Digital Netherlands VII B.V. (Netherlands)

INXN DUB15/16

Air Quality and Climate Impact Assessment Report

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1 Introduction

1.1 General

Arup has been commissioned by Digital Netherlands VII B.V. (Netherlands) company, to carry out an air quality and climate impact assessment for the expansion of their data centre facilities on their site in Profile Business Park, Nangor Road, Dublin 22 ('the proposed development'). The site of the proposed development is illustrated in **Figure 1**.

This Air Quality and Climate Impact Assessment Report accompanies the Planning Application Report for the proposed development.

This report assesses the impact of potential emissions from the construction and operation of the proposed development on air quality against Irish and EU standards. In addition, the potential air quality impact due to the predicted change in traffic volumes due to the proposed development is considered.

This report also assesses the potential impact of the proposed development on carbon emissions (greenhouse gases).

Figure 1: Proposed Site Location

1.2 Study Area

The site is located in the Profile Business Park, Nangor Road, Dublin 22.

The north-west part of the site is already occupied by 2 no. data centres. The south-west part of the site is a former construction compound for the existing data

centres. The site is subdivided in half by an internal access road. The site area located to the east of the access road is a greenfield site, bordered by a ditch and hedgerow along the west boundary.

The site is adjoined by the agricultural land to the south. To north and west, the site is adjoined by vacant business park sites. Further to the south there is Baldonnel Casement Aerodrome, approximately 200m from the site boundary. The Oldcastlepark housing estate is located approximately 1km north-east of the proposed development, on the opposite side of the R134.

There is public golf course (Grange Castle Golf Course) to the east, behind a hedge, approximately 10-20m from the site boundary. The next closest sensitive receptor is a residential dwelling and farm located approximately 71m from the site of the proposed development. There are other residential developments in proximity to the proposed development including -

- 225m south-west of the proposed development;
- 459m south-west of the proposed development
- 830m south west of the proposed development;
- 730m west of the proposed development; and
- 893m west of the proposed development.

1.3 Description of the Proposed Development

Digital Netherlands VII B.V. (Netherlands)company, is planning to expand their data centre facilities at Profile Business Park, Co. Dublin. Part of the site is already occupied by the DUB13 and DUB14 DLR data centres.

The proposed development will consist of the removal of an existing unused wastewater treatment facility on site and the erection of two data centre buildings, gas powered energy generation compound, and all other associated ancillary buildings and works. The two data centre buildings, DUB 15 and DUB 16, will comprise a total floor area of c. 33,577m^2 over two storeys. The first two storey data centre building (DUB15), located to the south west of the site, will comprise 16,865m^2 data storage use, ancillary office use and associated electrical and mechanical plant rooms, loading bays, maintenance and storage space. A second two storey data centre building (DUB16), located to the south east of the site, will comprise 16,712m^2 data storage areas, ancillary office use and associated electrical and mechanical plant rooms, loading bays, maintenance and storage space. Both data centre buildings will reach a height of 20m.

Emergency generators and associated emission flues and plant are proposed in compounds adjacent to each data centre building. Gas powered energy generation is proposed to the north east corner of the site to provide electricity for the proposed development. The application proposes to re-route and widen an existing watercourse constructed following an earlier planning permission.
It is proposed to reroute this watercourse along the eastern and southern boundary of the site. Landscaping is proposed to the south of the site to screen the buildings.

Fencing and security gates are proposed around the site. New access roads within the site are proposed along with 71 car parking spaces and 26 cycle spaces, bin stores, site lighting, and all associated works including underground foul and storm water drainage attenuation and utility cables and all other ancillary works.

2 Methodology

2.1 Air Quality Standards

In order to reduce the risk to human health and the environment due to poor air quality, national and European statutory bodies have set limit values for a range of air pollutants in ambient air. These limit values or Air Quality Standards (AQS) are defined for the protection of human health and ecosystems.

The Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011) transpose EU Directive 2008/50/EC into Irish law.

The purpose of the 2011 regulations is to establish limit values and alert thresholds for concentrations of certain pollutants, to provide for the assessment of certain pollutants using methods and criteria common to other European Member States, to ensure that adequate information on certain pollutant concentrations is obtained and made publicly available and to provide for the maintenance and improvement of ambient air quality where necessary.

The limit values established under the regulations, as relevant to the proposed development are included in **Table 1**.

Table 1: Air Quality Standards (AQS) from S.I. No. 180 of 2011

Pollutant	Limit value for the protection of:	Averaging period	Limit value ($\mu g/m^3$)	Basis of application of limit value	Limit value attainment date
NO_2	Human Health	1-hour	200	⩽18 exceedances p.a. (99.79 %ile)	1 January 2010
		Calendar year	40	Annual mean	1 January 2010
PM_{10}	Human Health	24-hours	50	⩽35 exceedances p.a. (90%ile)	1 January 2005
		Calendar year	40	Annual mean	1 January 2005
SO_2	Human Health	One-hour	350	⩽24 exceedances p.a. (99%ile)	1 January 2020
	Human Health	24 hours	125	⩽3 exceedances p.a. (90.41 %ile)	1 January 2020
CO	Human Health	8 hours	10,000	Not to be exceeded	1 January 2005

2.2 Construction Phase Methodology

As stated in the Transport Infrastructure Ireland, TII, (formerly National Roads Authority (NRA)) document 'Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes', 2011 it is "very difficult to accurately quantify dust emissions arising from construction activities".

'*A semi quantitative approach is recommended to determine the likelihood of a significant impact, which should be combined with an assessment of the proposed mitigation measures*'. The semi-quantitative assessment methodology outlined in

Table 2 is used to assess the impact of dust during the construction phase. This approach considers sensitive receptors in the vicinity of the construction site.

The TII guidance defines sensitive receptors as locations including residential housing, schools, hospitals, places of worship, sport centres and shopping areas, i.e. locations where members of the public are likely to be regularly present.

The guidance states that dust emissions from construction sites can lead impacts at nearby properties.

The assessment criteria, taken from the TII guidance, are outlined in **Table 2**.

Table 2: Assessment criteria for the impact of dust emissions from construction activities with standard mitigation in place

Source		Potential distance for Significant Effects (Distance from Source)		
Scale	**Description**	**Soiling**	**PM_{10}***	**Vegetation Effects**
Major	Large construction sites, with high use of haul routes	100m	25m	25m
Moderate	Moderate sized construction sites, with moderate use of haul routes	50m	15m	15m
Minor	Minor construction sites, with limited use of haul routes	25m	10m	10m

*Significance based on the PM_{10} Limit Values specified in SI No. 180 of 2011, which allows 35 daily exceedances/year of 50 $\mu g/m^3$

The impact of dust emissions during the construction phase is assessed by estimating the area over which there is a risk of significant impacts, in line with the TII guidance.

In accordance with TII guidance, emissions from construction vehicles are assessed where construction traffic results in a significant (>10%) increase in AADT (annual average daily traffic) flows near sensitive receptors.

2.3 Operational Phase Methodology

2.3.1 Introduction

The assessment of the impact of the proposed development on air quality and climate has been prepared having regard to the Environmental Protection Agency (EPA) Guidelines on the Information to be contained in Environmental Impact Assessment Reports, Draft, August 2017.

2.3.2 Dispersion Modelling Methodology

2.3.2.1 Introduction

The air dispersion modelling study has been carried out having regard to the EPA Air Dispersion Modelling from Industrial Installations Guidance Note (AG4). The USEPA approved Breeze AERMOD computer package (Version 18081) was used to predict the effect of emissions on ambient air quality.

Two modelling scenarios were examined in this assessment:

1. **Scenario 1: Testing of diesel generators with continuous operation of Gas Generators**
    - 5 No. gas generators (energy centre) operating concurrently and continuously with the testing of one standby diesel generator. Each diesel generator will be tested one at a time for one hour, once a month.
2. **Scenario 2: Emergency mode:**
    - 32 No. diesel generators (standby) running concurrently and continuously. The gas generators (energy centre) is not operational in this scenario.

It should be noted that this emergency situation is highly unlikely to occur as it will only arise in the event of a breakdown in the supply of power to the site.

The continuous operation of the gas generators is only expected to occur between 2023 and 2025 (from 2025 it is expected that the proposed development will be powered by the national electricity grid). Therefore, from 2025 onwards only emissions from the diesel generators will take place on site.

Breeze AERMOD is a computer model that predicts the ground level concentration due to pollutant emissions from specified sources. The model requires information on:

- Neighbouring buildings;
- Receptor locations;
- Meteorological conditions;
- Conversion of NO_x to NO_2;
- Emission data.

The model was used to predict ground level concentrations over 1-hour, 8-hour 24-hour and annual averaging period and relevant percentiles.

An assessment of cumulative ground level concentrations including the effect of emissions from neighbouring facilities is also carried out.

2.3.2.2 Neighbouring Buildings

The length, width and height of buildings in the vicinity of the sources were taken into account in modelling. Building data was taken from information supplied by

Digital Realty for the proposed development. AERMOD includes a software utility called BPIP to calculate direction-specific building downwash factors using the relative positions and dimensions of sources and neighbouring buildings.

2.3.2.3 Receptor Locations

Two nested, Cartesian receptor grids were used, centred on the proposed development, as in previous assessments. One has receptors covering a 10km by 10km area at 500m intervals. The other has receptors covering a 2km by 2km area at 100m intervals. Elevations were taken from Ordnance Survey mapping.

2.3.2.4 Meteorological Data

Meteorological data from Met Éireann's synoptic station at Casement Aerodrome, the nearest weather station from the proposed development (approximately 200m) was used for 2016 to 2020 inclusive. The meteorological data includes hourly values for wind speed, wind direction, atmospheric stability, ambient temperature and mixing height.

2.3.2.5 Conversion of NO_x to NO_2

The EPA Guidance AG4 advises that detailed modelling of NO_2/NO_x chemistry should use the Plume Volume Molar Ratio Method (PVMRM) in AERMOD. This method takes account of the complex and reversible chemical reactions between the oxides of nitrogen, oxygen and ozone. The PVMRM uses both plume size and ozone (O_3) concentration to derive the amount of O_3 available for the reaction between NO and O_3. For a given NO_x emission rate and ambient ozone concentration, the NO_2/NO_x conversion ratio is primarily controlled by the volume of the plume. This method has been shown to give better agreement with monitoring data.

For the PVMRM calculation, the following assumptions are made, as advised by EPA guidance:

- Background ozone is 49.6µg/m^3 (average of Zone A monitoring from EPA long term data).
- NO_2/NO_x equilibrium ratio = 0.90.
- NO_2/NO_x in-stack ratio = 0.10.

2.3.2.6 Emergency Generator Assessment

In order to assess the impact of the emergency operation of eight generators, the EPAs Air Dispersion Modelling from Industrial Installations Guidance Note (AG4), 2020 has been used. The methodology allows for the factoring down of emission rates due to the unlikely event of both; the emergency phase occurring, and the emergency phase occurring during the worst-case meteorological conditions.

The EPA Guidance describes an approach for the *Air Dispersion Modelling of Emergency Generators*. This methodology follows the USEPA guidance – which is based on reduced emission rates allowing for the unlikely emergency scenario, and UKEA guidance – which predicts the estimated number of hours before an exceedance of the 1-hr limit would occur, based on a 95% confidence interval. For due diligence purposes only the USEPA Guidance has been followed.

In accordance with the Guidance, when assessing a development with a large number of emergency generators, the modeller shall consider the following:

EPA Guidance suggest that for emergency operations, an average hourly emission rate should be used rather than the maximum hourly rate. The guidance suggests that the modelling analysis be based on assuming continuous operation at the average hourly rate.

A worst-case assumption was made that the generators would operate for up to 100 hours per year. As outlined in the USEPA guidance maximum hourly emission rates were reduced by 100/8760 to generate an hourly average emission rate for which the generators are run over a full year. This approach accounts for the worst-case meteorological conditions by assuming continuous operations of the generators while the reduced emission rates account for the low probability that the emergency generators would actually be operating in a given hour.

2.3.3 Emission data

As outlined in Section 3.3.2, two modelling scenarios were considered in this assessment:

- Scenario 1: testing of diesel generators with continuous operation of gas generators.
- Scenario 2: Emergency mode.

The emission data for Scenario 1 and Scenario 2 are provided in

Table 3 and **Table 4**, respectively.

According to Directive 2015/2193/EU the main pollutants of concern for gas generators are NO_x and CO, therefore SO_2 and Particulate Matter were not modelled for Scenario 1. These pollutants are not of concern as the diesel generators will be tested only one at a time for limited hours per year.

The air quality standard for NOx relates to the protection of vegetation, however there are no ecological sensitive sites in proximity to the proposed development. In addition, the NOx limit is applicable only in highly rural areas away from major sources of NOx, such as large conurbations, factories and high road vehicle activity.

2.3.3.1 Scenario 1

It is assumed that one diesel generator will be in operation during the testing phase for up to 40 hours per month (during normal workings hours), with the energy centre gas generators operating continuously. This is a worst-case

assessment, as generators will only be tested for 32 hours per month, i.e. each generator tested for one hour per month. The emission data outlined in

Table 3 presents emission concentrations proposed by the design team (at 15% oxygen in accordance with the Industrial Emissions Directive 2010/75/EU).

Table 3: Emission data- Scenario 1

Generators	Diesel Generator (Standby) x 1	Gas Generators (Energy Centre) x 5
Height (m)	20	20
Diameter (m)	0.51	0.71
Velocity (m/s)	35	17.2
Flow rate (m^3/hr)	25,500	24,444
Temperature (°C)	608	423
Normalised flow rate (Nm^3/hr)	7,902	9,588
NOx concentration (mg/Nm^3)	1,176	100
NO_x emission rate (g/s)	2.58	0.27
CO concentration (mg/Nm^3)	36	100
CO emission rate (g/s)	0.08	0.27

2.3.3.2 Scenario 2

As detailed in **Section 2.3.2.2**, it is not envisaged that the emergency generators will be in operation for more than 100 hours per year in an emergency scenario. As such, continuous operations of the generators has been assumed with the concentrations provided by the Design Team at reduced emission rates, to account for the low probability of the generator actually running in a given hour.

Table 4: Emission data- Scenario 2

Generators	Diesel Generator (Standby) x 32
Height (m)	20
Diameter (m)	0.51
Velocity (m/s)	35
Flow rate (m^3/hr)	25,500
Temperature (°C)	608
Normalised flow rate (Nm^3/hr)	7,902
NOx concentration (mg/Nm^3)	1,176
NO_x emission rate (g/s)	2.58
Factored NOx emission rate (g/s)	0.029
CO concentration (mg/Nm^3)	36
CO emission rate (g/s)	0.08
Factored CO emission rate (g/s)	0.001

Generators	Diesel Generator (Standby) x 32
SO_2 emission rate (g/s)	0.03
Factored SO_2 emission rate (g/s)	0.0003
PM_{10} emission rate (g/s)	0.003
Factored PM_{10} emission rate (g/s)	0.00003

2.3.4 Traffic Assessment Methodology

The TII Guidelines advise that an air quality impact assessment should be completed on road links where a greater than 5% change in flows occurs during the operational phase and 10% during the construction phase.

As outlined in the Traffic and Transportation Impact Assessment Report, Arup 2021, prepared for the proposed development, no roads are predicted to experience increases of greater than 5% during the operational phase and 10% during the construction phase. Therefore, traffic impacts are not considered further.

2.3.5 Climate Assessment Methodology

2.3.5.1 Ireland's Climatic Obligations

The Government of Ireland's *Climate Action Plan*[1] was published in 2019. It commits to achieving a net zero carbon energy systems objective for Ireland. The plan sets out a detailed sectoral roadmap to deliver a cumulative reduction in emissions.

The *Climate Action and Low Carbon Development (Amendment) Bill 2021*[2] has been approved by Government and will amend the Climate Action and Low Carbon Development Act 2015. The Bill sets out the national objective of transitioning to a low carbon, climate resilient and environmentally sustainable economy in the period up to 2050. The Bill commits us, in law, to move to a climate resilient and climate neutral economy by 2050.

In October 2014, the European Council reached political agreement on headline greenhouse gas emissions reduction targets in the context of the *2030 Climate and Energy Framework*[3]. An overall EU reduction of at least 40% in greenhouse gas emissions by 2030 compared to 1990 levels is to be delivered collectively by the EU.

Ireland's 2030 target is to achieve a 30% reduction of non-Emissions Trading Scheme sector emissions on 2005 levels with annual binding limits set for each year over the period 2021-2030.

This climate impact assessment seeks to determine the potential impact of greenhouse gas emissions (Mt CO_2 eq.) predicted due to the proposed

[1] Climate Action Plan, Government of Ireland 2019
[2] Climate Action and Low Carbon Development (Amendment) Bill 2021.
[3] European Commission, 2013. 2030 Climate & Energy Framework

development, relative to Ireland's projected baseline for 2023 as reported by the EPA.

2.3.5.2 The EU Emissions Trading System (ETS)

The EU emissions trading system was launched in 2005 as the world's first international company-level 'cap-and trade' system for reducing emissions of greenhouse gases cost-effectively.

The EU ETS is implemented in Ireland under *S.I. 490 of 2012*[4] and amendments and *S.I. No. 261 of 2010* and amendments. The legislative framework of the EU ETS was revised in 2018 to enable it to achieve the EU's 2030 emission reduction targets in line with the *2030 Climate And Energy Policy Framework3* and as part of the EU's contribution to the *2015 Paris Agreement*[5].

2.3.5.3 Carbon

The construction phase emissions are considered qualitatively in terms of contribution to EU targets outlined in **Section 2.3.5.2**.

The Sustainable Energy Authority of Ireland (SEAI) provides emission factors for carbon dioxide per unit energy for specific fuels. A value of 204.7g CO_2/kWh is provided for natural gas (2020)[6]. This value is based on the current national portfolio.

[4] Irish Statute Book. 2012. EC Greenhouse Gas Emissions Trading Regulations
[5] Paris Agreement, 2015. https://ec.europa.eu/clima/policies/international/negotiations/paris_en
[6] https://www.seai.ie/data-and-insights/seai-statistics/conversion-factors/

3 Existing Environment

3.1 Air Quality

3.1.1 Background Concentrations

S.I. No. 180 of 2011 established a zoning system for areas of Ireland for air quality purposes.

The proposed development site falls within Zone A, as defined under S.I. No. 180 of 2011. Background levels from 2017-2019 air quality monitoring in suburban Zone A locations (as the development is located in a suburban area), as provided by the relevant EPA Air Quality in Ireland reports, are presented in **Table 5**.

Table 5: EPA Monitoring Results for Zone A

Pollutant	Annual Mean 2019 [7] ($\mu g/m^3$)	Annual Mean 2018 [8] ($\mu g/m^3$)	Annual Mean 2017 [9] ($\mu g/m^3$)	Average Annual Mean (2019-2017) ($\mu g/m^3$)	Air quality standard ($\mu g/m^3$)
NO_2	17	17	20	18	40
SO_2	1.2	2.8	0.9	1.6	20
CO	300	200	100	200	10,000
PM_{10}	13.8	14.2	12.3	13.4	40

3.1.2 Sensitive Receptors

As outlined in **Section 1.2**, the closest sensitive receptors to the site of the proposed development are shown in **Figure 2**. The golf course is located approximately 10-20m from the site boundary. The next closest sensitive receptor is a residential dwelling and farm located approximately 71m from the site of the proposed development. There are other residential developments in proximity to the proposed development (as shown in **Figure 2)** in the following locations;

- 225m south-west of the proposed development;
- 459m south-west of the proposed development
- 830m south west of the proposed development;
- 730m west of the proposed development; and
- 893m west of the proposed development.

The Oldcastlepark housing estate is located approximately 1km north-east of the proposed development, on the opposite side of the R134.

[7] EPA, Air Quality in Ireland 2019, Key Indicators of Ambient Air Quality, 2020
[8] EPA, Air Quality in Ireland 2018, Key Indicators of Ambient Air Quality, 2019
[9] EPA, Air Quality in Ireland 2017, Key Indicators of Ambient Air Quality, 2018

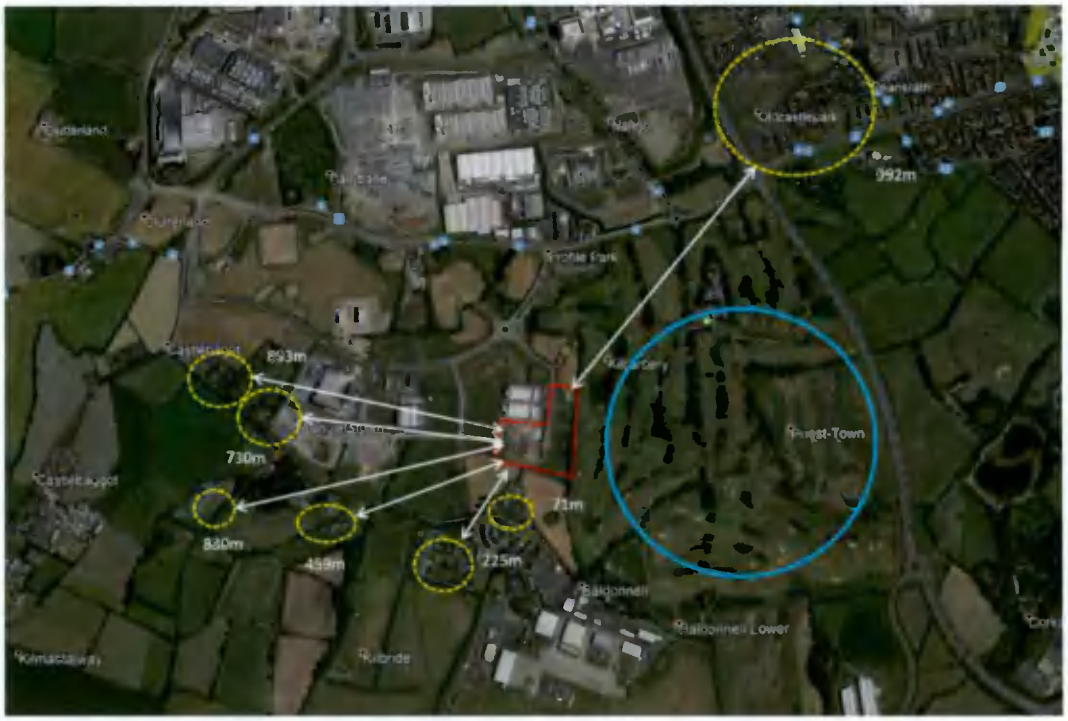

Figure 2: Location of closest sensitive receptors

3.2 Climate

In July 2020, the EPA released the report *Ireland's Greenhouse Gas Emissions Projections 2019-2040*[10]. This report states that total national greenhouse gas emissions in 2018 are estimated to be 60.9 million tonnes carbon dioxide equivalent (Mt CO_2eq). This is 1.1% lower than emissions in 2017. Ireland's greenhouse gas emissions for the energy intensive industries (known as the ETS sectors) are recorded to be 15.5 Mt CO_2 eq. in 2018.

Table 6 outlines the projected emissions for the ETS sector *With Existing Measures* and *With Additional Measures* scenarios.

Table 6: Projected Emissions for the ETS Sector and Total Emissions (EPA, 2020)

Projections	Year	ETS Sector Only (Mt CO_2 eq.)	Total (Mt CO_2eq)
Projections (with existing measures)[11]	2021	19.88	62.47
	2023	20.01	62.49
Projections (with additional measures)[12]	2021	19.60	60.65
	2023	18.51	57.81

[10] EPA, 2020. Ireland's Provisional Greenhouse Gas Emissions 2019 – 2040.
[11] The *With Existing Measures* scenario assumes that no additional policies and measures, beyond those already in place by the end of 2018 (latest national greenhouse gas emission inventory), are implemented. (EPA, 2020)
[12] The *With Additional Measures* scenario assumes implementation of the *With Existing Measures* scenario in addition to, based on current progress, further implementation of

As outlined in the 2020 EPA report, under the *With Existing Measures* scenario, emissions from the energy industries sector are projected to decrease by 18% to 8.7 Mt CO_2 eq over the period 2019 to 2030.

Over the period 2018 to 2030, emissions from the energy industry sector are projected to decrease by 27% to 8.6 Mt CO_2eq.

3.3 Ecologically Sensitive Sites

The closest designated ecological sites to the proposed development are the Rye Water Valley/Carleton SAC (001398) which is located some 6.3km north-west and the Glenasmole Valley SAC (001209) which is located 7.7km south-east.

Due to the separation from the site, the impact on ecologically sensitive sites is not considered further.

Government renewable and energy efficiency policies and measures including those set out in the National Renewable Energy Action Plan (NREAP) and the National Energy Efficiency Action Plan (NEEAP) and more recently Ireland's National Development Plan 2018 - 2027 (EPA, 2020).

4 Predicted Impacts of the Proposed Development

4.1 Construction Phase

4.1.1 Air Quality

Dust emissions are likely to arise from the following activities:

- Site earthworks;
- Handling of construction materials;
- Construction works;
- Construction traffic movements.

In general, any additional airborne concentrations of particulate matter arising from construction would be small and very local to the construction activity (minimizing human exposure).

As shown in **Figure 2**, the golf course is located 10-20m from the proposed development. The next closest sensitive receptor is located approximately 71m from the site of the proposed development. According to the TII Guidance[13] all sensitive locations for human exposure are judged to be of 'high sensitivity.'

Having regard to the distance to the closest receptor and based on the definitions provided in **Table 2**, the proposed construction site is considered to be at a 'moderate' scale. This category of site has the potential for significant soiling impacts within 50m; PM_{10} impacts within 15m; and vegetation impacts within 15m of the site boundary.

As no residential dwellings are located closer than 50m from the proposed construction works, no significant impacts due to construction activities are envisaged at those receptors. There is potential for dust impacts to occur at the golf course given its proximity to the proposed development works. The implementation of standard and specific mitigation measures is detailed in **Section 5.1**.

4.1.2 Climate

The ETS projections are detailed in **Table 6**. Given the scale of the proposed works, limited construction traffic and temporary nature of the same, CO_2 emissions predicted to arise during the construction phase of the proposed development are not considered to be significant in terms of ETS allowances in that it will amount to a diminutive fraction of the projected ETS emissions. Therefore, an imperceptible impact on climate is predicted.

[13] Transport Infrastructure Ireland (2011) *Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes*

4.2 Operational Phase

4.2.1 Air Quality

Based on the air dispersion modelling assessment, the maximum predicted ground-level concentrations (GLCs) are presented in **Table 7** and **Table 8** for Scenario 1 and Scenario 2 respectively. The percentage pollutant concentrations are calculated relative to the air quality standards.

Table 7: Results of air dispersion modelling assessment - Scenario 1

Pollutant	Averaging Period	Background Concentration (µg/m³)	Highest Predicted Value (µg/m³)	Total Concentration (µg/m³)	Limit Value (µg/m³)	Percentage of AQS (%)
NO_2	99.79%ile of 1-hour average	36[14]	99.8	135.8	200	68
	Annual mean	18	5.5	23.5	40	59
CO	8-hour average	200	25.8	225.8	10,000	2.3

4.2.1.1 Scenario 1: Testing

Nitrogen Dioxide (NO_2)

The maximum 99.79th percentile of 1-hour of NO_2 concentrations is predicted to be 135.8µg/m³. This value is 68% of the 200µg/m³ 1-hr limit which applies to the 99.79th percentile. Of this, 18% is due the background concentration and 50% is due to the proposed development.

The annual mean value for hourly NO_2 concentrations is predicted to be 23.5µg/m³. This value is 59% of the AQS 40µg/m³ limit which applies to the annual mean. Of this, 45% is due to the background concentration and 14% is due to the proposed development.

[14] Twice the annual mean background concentration (EPA guidance)

The predicted concentrations comply with the AQS.

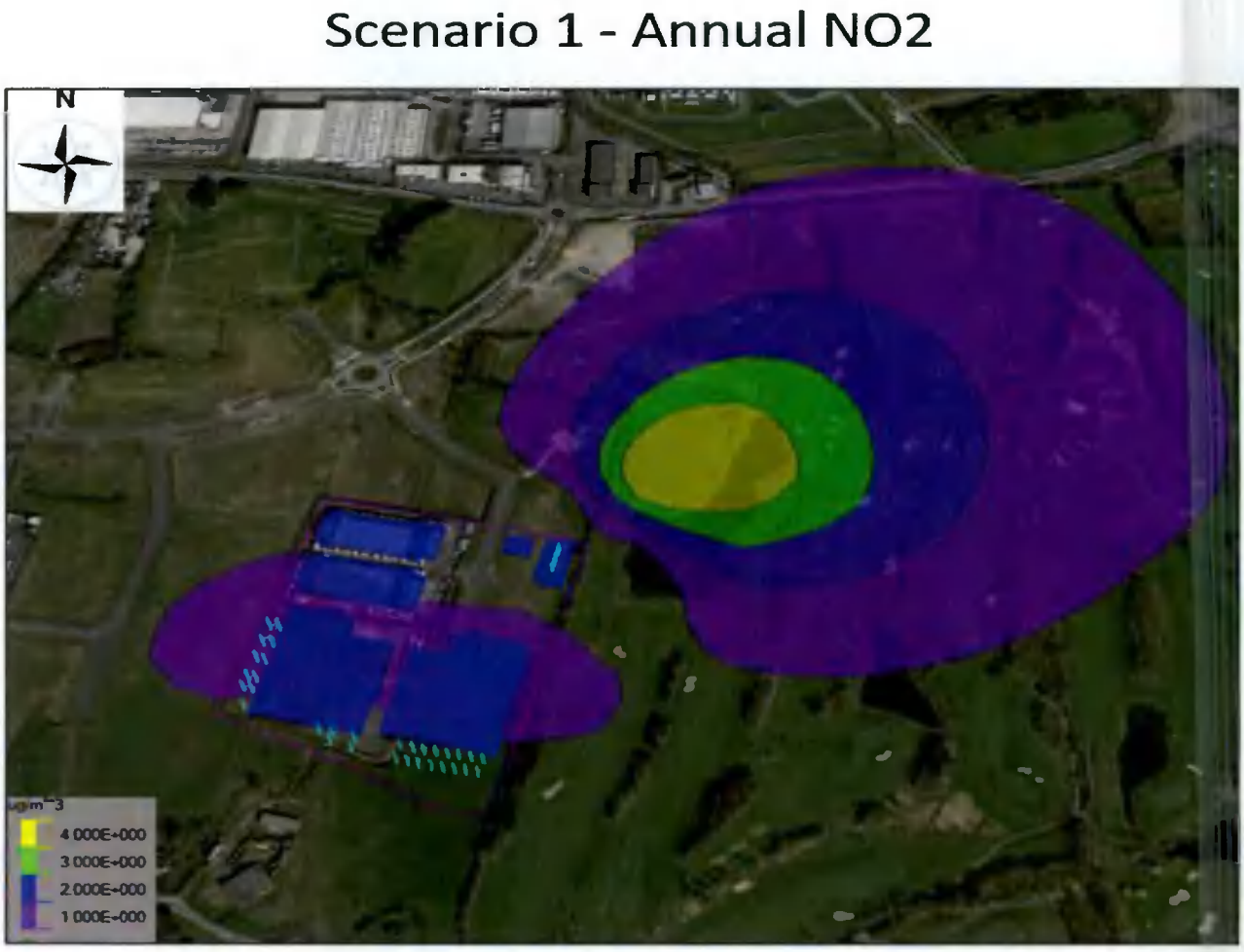

Figure 3 presents the NO_2 contour map for this annual assessment, excluding background concentrations. **Figure 6** presents the NO_2 contour map for this hourly assessment, excluding background concentrations.

Carbon Monoxide (CO)

The maximum GLC of CO is predicted to be 2.3% of the AQS for the 8-hour mean. Of this, 2% is due to the background concentration, and 0.3% is due to the proposed development. The predicted concentrations comply with the AQS.

4.2.1.2 Scenario 2: Emergency Mode

It should be noted that the emergency scenario will only arise in the unlikely event of the breakdown in supply of power to the site. The percentage pollutant concentrations are calculated relative to the air quality standards.

Table 8: Results of air dispersion modelling assessment- Scenario 2

Pollutant	Averaging Period	Background Concentration ($\mu g/m^3$)	Highest Predicted Value ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	Limit Value ($\mu g/m^3$)	Percentage of AQS (%)

NO_2	99.79%ile of 1-hour average	36[15]	51.1	87.1	200	43
	Annual mean	18	13.4	31.4	40	78
CO	8-hour average	200	1.8	201.8	10.000	2
SO_2	99.7%ile of the 1-hour average	3.2	0.56	3.76	350	1.1
	90.41%ile of the 24-hour average	1.6	0.38	1.98	125	1.6
PM_{10}	90%ile of the 24-hour average	13.4	3.08	16.48	50	33
	Annual mean	13.4	0.015	13.42	40	34

Nitrogen Dioxide (NO_2)

The maximum 99.79th percentile of 1-hour of NO_2 concentrations is predicted to be 87.1µg/m³. This value is 43% of the 200µg/m³ 1-hr limit which applies to the 99.79th percentile. Of this, 18% is due the background concentration and 25% is due to the proposed development.

Of this, 18% is due the background concentration and 25% is due to the proposed development.

The annual mean value for hourly NO_2 concentrations is predicted to be 31.4µg/m³. This value is 78% of the AQS 40µg/m³ limit which applies to the annual mean. Of this, 45% is due to background concentrations and 33% is due to the proposed development.

[15] Twice the annual mean background concentration (EPA guidance)

The predicted concentrations comply with the AQS.

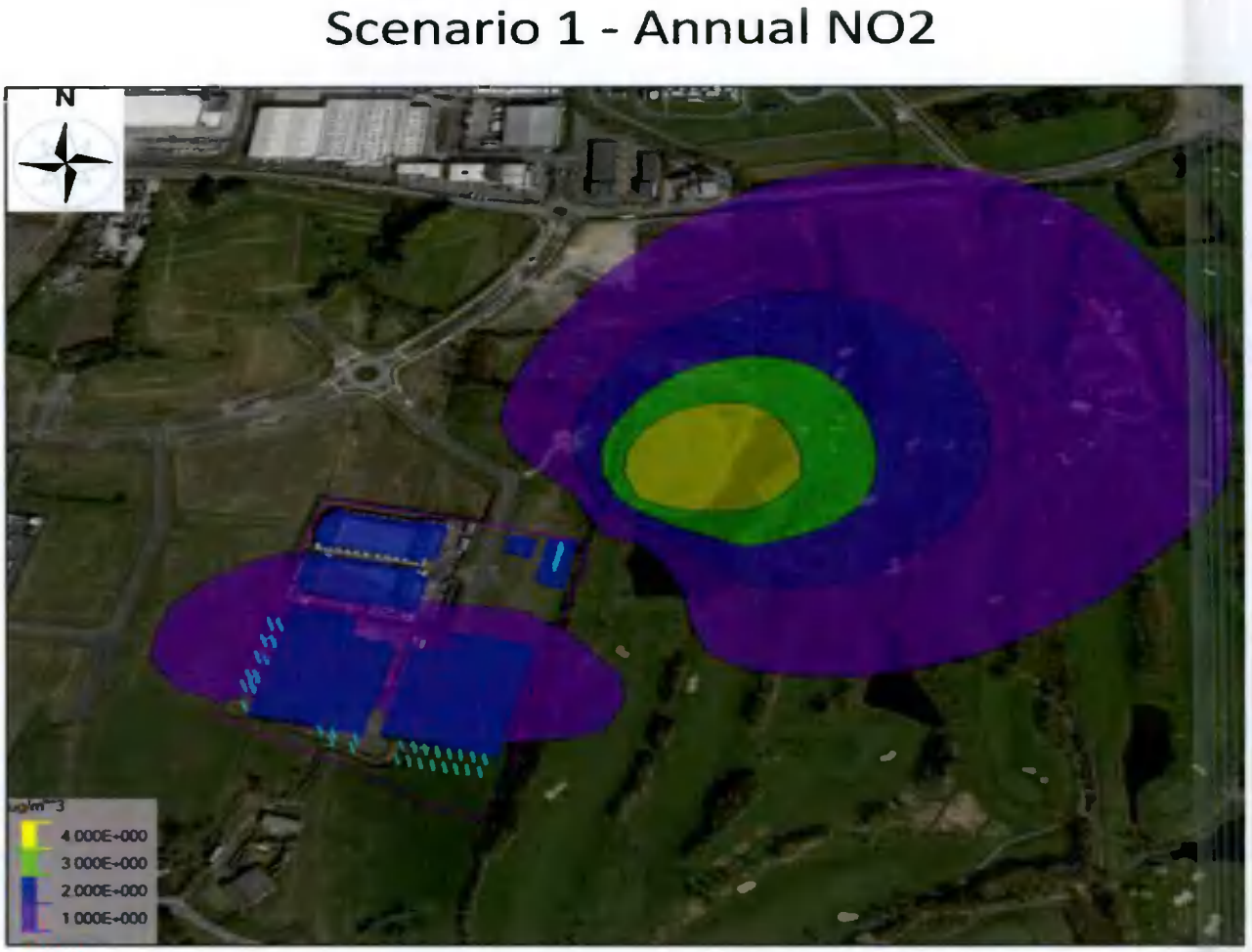

Figure 3 presents the NO_2 contour map for this annual assessment, excluding background concentrations. **Figure 6** presents the NO_2 contour map for this hourly assessment, excluding background concentrations.

Carbon Monoxide (CO)

The maximum GLC of CO is predicted to be 2.02% of the AQS for the 8-hour mean. Of this, 2% is due to background concentration, and 0.02% is due to the proposed development. The predicted concentrations comply with the AQS.

Sulphur Dioxide (SO_2)

The maximum GLC of SO_2 is predicted to be 1.1% of the AQS 350µg/m³ 1-hr limit for the 99.7th percentile of the 1-hour mean values. Of this, 0.9% is due the background concentration and 0.2% is due to the proposed development.

The annual mean value for 24-hour NO_2 concentrations is predicted to be 1.6% of the AQS 125µg/m³ 24-hour limit for the 90.41st percentile of the 24-hour mean values. Of this, 1.3% is due to background concentrations and 0.3% is due to the proposed development.

The predicted concentrations comply with the AQS.

Particulate Matter (PM_{10})

The maximum 24-hour average GLC of PM_{10} is predicted to be 33% of the AQS for the 24-hour mean. Of this, 26.8% is due to background concentrations and 6% is due to the proposed development. The predicted concentrations comply with the AQS.

The maximum annual GLC of PM_{10} is predicted to be 34% of the AQS for the annual mean for the proposed development. Of this, 33.5% is due to background concentrations and 0.05% is due to the proposed development. The predicted concentrations comply with the AQS.

4.2.1.3 Cumulative Impact assessment

In accordance with the EPA Air Guidance Note (AG4) the impact area for the cumulative assessment is defined as a circular area with a radius extending from the source to the most distant point where dispersion modelling predicts a 'significant' ambient effect (5% of the AQS for criteria pollutants). Only the DUB13/15 facility and the Google Ireland data centre fall within this radius for nitrogen dioxide.

The guidance document suggests that a single limit of 100 tonnes/annum of any regulated pollutant from the existing installation be used as the threshold level for assessment.

Based the generator specifications provided for DUB13/14, the mass emission from the 16 generators (8 generators at both DUB13 and DUB14) is approximately 5.5 tonnes/annum (assuming 24 hours of operation for each generator per year). The Google Ireland data centre contains 26 stand-by generators, which will only operate in the event of an emergency and for testing.

Both facilities operate far below the threshold of 100 tonnes/annum and as such no cumulative impacts are expected to occur.

Greener Ideas Ltd. submitted a planning application for a gas fired power plant in Profile Park in June 2021. The development will provide an electrical output of up to 125 MW and is expected to provide some level of power supply to the proposed development once operational in 2025. When the Profile Park Power Plant is operational, the gas generation on site will no longer be required, therefore, no potential significant cumulative effects will arise.

4.2.2 Climate

As outlined in **Section 3.2**, the EPA reported in 2018 that total national greenhouse gas emissions were estimated to be 60.9 million tonnes of carbon dioxide equivalent (Mt CO_2eq), and that greenhouse gas emissions from Irish companies in the EU Emissions Trading Scheme in 2018 was 15.5 (million tonnes CO_2 eq). **Table 6** outlines a range of future projections for both total carbon emissions and ETS carbon emissions in Ireland (Mt CO_2eq), as set out in the EPA Report '*Ireland's Greenhouse Gas Emission Projections 2019-2040*' (EPA, 2020).

It is estimated that a maximum of 203,720,930kWh per annum is required to power all buildings on site (for 2023 and 2024). Based on an emission factor of 204.7g CO_2/kWh for natural gas, as outlined in **Section 2.3.5.3**, it is estimated that the proposed development will generate 41,701 tonnes of CO_2 per annum. This equates to 0.0006% of Ireland's national annual CO_2 emissions (with existing measures).

It is expected that the proposed development will be powered by the national electricity network by 2025. This would require 420,480,000kWh per annum to power all buildings on site. Based on an emission factor of 295.1gCO_2/kWh for electricity, it is estimated the proposed development will generate 124,084 tonnes of CO2 per annum. This equates to 0.002% of Ireland's national annual CO2 emissions (with existing measures).

It is expected that as the national electricity network in Ireland decarbonises, the carbon intensity of the energy consumed on the site will reduce over time.

5 Mitigation Measures

5.1 Construction Phase

As outlined in **Section 3.1**, the only sensitive receptor located within 50m of the areas of the proposed construction works is the Grange Castle Golf Course. There will be standard and specific mitigation measures implemented during the construction works to minimise dust generation. The following measures will be implemented at a minimum:

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Erect a 2m minimum site hoarding around construction compounds.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Spraying of exposed earthwork activities and site haul roads during dry weather.
- Control of vehicle speeds on site.
- Sweeping of hard surfaces on-site and in the surrounding area, as required.

5.2 Operational Phase

5.2.1 Air quality

As all normal and emergency operational emissions comply with AQS, there are no significant adverse effects on air quality predicted during the operational phase

of the proposed development, therefore, there are no mitigation measures proposed.

5.2.2 Climate

A number of measures have been incorporated into the design of the proposed development to minimise carbon emissions.

- Heat produced by the generators is stable and has the potential to be captured and deployed a heat source. Provision is made on site for the recovery and distribution of this energy to the site boundary for the future connection by others. This may allow supplying heat energy to a district heat scheme developed by others in the future. This provision has the potential to have a positive impact on carbon emissions through the reuse of waste heat.
- The location of the site in a region of temperate climate is considered a mitigation by location. The temperate climate removes the requirement for active cooling through refrigeration. This is considered to have a positive impact on climate globally.
- By accommodating cloud computing and storage within a single large facility enables significant savings in energy use compared to individual data server facilities. This results in a significant reduction in energy requirements, representing a positive impact on carbon emissions.
- The proposed development will be powered by natural gas which currently has a lower g CO_2/kWh contribution than the national electricity grid (approximately 37% lower) as per the SEAI National Energy Projections[6] and a lower contribution than other fossil fuel sources.

6 Residual Impacts

6.1 Construction Phase

No significant residual impact on air quality and climate is likely following the implementation of mitigation measures outlined above.

6.2 Operational Phase

6.2.1 Air quality

No significant residual impact on local air quality is likely as a result of the proposed development. All normal and emergency operational emissions comply with relevant AQS.

It should be noted that the emergency situation is highly unlikely to occur as it will only arise when the gas supply to the site breaks down, or there is a failure of the gas engine compound.

6.2.2 Climate

The proposed development is considered to have a moderate negative impact on climate due to the projected carbon emissions predicted to be generated from powering the site. However, these emissions will be regulated under the ETS and will reduce over time.

7 References

Air Quality Standards Regulations 2011 (S.I. No. 180 of 2011)

EU Directive 2008/50/EC

EU Directive 2001/81/EC, as amended by COM (13) 920

Transport Infrastructure Ireland, TII, Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes, 2011

Environmental Protection Agency (EPA) Guidelines on the Information to be contained in Environmental Impact Assessment Reports, Draft, August 2017.

EPA Air Dispersion Modelling from Industrial Installations Guidance Note (AG4).

Medium Combustion Plant Directive (Directive (EU) 2015/2193).

EUCO 169/14: http://data.consilium.europa.eu/doc/document/ST-169-2014-INIT/en/pdf

National Mitigation Plan, July 2017

Directive 2003/87/EC and amendments. This is implemented in Ireland under S.I. 490 of 2012 and amendments and S.I. No. 261 of 2010

EPA, Air Quality in Ireland 2018, Key Indicators of Ambient Air Quality, 2019

EPA, Air Quality in Ireland 2017, Key Indicators of Ambient Air Quality, 2018

EPA, Air Quality in Ireland 2016, Key Indicators of Ambient Air Quality, 2017

Ireland's Provisional Greenhouse Gas Emissions 1990-2016. EPA 2017

Report '*Ireland's Greenhouse Gas Emission Projections 2016-2035*' (EPA, 2017)
National Emissions Ceiling Directive (2001/81/EC)

