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# Attachment 7-1-3-2-Emission Impact Assessment

IEL Review Application W0232-01

Application ID LA003577

Dublin Waste to Energy Limited

Project number: PR-351653

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## Quality information

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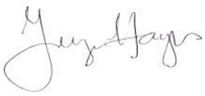
|  |  |  |
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## Revision History

| Revision | Revision date | Details | Authorized | Name | Position |
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# 1. Introduction

Dublin Waste to Energy (DWtE) Limited is proposing an increase in the annual capacity of the waste to energy plant at Pigeon House Road, Poolbeg from the current 600,000 tonnes per annum (tpa) to 690,000 tpa.

This report focuses on impacts on air quality with a particular emphasis on:

- The receiving environment and predicted impacts as described in the original environmental impact assessment completed in 2006;
- Emissions to air from the facility since commissioning in 2017;
- The receiving environment in 2018 and an updated air quality impact assessment.

# 2. The Receiving Environment and Predicted Impacts 2006

## Reported Background Air Quality



Background data was sourced from a baseline survey undertaken between July 2003 and December 2005. The survey included the monitoring of the following pollutants:

- Oxides of nitrogen ($NO_X$);
- Nitrogen dioxide ($NO_2$);
- Particulate matter ($PM_{10}$);
- Fine particulate matter ($PM_{2.5}$);
- Benzene ($C_6H_6$);
- Sulphur dioxide ($SO_2$);
- Heavy metals (Antimony (Sb), Arsenic (As), Cadmium (Cd), Cobalt (Co), Chromium (Cr), Copper (CU), Mercury (Hg), Manganese (Mn), Nickel (Ni), Lead (Pb), Thallium (Tl) and Vanadium (V));
- Hydrogen Chloride (HCl);
- Hydrogen Fluoride (HF); and
- Polychlorinated dibenzodioxins (PCDDs)/Polychlorinated dibenzofurans (PCDFs).

Some of the listed pollutants were monitored using a continuous analyser at a location on the Irish Glass Bottle Co. Ltd. site in Ringsend, Dublin 4. $NO_2$ and $SO_2$ were also measured passively at four other locations in close proximity to the DWtE plant site, at Irishtown Nature Park, Sean Moore Park, Sandymount Green, Ringsend Park, and further afield, at Belgrove Road, in Clontarf, and on Bull Island.

This data is provided in Table 2.1, as it was summarised in the 2006 EIS. The data indicated that none of the pollutants monitored exceeded the air quality Limit Values during the survey. It also indicated that concentrations of $NO_2$, $PM_{10}$ and $PM_{2.5}$ were elevated at the monitoring site/s situated at the roadside locations (Irish Glass Bottle site), and that concentrations of $SO_2$ were elevated at the monitoring site situated close to the Port and nearby industry.

**Table 2-1: Monitored Background Air Quality Survey Data, as reported in the 2006 EIS**

| Pollutant | Monitoring Info | Averaging Period | Average Concentration µg/m³ | Limit Value[1] µg/m³ |
|---|---|---|---|---|
| $NO_2$ | Continuous analyser between July 2003 and August 2005 (continuous) | Annual | 30.5 | 40 |
| | | 99.8th percentile of 1 hour values | 101.0 | 200 |
| | Diffusion tube measurements between July 2003 and August 2005 (24 monthly results) | Annual | 16.0 to 30.6 | 40 |
| $PM_{10}$ | Continuous analyser between July 2003 and August 2005 (three hundred and fourteen (314) 24-hour samples) | