for-your-environmental-permit	*	*	☐
Soil water partition coefficient (litres per kilogramme)		*	*	☐
Mixing zone thickness (metres)		*	*	☐
Distance to compliance point (metres)		*	*	☐

Appendix 2 – Discharges into land

Answer the questions below. Use a separate line for each effluent if more than one effluent discharges using this discharge point. Remember, when linking your effluent to a discharge point you must use the name you gave to your effluent in answer to question 1b in the effluent form.

2.1 Give the discharge point a unique name

For example, 'Outlet 1' (you must use this name to identify the discharge point on the plan) W1

2.2 Give the national grid reference of the discharge point SU 48265 86616

2.3 Is your infiltration system new or existing?

New ☑ Now go to question 2.5

Existing ☐ Now go to question 2.4

2.4a When was it built? _____ (DD/MM/YYYY)

2.4b Now answer questions 2.5–2.8 if you are able to, if not leave them blank and go to question 2.9

2.5 Is your infiltration system designed and built to British Standard 6297:2007 + A1:2008 or the British Standards in force at the time of installation?

Yes ☐

No ☐ Please provide details, on a separate sheet, of the design criteria used for your infiltration system

Document reference _____

2.6 On what date did you carry out a percolation test and dig a trial hole in line with British Standard 6297:2007 + A1:2008? TBC (DD/MM/YYYY)

2.7 What is your percolation value (Vp) result? TBC seconds per millimetre

You must show in Table 6 how you worked out the percolation value. Please also provide your test sheets and any field notes or observations made regarding ground conditions.

Table 6 – Percolation value

	Trial 1	Trial 2	Trial 3	Average
Hole 1	TBC			
Hole 2				
Hole 3				
Hole 4				

2.8 Please show us how you have calculated the area (A) of your infiltration system

p TBC × Vp = _____ × 0.25 for septic tanks = A _____ square metres

or

p _____ × Vp = _____ × 0.20 for package treatment plants = A _____ square metres

p Population based on maximum occupancy Vp Percolation value in seconds/mm

Appendix 2 – Discharges into land, continued

2.9 If known, mark on the plan you have provided the extent of the infiltration system. Please write on the plan the length and width of the sides in metres.

2.10 Is any part of your infiltration system within 50 metres of a well, spring or borehole?

No ☑

Yes ☐ Identify the location of the well, spring or borehole on the plan you have provided and answer question 2.11

2.11 Is the well, spring or borehole you have identified used to supply water?

No ☑

Yes ☐ You must describe what the water supplied is used for

2.12 Is any part of your infiltration system within 10 metres of a watercourse?

No ☑

Yes ☐ Identify the location of the watercourse on the plan you have provided for section 4 of part B2

Appendix 3 – Discharges onto land

Answer all the questions below. Use a separate line for each effluent if more than one effluent discharges using this discharge point. Remember, when linking your effluent to a discharge point you must use the name you gave to your effluent in answer to question 1b in the effluent form.

3.1 Give the discharge point a unique name
For example, 'Outlet 1' (you must use this name to identify the discharge point on the plan)

3.2 Give the national grid reference of the discharge point

3.3 Select from the table below the type of area where the effluent is disposed of

Area type		
Unlined reed bed	☐	
Unlined grass plot	☐	
Unlined wetland	☐	
Other	☐	Please specify below

3.4 What is the surface area of the land used for your disposal? square metres

3.5 Is any part of your infiltration system within 50 metres of a well, spring or borehole?

No ☐

Yes ☐ Identify the location of the well, spring or borehole on the plan you have provided and answer question 3.6

3.6 Is the well, spring or borehole you have identified used to supply water?

No ☐

Yes ☐ You must describe what the water supplied is used for

3.7 Is any part of your infiltration system within 10 metres of a watercourse?

No ☐

Yes ☐ Identify the location of the watercourse on the plan you have provided for section 4 of part B2

Appendix 4 – Discharges to tidal river, tidal stream, estuary or coastal waters

Answer all the questions below. Use a separate line for each effluent if more than one effluent discharges using this discharge point. Remember, when linking your effluent to a discharge point you must use the name you gave to your effluent in answer to question 1b in the effluent form.

4.1 Give the discharge point a unique name
For example, 'Outlet 1' (you must use this name to identify the discharge point on the plan)

4.2 Give the national grid reference of the discharge point

4.3 Give the name of the tidal river, tidal stream, estuary or area of coastal water if you know it

4.4 Is the discharge into a

- Tidal river ☐
- Tidal stream ☐
- An estuary ☐
- Coastal water ☐

4.5 Does the discharge reach the watercourse by flowing through a surface water sewer?

Yes ☐ Give the national grid reference where the discharge enters the surface water sewer

No ☐

4.6 Is the discharge point above the mean low water spring tide mark?

Yes ☐ Please explain, on a separate sheet, why the discharge cannot be made below this point

Document reference

No ☐

4.7 How is the effluent dispersed?

For example, open pipe or diffuser system

If diffuser system go to question 4.8

4.8 Give details, on a separate sheet, of the design of the diffuser system

Document reference

4.9 Is the discharge made to a roadside drain or ditch?

No ☐

Yes ☐ If yes, it is your responsibility to ascertain whether the relevant highways authority is responsible for the roadside drain or ditch. If it is, you need to secure the appropriate permissions from the relevant highways authority before submitting an application for an environmental permit to the Environment Agency. A copy of the written permission from the relevant highways authority must be submitted with the environmental permit application.

Document reference for the written permission from the relevant highways authority

Appendix 5 – Discharges to non-tidal river, stream or canal

Answer all the questions below. Use a separate line for each effluent if more than one effluent discharges using this discharge point. Remember, when linking your effluent to a discharge point you must use the name you gave to your effluent in answer to question 1b in the effluent form.

5.1 Give the discharge point a unique name
For example, 'Outlet 1' (you must use this name to identify the discharge point on the plan) _____

5.2 Give the national grid reference of the discharge point _____

5.3 Give the name of the watercourse, canal or the main watercourse it is a tributary of if you know it _____

5.4 Is the discharge into a

Non-tidal river ☐

Stream ☐

Canal ☐

5.5 Does the discharge reach the watercourse or canal by flowing through a surface water sewer?

Yes ☐ Give the national grid reference where the discharge enters the surface water sewer _____

No ☐

5.6 Does the watercourse dry up for part of the year?

No ☐

Yes ☐ How many months per year is the watercourse dry? _____

Do you agree to install perforated pipe work before the discharge point?

The discharge must be made via a perforated pipe. Any section of that pipe which lies within 10 metres of the bank of any watercourse shall be perforated, but this perforated section shall not extend more than 10 metres from the bank of any watercourse.

Yes

No

5.61. If the watercourse does dry up for part of the year can you indicate a typical period when the surface water runs dry each year – start and finish (in months)

Watercourse typically becomes dry in:

January	May	September
February	June	October
March	July	November
April	August	December

Watercourse typically flows again in:

January	May	September
February	June	October
March	July	November
April	August	December

Appendix 5 – Discharges to non-tidal river, stream or canal, continued

5.6.2 If the watercourse does dry up for part of the year, how many metres downstream of the discharge is it before the discharged effluent soaks in?

5.7 Is the discharge made to a roadside drain or ditch?

No ☐

Yes ☐ If yes, it is your responsibility to ascertain whether the relevant highways authority is responsible for the roadside drain or ditch. If it is, you need to secure the appropriate permissions from the relevant highways authority before submitting an application for an environmental permit to the Environment Agency. A copy of the written permission from the relevant highways authority must be submitted with the environmental permit application.

Document reference for the written permission from the relevant highways authority

Appendix 6 – Discharges to a lake or pond

Answer all the questions below. Use a separate line for each effluent if more than one effluent discharges using this discharge point. Remember, when linking your effluent to a discharge point you must use the name you gave to your effluent in answer to question 1b in the effluent form.

6.1 Give the discharge point a unique name
For example, 'Outlet 1' (you must use this name to identify the discharge point on the plan) tbc

6.2 Give the national grid reference of the discharge point tbc

6.3 Give the name of the lake or pond if you know it attenuation pond

6.4 Select from the following table the type of lake or pond you will be discharging to and answer the relevant questions

Type of lake or pond		Relevant questions
Lake or pond which is not connected to a river or watercourse	☑	Permit not required*
Lake or pond which is not connected to a river or watercourse, where you have had a notice served under paragraph 5 of Schedule 21 of the Environmental Permitting (England and Wales) Regulations 2016	☐	6.5, 6.6, 6.7
Lake or pond that discharges into a river or watercourse	☐	6.5, 6.6, 6.7

* Unless a Notice has been served under paragraph 5 of Schedule 21 of the Environmental Permitting (England and Wales) Regulations 2016

6.5 What is the surface area of the lake or pond? _____ square metres

6.6 What is the maximum depth of the lake or pond? _____ metres

6.7 What is the average depth of the lake or pond? _____ metres

Application for an environmental permit Part B6 – New bespoke water discharge activity or groundwater activity (point source discharge) or point source emission to water from an installation

Environment Agency

Fill in this part of the form, together with parts A, B2 and F1, if you are applying for a new bespoke permit for a water discharge activity or a point source discharge groundwater activity.

Fill in this part of the form, together with parts A, B2, B3 and F1, if you are applying for a new bespoke permit for an installation where a point source emission to water, groundwater or sewer forms part of the operation.

Please check that this is the latest version of the form available from our website.

Please read through this form and the guidance notes that came with it. The form can be:

1) saved onto a computer and then filled in. Please note that the form follows a logic that means questions will open or stay closed depending on a previous answer. So you may not be able to enter text in some boxes.

2) printed off and filled in by hand. Please write clearly in the answer spaces.

If you want to apply for a standalone discharge of treated domestic sewage effluent of up to fifteen cubic metres (15 m^3) a day to ground or up to twenty cubic metres (20 m^3) a day to surface water, please fill in form B6.5.

It will take less than three hours to fill in this part of the application form.

Contents

1 About the effluent – details and type

From the list below, choose which type of effluent you are applying for on this form and answer the questions shown in Table 1.

You must fill in a separate copy of this form and the appropriate appendix or appendices for each type of effluent you plan to discharge.

Table 1 – About the effluent

Type of effluent	Charge band	Please tick box	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Sewage effluent (non-water company)	1.3.8 Sewage effluent discharge with a volume greater than 15 m^3/day to groundwater (not requiring specific substances assessment)	☐	All	a, b, c, d	b, f	-	a, b	All	-	d, f*	a, b, c, d*, e*, f*, h, i	All
	1.3.9 Sewage effluent discharge to groundwater requiring specific substances assessment (any volume)	☐	All	a, b, c, d	b, f	-	a, b	All	b, c, d, e	d, f*	a, b, c, d*, e*, f*, h, i	All
	1.3.10 Sewage effluent discharge with a volume greater than 5 m^3/day up to and including 50 m^3/day to surface water (not requiring specific substances assessment)	☐	All	a, b, c, d	b, f	-	a, b	All	-	b*, f*	a, b, c, f*, h, i	All
	1.3.11 Sewage effluent discharge with a volume greater than 50 m^3/day to surface water (not requiring specific substances assessment)	☐	All	a, b, c, d	b, f	-	a, b	All	-	b*, f*	a, b, c, d*, e*, f*, h, i	All
	1.3.11 Sewage effluent discharge to surface water requiring specific substances assessment (any volume)	☐	All	a, b, c, d	b, f	-	a, b	All	b, c, d, e	b*, c, f*	a, b, c, d*, e*, f*, h, i	All

Type of effluent	Charge band	Please tick box	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Water company WwTW treated sewage effluent	1.3.8 Sewage effluent discharge with a volume greater than 15 m^3/day to groundwater (not requiring specific substances assessment)	☐	All	a, b	a, f (b is optional)	-	-	All	-	a, d, f*	a, b, c, d*, e*, f*, h, i	All
	1.3.9 Sewage effluent discharge to groundwater requiring specific substances assessment (any volume)	☐	All	a, b	a, f (b is optional)	-	-	All	a, b, c, d, e	a, d, f*	a, b, c, d*, e*, f*, h, i	All
	1.3.10 Sewage effluent discharge with a volume greater than 5 m^3/day up to and including 50 m^3/day to surface water (not requiring specific substances assessment)	☐	All	a, b	a, f (b is optional)	-	-	All	-	a, b*, f*	a, b, c, f*, h, i	All
	1.3.11 Sewage effluent discharge with a volume greater than 50 m^3/day to surface water (not requiring specific substances assessment)	☐	All	a, b	a, f (b is optional)	-	-	All	-	a, b*, f*	a, b, c, d*, e*, f*, h, i	All
	1.3.11 Sewage effluent discharge to surface water requiring specific substances assessment (any volume)	☐	All	a, b	a, f (b is optional)	-	-	All	a, b, c, d, e	a, b*, c, f*	a, b, c, d*, e*, f*, h, i	All

Type of effluent	Charge band	Please tick box	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Settled storm sewage	1.3.19 Combined sewer overflow	☐	All	a, b	-	a, b, c, d, f, g, h, i, j, k	-	All	-	a, b*, d*, f*	b, g, h, i	All
Storm sewage	1.3.19 Combined sewer overflow	☐	All	a, b	-	a, b, c, e, f, g, h, i, j, k	-	All	-	a, b*, d*, f*	b, g, h, i	All
Emergency overflow	1.3.20 Emergency overflows	☐	All	a, b	-	a, l, m, n, o	-	All	-	a, b*, d*, f*	b, g, h, i	All
Trade and/or non-sewage – known volume	1.3.12 Trade and/or non-sewage effluent discharge to surface water or groundwater with a volume up to and including 5 m^3/ day (not requiring specific substances assessment)	☐	All	a, b, c, d	b, c, f	-	a, b	All	b, c, d, e	b*, d*, f*	b, f*, h, i	All
	1.3.13 Trade and/or non-sewage effluent discharge to surface water or groundwater with a volume greater than 5 m^3/ day (not requiring specific substances assessment)	☐	All	a, b, c, d	b, c, f	-	a, b	All	b, c, d, e	b*, d*, f*	b, d*, e*, f*, h, i	All
	1.3.14 Trade and/or non-sewage effluent discharge to surface water or groundwater requiring specific substances assessment (any volume)	☐	All	a, b, c, d	b, c, f	-	a, b	All	b, c, d, e	b*, d*, f*,c*	b, d*, e*, f*, h, i	All

Type of effluent	Charge band	Please tick box	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Trade and/or non-sewage – rainfall-dependent	1.3.12 Trade and/or non-sewage effluent discharge to surface water or groundwater with a volume up to and including 5 m^3/day (not requiring specific substances assessment)	☐	All	a, b	b, e, f	-	-	All	b, c, d, e	b*, d*, f*	b, f*, h, i	All
	1.3.13 Trade and/or non-sewage effluent discharge to surface water or groundwater with a volume greater than 5 m^3/day (not requiring specific substances assessment)	✔	All	a, b	b, e, f	-	-	All	b, c, d, e	b*, d*, f*	b, d*, e*, f*, h, i	All
	1.3.14 Trade and/or non-sewage effluent discharge to surface water or groundwater requiring specific substances assessment (any volume)	☐	All	a, b	b, e, f	-	-	All	b, d, e	b*, c, d*, f*	b, d*, e*, f*, h, i	All
Mixed effluent (sewage combined with trade and/or non-sewage) – known volume	1.3.8 Sewage effluent discharge with a volume greater than 15 m^3/day to groundwater (not requiring specific substances assessment	☐	All	a, b, c, d	b, c, f	-	a, b	All	b, c, d, e	d, f	a, b, c, d*, e*, f*, h, i	All
	1.3.9 Sewage effluent discharge to groundwater requiring specific substances assessment (any volume)	☐	All	a, b, c, d	b, c, f	-	a, b	All	b, c, d, e	d,f*	a, b, c, d*, e*, f*, h, i	All

Type of effluent	Charge band	Please tick box	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Mixed effluent (sewage combined with trade and/or non-sewage) – known volume	1.3.10 Sewage effluent discharge with a volume greater than 5 m^3/day up to and including 50 m^3/day to surface water (not requiring specific substances assessment)	☐	All	a, b, c, d	b, c, f	-	a, b	All	b, c, d, e	b*, f*	a, b, c, f*, h, i	All
	1.3.11 Sewage effluent discharge with a volume greater than 50 m^3/day to surface water (not requiring specific substances assessment)	☐	All	a, b, c, d	b, c, f	-	a, b	All	b, c, d, e	b*, f*	a, b, c, d*, e*, f*, h, i	All
	1.3.11 Sewage effluent discharge to surface water requiring specific substances assessment (any volume)	☐	All	a, b, c, d	b, c, f	-	a, b	All	b, c, d, e	b, c, d	a, b, c, d*, e*, f*, h, i	All
Mixed effluent (sewage combined with trade and/or non-sewage) containing rainfall-dependent effluent	1.3.8 Sewage effluent discharge with a volume greater than 15 m^3/day to groundwater (not requiring specific substances assessment)	☐	All	a, b	b, c, d, e, f	-	a, b	All	b, c, d, e	d, f*	a, b, c, d*, e*, f*, h, i	All
	1.3.9 Sewage effluent discharge to groundwater requiring specific substances assessment (any volume)	☐	All	a, b	b, c, d, e, f	-	a, b	All	b, c, d, e	d, f*	a, b, c, d*, e*, f*, h, i	All

Type of effluent	Charge band	Please tick box	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
	1.3.10 Sewage effluent discharge with a volume greater than 5 m^3/ day up to and including 50 m^3/ day to surface water (not requiring specific substances assessment)	☐	All	a, b	b, c, d, e, f	- a, b		All	b, c, d, e	b*, f*	a, b, c, f*, h, i	All
Mixed effluent (sewage combined with trade and/or non-sewage) containing rainfall-dependent effluent	1.3.11 Sewage effluent discharge with a volume greater than 50 m^3/ day to surface water (not requiring specific substances assessment)	☐	All	a, b	b, c, d, e, f	-	a, b	All	b, c, d, e	b*, f*	a, b, c, d*, e*, f*, h, i	All
	1.3.11 Sewage effluent discharge to surface water requiring specific substances assessment (any volume)	☐	All	a, b	b, c, d, e, f	-	a, b	All	b, c, d, e	b*, c, f*	a, b, c, d*, e*, f*, h, i	All
Trade – returned abstracted water (including ground source heating and cooling)	1.3.15 Cooling water or thermal discharge to surface water or groundwater (not requiring specific substances assessment)	☐	All	a, b, c, d	b, c, f	-	-	All	b, c, d, e, f, g	b*, d*, f*	a*, b, d*, e*, f*, h, i	All
	1.3.16 Cooling water or thermal discharge to surface water or groundwater requiring specific substances assessment	☐	All	a, b, c, d	b, c, f	-	-	All	b, c, d, e, f, g	b*, c, d*, f*	a*, b, d*, e*, f*, h, i	All

Type of effluent	Charge band	Please tick box	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
	1.3.17 Aquaculture (not requiring specific substances assessment)	☐	All	a, b, c, d	b, c, f	-	-	All	b, c, d, e	b*, d*, f*	a*, b, d*, e*, f*, h, i	All
Trade – returned abstracted water (including ground source heating and cooling)	1.3.18 Aquaculture requiring specific substances assessment	☐	All	a, b, c, d	b, c, f	-	-	All	b, c, d, e	b*, c, d*, f*	a*, b, d*, e*, f*, h, i	All
Effluent and/or contaminated surface water run-off arising from the operation of an installation	No additional charge, as already included as part of the installation permit application charge	☐	a, b, d	c	b, c, d, f	--	a, b2	a, b, c	b, c, d, e, f, g	b, d, e, f	a, b, d, e, f, h, i	a, b, c

* Check the relevant question and our guidance notes on part B6 to see if you need to give an answer.

1 About the effluent – details and type, continued

1a Give a brief description of the effluent discharge you want a permit for, for example, treated domestic sewage effluent

The effluent that is being discharged to groundwater is surface water runoff from the site. The runoff is expected to be clean and not contaminated. The surface water goes to an attenuation pond where it soaks away to groundwater.

1b Give this effluent a unique name

Surface Water Runoff

You must use this name to identify this effluent throughout this application and all associated documents.

1c Is this a release from a dam, weir or sluice ('reservoir release') under Schedule 21 of the EPR meaning of water discharge activity?

Yes ☐

No ☑

1d Have you obtained all the necessary permissions in addition to this environmental permit to be able to carry out the discharge (see B6 guidance notes for more details)?

Yes ☐

No ☐

N/A ☑

2 About the effluent – how long will you need to discharge the effluent for?

2a What date do you want the permit for this effluent to start? 01/09/2024 (DD/MM/YYYY)

Please note that this is the date that your annual subsistence charges will start, even if you have not started to discharge, unless you contact us to change (delay) the start date (see the guidance notes on part B6). The start date cannot be before the permit is issued and cannot be changed (delayed) after it has already passed.

2b Is the discharge time limited?

Yes ☐ Please give the date you expect the discharge to end but please note that your permit will not end on that date and you will still need to notify us to surrender the permit _____ (DD/MM/YYYY)

No ☑

2c Will the discharge take place all year?

Yes ☐

No ☐ Please give details of the months when you will make the discharge _____

2d Will the discharge take place on more than six days in any year?

Yes ☐

No ☐

3 How much do you want to discharge?

3a What is the daily dry weather flow? N/A cubic metres

3b What is the maximum volume of effluent you will discharge in a day? 77.82 cubic metres

Show how you calculated the figure given in the box below and continue on a separate sheet if necessary, giving a reference for the extra sheet

Calculations within Moderna Discharge Application Pack - Section 1.2

Document reference Moderna Discharge Application Pack Section 1.2

3c What is the maximum rate of discharge? N/A litres a second

3d What is the maximum volume of non-rainfall dependent effluent you will discharge in a day? N/A cubic metres

3e What is the maximum rate of rainfall dependent discharge? TBC litres a second

3f For each answer in question 3, show how you worked out the figure on a separate sheet

Document reference Moderna Discharge Application Pack - Section 1.2

4 Intermittent sewage discharges

4a For each answer to 4b to 4o below, show how you worked out the figure on a separate sheet

Document reference Supporting Information Document Section 13

4b What is the total volume of the off-line/storm tank storage? cubic metres

4c What is the total volume of on-line storage? cubic metres

4d What is the pass forward flow at the settled storm overflow setting? litres a second

4e What is the pass forward flow at the storm overflow setting? litres a second

4f Is the discharge screened?

Yes ☐ Answer the relevant questions from 4g to 4j

No ☐ Now go to 4k

4g What is the mesh screen spacing? ⌊_____⌋ millimetres

4h What is the minimum screen capacity flow through the mesh screen? ⌊_____⌋ litres a second

4i What is the bar screen spacing? ⌊_____⌋ millimetres

4j What is the minimum screen capacity flow through the bar screen? ⌊_____⌋ litres a second

4k Is the overflow constructed to good engineering design?

Yes

No On a separate sheet explain what standards the overflow has been constructed to

Document reference ⌊_____⌋

4l What is the emergency storage capacity of the sewer and wet well? ⌊_____⌋ cubic metres

4m What is the storage time within the sewer and the wet well above the top water level at dry weather flow? ⌊_____⌋ hours and minutes

4n What is the pass forward flow at the pumping station? ⌊_____⌋ litres a second

4o For intermittent emergency overflows you must provide a document setting out the key protection measures you will provide

Document reference for pumping station key protection measures ⌊_____⌋

5 Should your discharge be made to the foul sewer?

Foul sewer means public or private foul sewer.

Before answering these questions, you must read the guidance notes to part B6.

You will also need to contact your sewerage undertaker (usually your local water company) and you may need to check if it is possible to connect to a private foul sewer.

5a How far away is the nearest foul sewer from the boundary of the premises? N/A metres

5b To assess whether it is reasonable to discharge your effluent into the foul sewer, please answer 5b1 or 5b2

5b1 Discharges from domestic properties

Multiply the number of properties served by the sewage treatment system by 30 metres.

Number of domestic properties served by the sewage treatment system metres [ ] × 30 metres = [ ] metres

5b2 Discharges from all other premises including trade effluent

Divide the volume of the discharge (in cubic metres) by 0.75 and then multiply this figure by 30 metres.

Volume of the discharge (answer to question 3b) [ ] cubic metres / 0.75 = [ ] × 30 = [ ] metres

Is your answer to question 5b1 or 5b2 above greater than the distance to the nearest foul sewer (answer to 5a)?

No ☐ You do not need to explain why you cannot discharge your effluent into the foul sewer at this point. However, we may request this information from you when we determine your application. Now go to question 6.

Yes ☐ You must explain on a separate sheet why you cannot discharge your effluent into the foul sewer, giving a reference for the extra sheet. Before you submit the application, you must explore the possibility of connecting to the foul sewer, and send us evidence that you have approached the sewerage undertaker, including their formal response regarding connection, if relevant. You must also show the extra cost of connecting to a sewer compared with the treatment system you propose, and details of any physical obstacles such as roads, railways, rivers or canals.

We will only agree to the use of private treatment systems within sewered areas if you can demonstrate that:

- the additional cost of connecting to the foul sewer would be unreasonable
- connection is not practically feasible, or
- the proposed private treatment system can be shown to significantly benefit the environment

We are unlikely to grant a permit for a discharge of treated domestic sewage in circumstances where a private sewerage system is being proposed due to a lack of capacity in the nearest public sewerage network.

The guidance notes to part B6 will help you understand what information you need to provide in order to answer this question.

Document reference for where you have given this justification [ ]

6 How will the effluent be treated?

6a Do you treat your effluent?

Yes ☐ Now go to question 6b

No ☑ You must explain why the effluent will not be treated

Document reference for where you have given this justification

6b Fill in Table 2 for each stage of the treatments carried out on your effluent in the order in which they are carried out

For installations with point source emission to water or sewer, there is no need to duplicate information already provided in part B3 form. Where this information is already provided, give the document reference and go to question 7.