Figures

Scenario 1 - Annual NO2

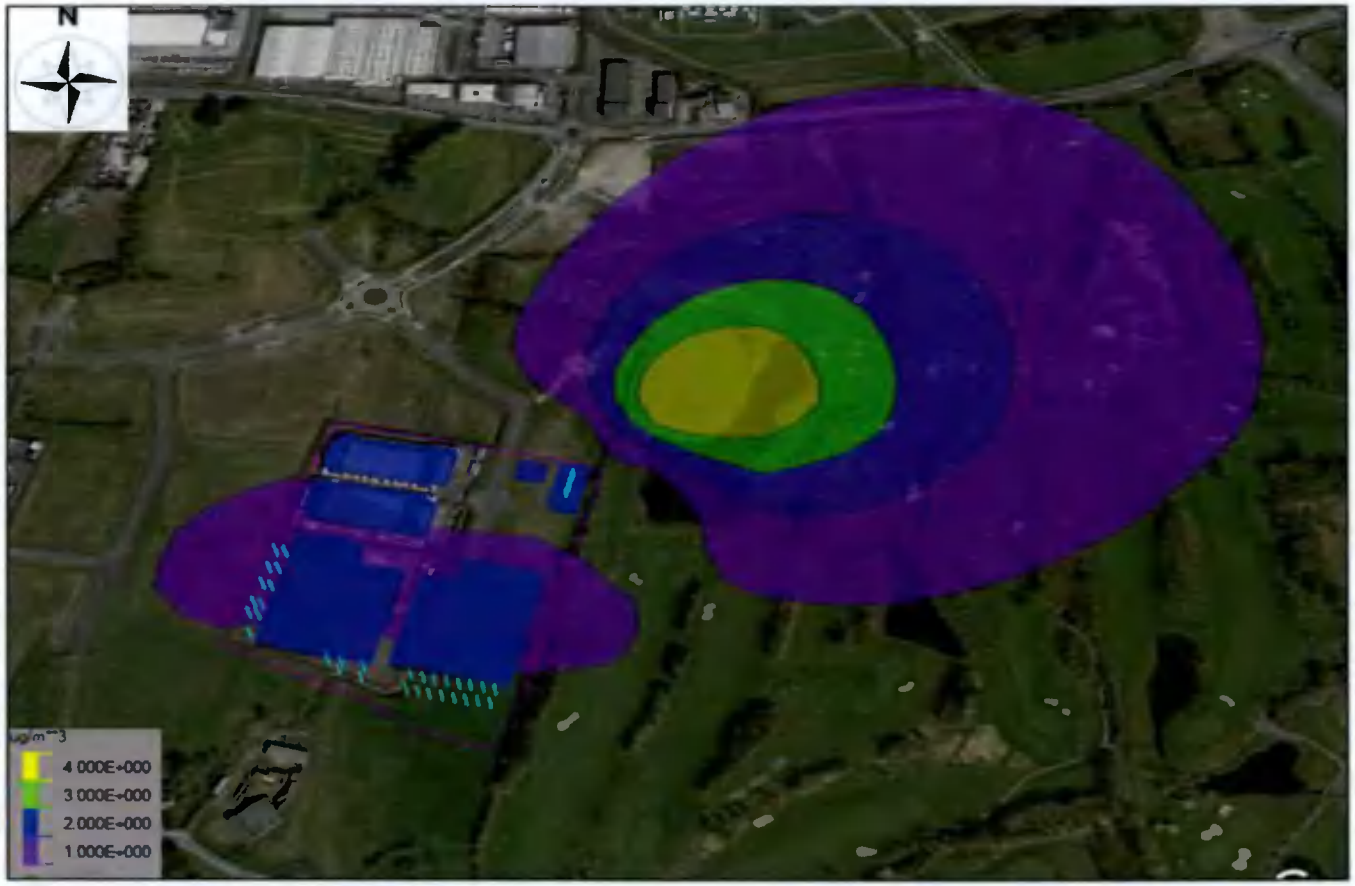

Figure 3: Scenario 1 isopleth of annual mean of NO_2µg/m^3

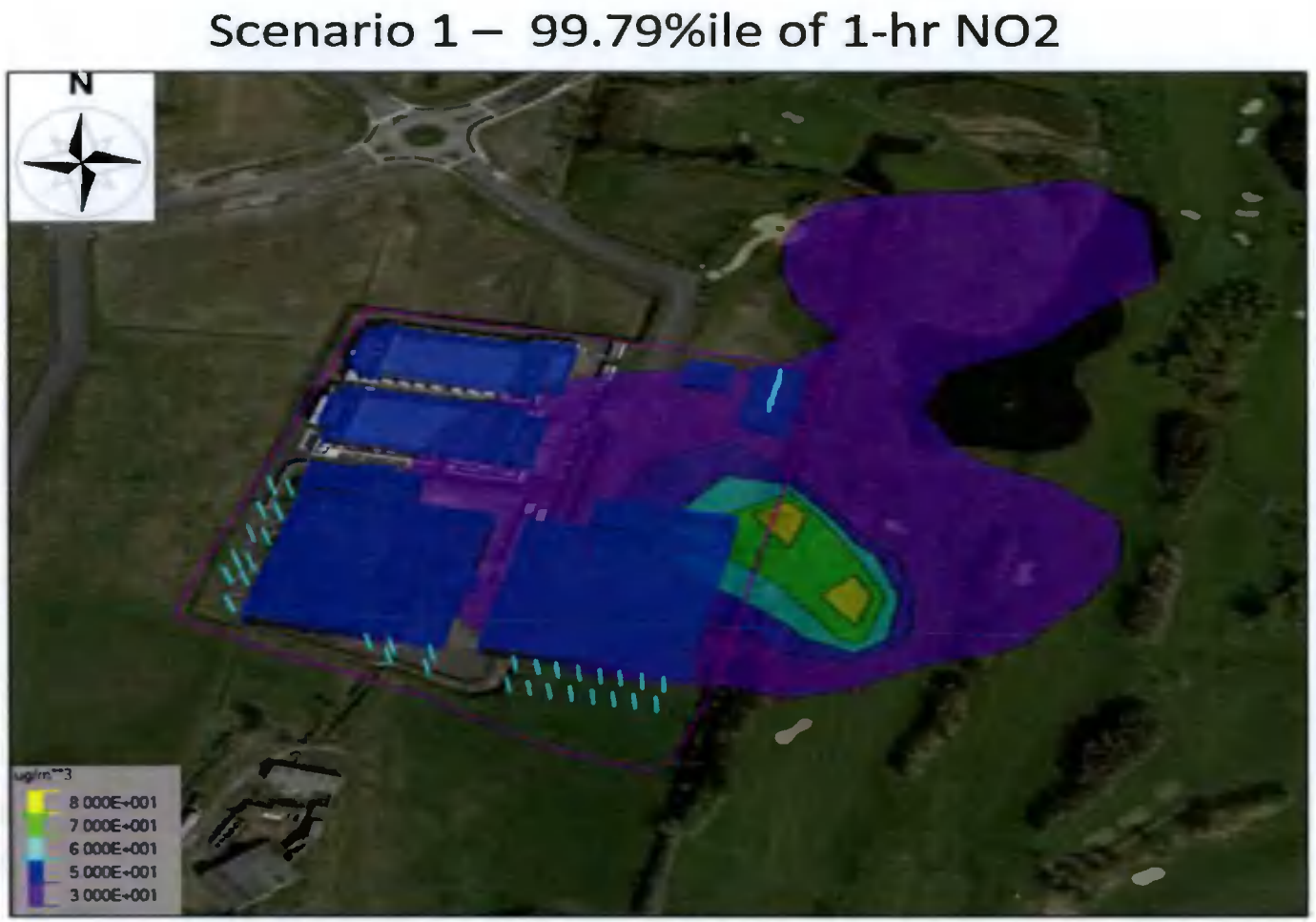

Figure 4: Scenario 1 isopleth of 99.79 percentile of 1-hour of NO_2µg/m^3