Document reference: Supporting Information Document Section 9

Table 2 – Treatments carried out on your effluent

Order of treatment	Code number	Description
First		
Second		
Third		
Fourth		

Continue on a separate sheet if you need more rows. If you prefer, you can also send us an overall design for the whole treatment process.

Document reference

6c You must provide details on a separate sheet of the final effluent discharge quality that the overall treatment system is designed to achieve

Document reference

7 What will be in the effluent?

For all applications, whether to surface water, or onto or into ground, you should still check to see if your discharge is likely to contain any of the specific substances listed in the guidance documents on 'Risk assessment for treated sewage or trade effluent discharges to surface water or groundwater' (see https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit)

Answer the relevant questions for your discharge below.

7a Are any of the specific substances listed in 'Risk assessment for treated sewage or trade effluent discharges to surface water or groundwater' likely to enter the sewerage system upstream of the discharge through any authorised or known inputs?

Yes ☐

No ☐

7b Are any of the specific substances listed in 'Risk assessment for treated sewage or trade effluent discharges to surface water or groundwater' added to or present in the effluent as a result of the activities on the site?

Yes ☑

No ☐

7c Have any of the specific substances listed in 'Risk assessment for treated sewage or trade effluent discharges to surface water or groundwater' been detected in samples of the effluent or in the sewerage catchment upstream of the discharge?

Yes ☐

No ☑

7d Are there any other harmful or specific substances in your effluent not mentioned in 'Risk assessment for treated sewage or trade effluent discharges to surface water or groundwater'?

Yes ☐

No ☑

7e If you have answered 'No' to any of questions 7a to 7d provide details on a separate sheet of how you have established that the effluent is not likely to contain specific substances.

Document reference: Moderna Discharge Application Pack Section 1.4

7f What is the maximum temperature of your discharge?

N/A degrees Celsius

7g What is the maximum expected temperature change compared to the incoming water supply?

N/A increase in degrees Celsius

N/A decrease in degrees Celsius

8 Environmental risk assessments and modelling

You may need to carry out an environmental risk assessment or modelling to support your application. Please answer all the questions that are relevant to your discharge. If an environmental risk assessment or modelling is required, you must send it to us with your application.

8a Sewer modelling report (for discharges of final effluent from a water company WwTW or intermittent sewage discharges)

You must carry out sewer modelling following the guidance 'Surface water pollution risk assessment for your environmental permit' (see https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit). Send us details of how the modelling was carried out and the outcome.

Document reference for the sewer modelling report

8b Discharges to lakes, estuaries, coastal waters or bathing waters

You must carry out modelling following the guidance 'Surface water pollution risk assessment for your environmental permit' (see https://www.gov.uk/guidance/risk-assessments-for-your-environmental-permit). Send us details of how the modelling was carried out and the outcome.

Document reference for the modelling report

8c Discharges to freshwater (non-tidal) rivers

If the discharge contains, or potentially contains, any specific substances, you must carry out screening following the guidance (see https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit). The guidance notes on part B6 outline the information you must provide.

Have you answered yes to any of 7a to 7d?

Yes ☐ Send us the completed screening tool, along with the raw data used to create the summary statistics

Document reference for the screening tool and raw data

No ☐

8d Discharges to groundwater

You must carry out a groundwater quantitative risk assessment following the guidance in 'Groundwater risk assessment for your environmental permit' (see https://www.gov.uk/guidance/groundwater-risk-assessment-for-your-environmental-permit).

Send us details of how the modelling was carried out and the outcome.

For groundwater remediation schemes you must send us a site-specific remediation strategy that has been agreed with the local Environment Agency Groundwater and Contaminated Land Team.

Document reference for the groundwater remediation report

Moderna Discharge Application Pack Section 1.5

8e Discharges to freshwater (non-tidal) rivers from an installation, including discharges via sewer

If the discharge contains, or potentially contains, any specific substances, you must carry out screening following the guidance (see https://www.gov.uk/guidance/surface-water-pollution-risk-assessment-for-your-environmental-permit). The guidance notes on part B6 outline the information you must provide.

Have you answered yes to any of 7a to 7d?

Yes ☐ Send us the completed screening tool, along with the raw data used to create the summary statistics. Where the discharge is via sewer, include sewage treatment reduction factors in the calculations.

Document reference for the screening tool and raw data

There is no need to duplicate information already provided in part B3 form. Where this information is already provided, give the document reference above.

No ☐

8f Environmental impact assessment

Have you carried out an environmental impact assessment?

Yes ☐ Send us details of how the assessment was carried out and the outcome

Document reference for the environmental impact assessment

No ☑

9 Monitoring arrangements

Note: If your effluent has a maximum volume of no more than 50 cubic metres a day you do not need to complete question 9d or 9e.

9a What is the national grid reference of the inlet sampling point? (for example, SJ 12345 67890)

N/A

9b What is the national grid reference of the effluent sample point?

SU 48265 86616

9c Do you have an Urban Waste Water Treatment Directive final effluent sampling point?

Yes ☐ Please provide the national grid reference

No ☐

9d What is the national grid reference of the flow monitoring point?

SU 48265 86616

9e Does the flow monitor have an MCERTS certificate?

Yes ☑ Please give the certificate number

TBC - exact model yet to be specified

No ☐

9f Do you have a UV disinfection efficacy monitoring point?

Yes ☐ Please provide the national grid reference

No ☑

9g Do you have an event duration monitoring point(s)?

Yes ☐ Please provide the national grid reference

No ☐

9h You should clearly mark on the plan the locations of any of the above that apply to this effluent

Document reference for the plan

plan to be produced

9i Do you intend to do your own effluent monitoring?

Yes ☑

No ☐

10 Where will the effluent discharge to?

10a Mark in Table 3 where this effluent discharges to and fill in the relevant appendix or appendices.

You must use the name you gave to this effluent in answer to question 1b of this form when filling in your relevant appendix or appendices.

Table 3 – Where the effluent discharges to

Receiving environment		Relevant appendix
Borehole or well	☐	1
Into land (for example, through a drainage system)	☑	2
Onto land	☐	3
Tidal river, tidal stream, estuary or coastal waters	☐	4
Non-tidal river, stream or canal	☐	5
Lake or pond	☐	6

10b Is this effluent discharged through more than one outlet?

Yes ☐ Give details, on a separate sheet, of the circumstances under which each outlet would be used by this effluent

Document reference

No ☑

10c If you answered yes to question 10b above make sure you show clearly on your discharge point appendix or appendices and site plan that this one effluent can discharge to more than one discharge point.

You must give us all the details we need for each of the discharge points used by this effluent.

11 How to contact us

If you need help filling in this form, please contact the person who sent it to you or contact us as shown below.

General enquiries: 03708 506 506 (Monday to Friday, 8am to 6pm)

Textphone: 03702 422549 (Monday to Friday, 8am to 6pm)

Email: enquiries@environment-agency.gov.uk

Website: www.gov.uk/government/organisations/environment-agency

If you are happy with our service, please tell us. It helps us to identify good practice and encourages our staff. If you're not happy with our service, please tell us how we can improve it.

Please tell us if you need information in a different language or format (for example, in large print) so we can keep in touch with you more easily.

Feedback

(You don't have to answer this part of the form, but it will help us improve our forms if you do.)

We want to make our forms easy to fill in and our guidance notes easy to understand. Please use the space below to give us any comments you may have about this form or the guidance notes that came with it.

How long did it take you to fill in this form?

We will use your feedback to improve our forms and guidance notes, and to tell the Government how regulations could be made simpler.

Would you like a reply to your feedback?

Yes please ☐

No thank you ☐

Crystal Mark 19107 Clarity approved by Plain English Campaign

For Environment Agency use only

Date received (DD/MM/YYYY)

Payment received?

No ☐

Yes ☐ Amount received

Our reference number

£

Plain English Campaign's Crystal Mark does not apply to appendices 1 to 6.

Appendix 1 – Discharges to a borehole or well (or other deep structure)

If you are discharging the effluent to a borehole or well or other deep structure (such as concrete rings, natural swallow hole or deep soakage pit) you must ensure that the discharge is indirect to groundwater. Direct discharges to groundwater cannot be permitted. We will undertake a groundwater quantitative risk assessment on your behalf in line with the guidance 'Groundwater risk assessment for your environmental permit' (see https://www.gov.uk/guidance/groundwater-risk-assessment-for-your-environmental-permit)

For us to do this you must answer the following questions relevant to your application and provide us with additional information as summarised in Table 4.

Without this information we will be unable to complete the risk assessment and it is likely your application will be rejected.

Answer all the questions below. Use a separate line for each effluent if more than one effluent discharges using this discharge point. Remember, when linking your effluent to a discharge point you must use the name you gave to your effluent in answer to question 1b in the effluent form.

1.1 Give the discharge point a unique name

For example, 'Outlet 1' (you must use this name to identify the discharge point on the plan) ⌊_____⌋

1.2 Give the national grid reference of the discharge point ⌊_____⌋

1.3 Is the discharge to ground via a

Well ☐

Borehole ☐

Other deep structure ☐ Please give details (e.g. concrete ring structure, shaft, natural swallow hole, soakage pit etc.)

1.4 What is the diameter of the borehole, well or other deep structure that the effluent will be discharged into? ⌊_____⌋ metres

1.5 Is the borehole, well or other structure already constructed?

Yes ☐ Now answer questions 1.6 to 1.9

No ☐ Now answer questions 1.10 to 1.12

Appendix 1 – Discharges to a borehole or well (or other deep structure) continued

Existing borehole, well or other deep structure

1.6 What is the total depth to the bottom of the existing well, borehole or other structure? _____ metres below ground level

If you are unaware of the actual depth please estimate the depth based on the following categories:

- 0–5 metres ☐
- 5–10 metres ☐
- Greater than 10 metres ☐
- Uncertain ☐

What evidence is the estimated depth above based on? _____

1.7 Does the well, borehole or other structure extend into groundwater?

- Yes – always contains water ☐
- Sometimes – water is present occasionally ☐
- No – never contains water ☐

If groundwater is always, or sometimes, present, what is the highest level that the standing water reaches?

- Measured ☐ _____ metres below ground level
- Estimated ☐ _____ metres below ground level

1.8 Please provide any records, diagrams or borehole logs you may have that could help us understand:

- the method of construction (including any solid casings or linings used)
- the likely depth of the deep structure
- the local groundwater conditions

Please provide photocopies where possible. If it is not possible (for example, if the documents are large or bulky) please summarise any additional information you have on a separate sheet.

Document reference for the records, diagrams or borehole logs _____

1.9 If any maintenance has been carried out on your well, borehole or other deep structure (for example, to aid effective drainage), please give details below

Please now answer question 1.13

Appendix 1 – Discharges to a borehole or well (or other deep structure), continued

Proposed borehole, well or other deep structure that has not yet been constructed

1.10 Please tell us why you are unable to install a shallow engineered drainage system. This information forms an important part of our permit determination process. Which methods of shallow disposal have you considered, and why did you decide these were not feasible to take forward? Please answer questions 1.10a and 1.10b to provide the results of soakage tests and summarise in the box any relevant information supporting your decisions (for example, permission refusals from landowners or physical constraints, or land availability or proximity to buildings).

1.10a What was your percolation value (Vp) result? ⌊_____⌋ seconds per millimetre

You must show in Table 4 how you worked out the percolation value.

Table 4 – Percolation value

	Trial 1	Trial 2	Trial 3	Average
Hole 1				
Hole 2				
Hole 3				
Hole 4				

1.10b If a shallow engineered drainage system were feasible, what would be the required surface area of your infiltration system? ⌊_____⌋ square metres

Supporting information to explain why you are unable to install a shallow engineered drainage system can be appended to your application.

Document reference for these details ⌊_____⌋

1.11 Please tell us the type of deep structure (for example, borehole, well, deep soakage pit) you propose to install

What will the total depth be? ⌊_____⌋ metres below ground level

Appendix 1 – Discharges to a borehole or well (or other deep structure) continued

1.12 Please tell us the reason this depth has been selected and, if you are aware of any relevant existing information on local water levels, please also tell us the depth to groundwater (in metres below ground level). What measures will you undertake to ensure the discharge is not direct into groundwater? If the discharge will be direct to groundwater explain why you cannot make it indirect. Direct discharges to groundwater cannot be permitted.

Proximity of your discharge to other receptors

1.13 Is the borehole, well or other deep structure where the discharge is being/will be made within 50 metres of any other well, spring or borehole used to supply water for drinking water or food production purposes?

Yes ☐ Please show the location of the well, spring or borehole you identified in answer to question 1.13 on the plan you have provided for section 4 of the main application form. Please now answer question 1.14

No ☐ Please now answer question 1.15

1.14 Please tell us about the water supply (or supplies) used for drinking water or food production purposes identified in question 1.13 above; for example, the name of the property or properties served by the water supply, what they use the water for (drinking water, food production) and where they are in relation to your discharge

Appendix 1 – Discharges to a borehole or well (or other deep structure) continued

1.15 What is the distance to the nearest watercourse

(for example, surface water, river, stream or ditch)? |_____| metres

Please tell us whether you have considered discharging to surface water and why this is not feasible

In Table 5 please provide any further information required for us to complete a groundwater quantitative risk assessment on your behalf in line with the guidance 'Groundwater risk assessment for your environmental permit' at

https://www.gov.uk/guidance/groundwater-risk-assessment-for-your-environmental-permit. Without this information we will be unable to carry out a hydrogeological risk assessment on your behalf.