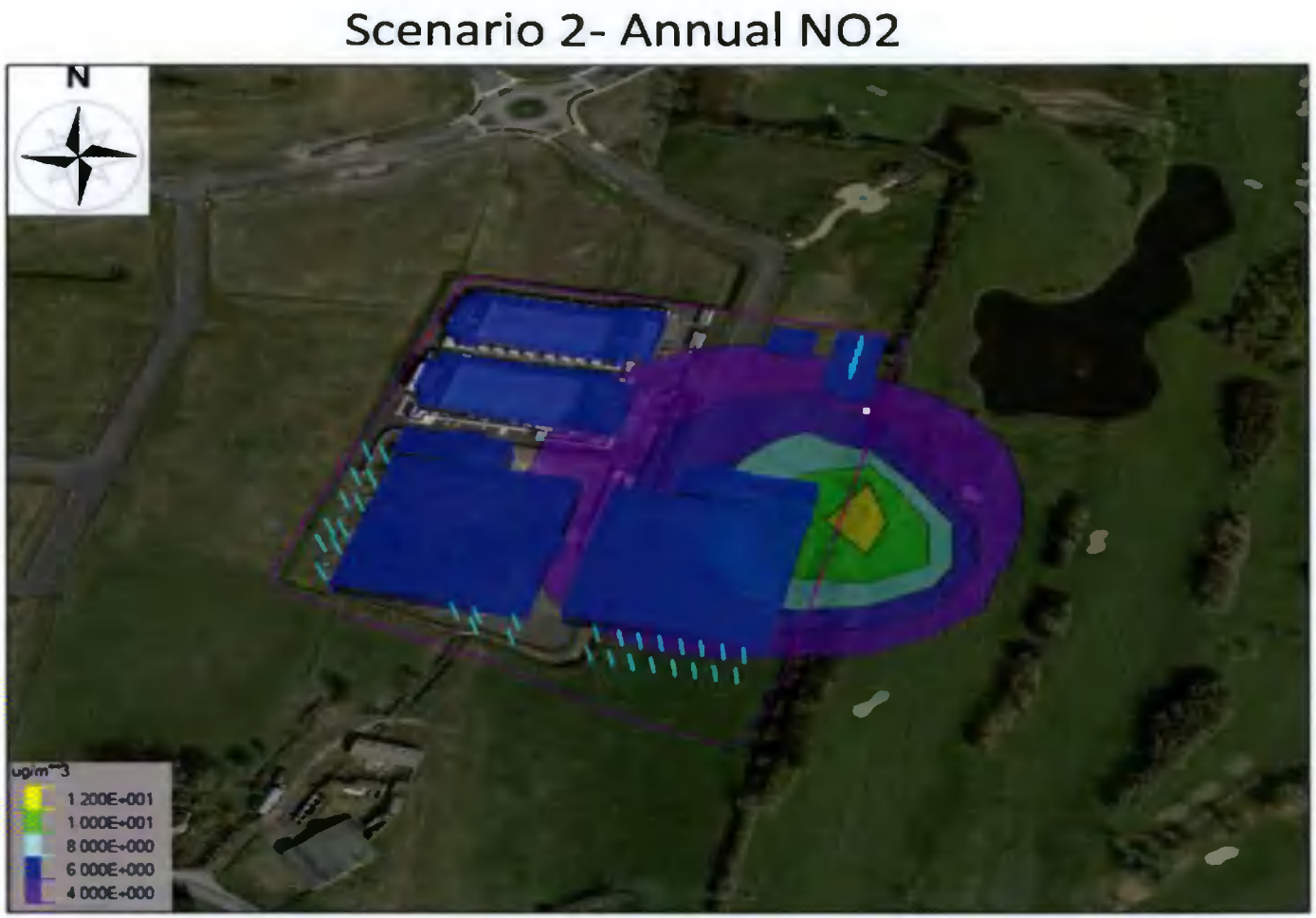

Figure 5: Scenario 2 isopleth of annual mean of NO_2µg/m^3

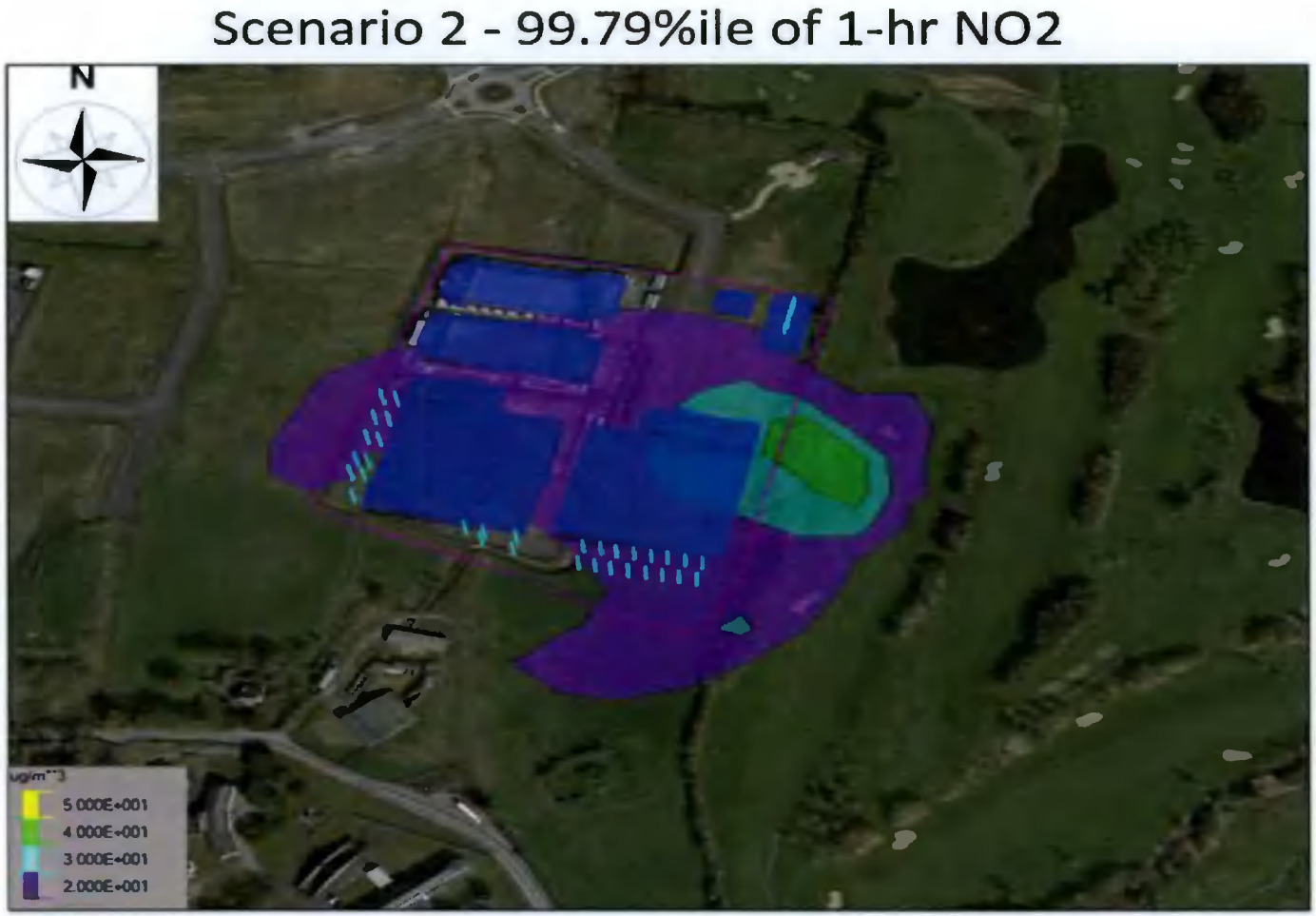

Figure 6: Scenario 2 isopleth of 99.79 percentile of 1-hour of NO_2µg/m3