Table 5 summarises the information required to allow us to undertake a hydrogeological risk assessment of your discharge to a deep infiltration system. Without this information your application will be rejected. You will already have provided some of this information earlier in this application form. **We also need you to provide additional information indicated by a tick (✔) in Table 5**. For further guidance on the additional information required see https://www.gov.uk/guidance/groundwater-risk-assessment-for-your-environmental-permit and the guidance notes on part B6. You may require the advice of an environmental consultant to collate this information.

For some of the risk assessment inputs we are better placed to provide the information and will do so for those parameters indicated by an asterisk (*) as far as possible. However, if you wish to provide site-specific information for those parameters with an asterisk you are welcome to do so.

Table 5 – Further information required for the Environment Agency to complete a groundwater quantitative risk assessment on your behalf

Information	Description	Existing structure	Proposed structure	Information supplied?
Information supplied by the applicant This has already been requested earlier in the application form				Information you have already supplied on the application form
National grid reference of the discharge point		Appendix 1 Q2	Appendix 1 Q2	
Volume of effluent (m^3 per day)		Q3b	Q3b	
Type of effluent treatment	Septic tank, package treatment plant, other	Q6	Q6	
Type of deep infiltration system	Borehole, well, concrete ring structure, other	Appendix 1 Q3	Appendix 1 Q3	
Diameter of deep infiltration system (metres)		Appendix 1 Q4	Appendix 1 Q4	
Depth to the base of deep infiltration structure (metres)		Appendix 1 Q6	Appendix 1 Q11	
Depth to water table (metres)	Is discharge above or below water table?	Appendix 1 Q7, Q8	Appendix 1 Q12	
Justification for a deep infiltration system	Why are you unable to install a shallow infiltration system? What other options for disposal have been considered? Provide full details of the infiltration tests undertaken plus results	Appendix 1 Q8 if available	Appendix 1 Q10	
Information supplied by the applicant This is additional information we need from you that is not provided elsewhere on the application form. Site data should be given where it is already available. If not, you can submit the relevant literature values quoting the source of the data and justification of the values you have selected. Please tick the right-hand column to confirm you have provided this essential information.				

Appendix 1 – Discharges to a borehole or well (or other deep structure) continued

Information	Description	Existing structure	Proposed structure	Information supplied?
Concentration of relevant substances entering the infiltration system	For discharges of domestic effluent we will routinely assess the concentration of nitrogen species, particularly the ammonium concentration	✓	✓	☐
Length of screened borehole section below the water table (metres)	Depth in metres of the borehole screened section that is below the water table (This applies only to boreholes that have groundwater in the base)	✓	✓	☐
Calculated area of infiltration system (square metres)	Explain how the area of the infiltration system has been calculated – this is especially relevant if a non-circular system is used	✓	✓	☐
Unsaturated zone parameters	The following represent the strata above the water table: • hydraulic conductivity (metres per day) • water-filled porosity (per cent) • bulk density (grammes per cubic centimetre)	✓	✓	☐
Saturated zone parameters	The following represent the strata below the water table: hydraulic conductivity (metres per day) water-filled porosity (per cent) bulk density (grammes per cubic centimetre) hydraulic gradient of the water table (fraction)	✓	✓	☐
Information provided by the Environment Agency where possible You are free to provide this information if you wish, or in some specific cases we may need to ask for this at a later stage. Please tick if you have provided this information (optional).				

Appendix 1 – Discharges to a borehole or well (or other deep structure) continued

Information	Description	Existing structure	Proposed structure	Information supplied?
Environmental standard	The relevant environmental standard or compliance value against which we will assess your effluent discharge	*	*	☐
Half-life for degradation of the substance (days)	If you wish to know more about these parameters see 'Groundwater risk assessment for your environmental permit' at https://www.gov.uk/guidance/groundwater-risk-assessment-for-your-environmental-permit	*	*	☐
Soil water partition coefficient (litres per kilogramme)		*	*	☐
Mixing zone thickness (metres)		*	*	☐
Distance to compliance point (metres)		*	*	☐

Appendix 2 – Discharges into land

Answer the questions below. Use a separate line for each effluent if more than one effluent discharges using this discharge point. Remember, when linking your effluent to a discharge point you must use the name you gave to your effluent in answer to question 1b in the effluent form.

2.1 Give the discharge point a unique name

For example, 'Outlet 1' (you must use this name to identify the discharge point on the plan) W1

2.2 Give the national grid reference of the discharge point SU 48265 86616

2.3 Is your infiltration system new or existing?

New ☑ Now go to question 2.5

Existing ☐ Now go to question 2.4

2.4a When was it built? _____ (DD/MM/YYYY)

2.4b Now answer questions 2.5–2.8 if you are able to, if not leave them blank and go to question 2.9

2.5 Is your infiltration system designed and built to British Standard 6297:2007 + A1:2008 or the British Standards in force at the time of installation?

Yes ☐

No ☐ Please provide details, on a separate sheet, of the design criteria used for your infiltration system

Document reference _____

2.6 On what date did you carry out a percolation test and dig a trial hole in line with British Standard 6297:2007 + A1:2008? TBC (DD/MM/YYYY)

2.7 What is your percolation value (Vp) result? TBC seconds per millimetre

You must show in Table 6 how you worked out the percolation value. Please also provide your test sheets and any field notes or observations made regarding ground conditions.

Table 6 – Percolation value

	Trial 1	Trial 2	Trial 3	Average
Hole 1	TBC			
Hole 2				
Hole 3				
Hole 4				

2.8 Please show us how you have calculated the area (A) of your infiltration system

p TBC × Vp = _____ × 0.25 for septic tanks = A _____ square metres

or

p _____ × Vp = _____ × 0.20 for package treatment plants = A _____ square metres

p Population based on maximum occupancy Vp Percolation value in seconds/mm

Appendix 2 – Discharges into land, continued

2.9 If known, mark on the plan you have provided the extent of the infiltration system. Please write on the plan the length and width of the sides in metres.

2.10 Is any part of your infiltration system within 50 metres of a well, spring or borehole?

No ☑

Yes ☐ Identify the location of the well, spring or borehole on the plan you have provided and answer question 2.11

2.11 Is the well, spring or borehole you have identified used to supply water?

No ☑

Yes ☐ You must describe what the water supplied is used for

2.12 Is any part of your infiltration system within 10 metres of a watercourse?

No ☑

Yes ☐ Identify the location of the watercourse on the plan you have provided for section 4 of part B2

Appendix 3 – Discharges onto land

Answer all the questions below. Use a separate line for each effluent if more than one effluent discharges using this discharge point. Remember, when linking your effluent to a discharge point you must use the name you gave to your effluent in answer to question 1b in the effluent form.

3.1 Give the discharge point a unique name
For example, 'Outlet 1' (you must use this name to identify the discharge point on the plan) ⌊_____⌋

3.2 Give the national grid reference of the discharge point ⌊_____⌋

3.3 Select from the table below the type of area where the effluent is disposed of

Area type		
Unlined reed bed	☐	
Unlined grass plot	☐	
Unlined wetland	☐	
Other	☐	Please specify below

3.4 What is the surface area of the land used for your disposal? ⌊_____⌋ square metres

3.5 Is any part of your infiltration system within 50 metres of a well, spring or borehole?

No ☐

Yes ☐ Identify the location of the well, spring or borehole on the plan you have provided and answer question 3.6

3.6 Is the well, spring or borehole you have identified used to supply water?

No ☐

Yes ☐ You must describe what the water supplied is used for

3.7 Is any part of your infiltration system within 10 metres of a watercourse?

No ☐

Yes ☐ Identify the location of the watercourse on the plan you have provided for section 4 of part B2

Appendix 4 – Discharges to tidal river, tidal stream, estuary or coastal waters

Answer all the questions below. Use a separate line for each effluent if more than one effluent discharges using this discharge point. Remember, when linking your effluent to a discharge point you must use the name you gave to your effluent in answer to question 1b in the effluent form.

4.1 Give the discharge point a unique name
For example, 'Outlet 1' (you must use this name to identify the discharge point on the plan)

4.2 Give the national grid reference of the discharge point

4.3 Give the name of the tidal river, tidal stream, estuary or area of coastal water if you know it

4.4 Is the discharge into a

- Tidal river ☐
- Tidal stream ☐
- An estuary ☐
- Coastal water ☐

4.5 Does the discharge reach the watercourse by flowing through a surface water sewer?

Yes ☐ Give the national grid reference where the discharge enters the surface water sewer

No ☐

4.6 Is the discharge point above the mean low water spring tide mark?

Yes ☐ Please explain, on a separate sheet, why the discharge cannot be made below this point

Document reference

No ☐

4.7 How is the effluent dispersed?

For example, open pipe or diffuser system

If diffuser system go to question 4.8

4.8 Give details, on a separate sheet, of the design of the diffuser system

Document reference

4.9 Is the discharge made to a roadside drain or ditch?

No ☐

Yes ☐ If yes, it is your responsibility to ascertain whether the relevant highways authority is responsible for the roadside drain or ditch. If it is, you need to secure the appropriate permissions from the relevant highways authority before submitting an application for an environmental permit to the Environment Agency. A copy of the written permission from the relevant highways authority must be submitted with the environmental permit application.

Document reference for the written permission from the relevant highways authority

Appendix 5 – Discharges to non-tidal river, stream or canal

Answer all the questions below. Use a separate line for each effluent if more than one effluent discharges using this discharge point. Remember, when linking your effluent to a discharge point you must use the name you gave to your effluent in answer to question 1b in the effluent form.

5.1 Give the discharge point a unique name
For example, 'Outlet 1' (you must use this name to identify the discharge point on the plan) _____

5.2 Give the national grid reference of the discharge point _____

5.3 Give the name of the watercourse, canal or the main watercourse it is a tributary of if you know it _____

5.4 Is the discharge into a

Non-tidal river ☐

Stream ☐

Canal ☐

5.5 Does the discharge reach the watercourse or canal by flowing through a surface water sewer?

Yes ☐ Give the national grid reference where the discharge enters the surface water sewer _____

No ☐

5.6 Does the watercourse dry up for part of the year?

No ☐

Yes ☐ How many months per year is the watercourse dry? _____

Do you agree to install perforated pipe work before the discharge point?

The discharge must be made via a perforated pipe. Any section of that pipe which lies within 10 metres of the bank of any watercourse shall be perforated, but this perforated section shall not extend more than 10 metres from the bank of any watercourse.

Yes

No

5.61. If the watercourse does dry up for part of the year can you indicate a typical period when the surface water runs dry each year – start and finish (in months)

Watercourse typically becomes dry in:

January	May	September
February	June	October
March	July	November
April	August	December

Watercourse typically flows again in:

January	May	September
February	June	October
March	July	November
April	August	December

Appendix 5 – Discharges to non-tidal river, stream or canal, continued

5.6.2 If the watercourse does dry up for part of the year, how many metres downstream of the discharge is it before the discharged effluent soaks in?

5.7 Is the discharge made to a roadside drain or ditch?

No ☐

Yes ☐ If yes, it is your responsibility to ascertain whether the relevant highways authority is responsible for the roadside drain or ditch. If it is, you need to secure the appropriate permissions from the relevant highways authority before submitting an application for an environmental permit to the Environment Agency. A copy of the written permission from the relevant highways authority must be submitted with the environmental permit application.

Document reference for the written permission from the relevant highways authority

Appendix 6 – Discharges to a lake or pond

Answer all the questions below. Use a separate line for each effluent if more than one effluent discharges using this discharge point. Remember, when linking your effluent to a discharge point you must use the name you gave to your effluent in answer to question 1b in the effluent form.

6.1 Give the discharge point a unique name
For example, 'Outlet 1' (you must use this name to identify the discharge point on the plan) tbc

6.2 Give the national grid reference of the discharge point tbc

6.3 Give the name of the lake or pond if you know it attenuation pond

6.4 Select from the following table the type of lake or pond you will be discharging to and answer the relevant questions

Type of lake or pond		Relevant questions
Lake or pond which is not connected to a river or watercourse	☑	Permit not required*
Lake or pond which is not connected to a river or watercourse, where you have had a notice served under paragraph 5 of Schedule 21 of the Environmental Permitting (England and Wales) Regulations 2016	☐	6.5, 6.6, 6.7
Lake or pond that discharges into a river or watercourse	☐	6.5, 6.6, 6.7

* Unless a Notice has been served under paragraph 5 of Schedule 21 of the Environmental Permitting (England and Wales) Regulations 2016

6.5 What is the surface area of the lake or pond? _____ square metres

6.6 What is the maximum depth of the lake or pond? _____ metres

6.7 What is the average depth of the lake or pond? _____ metres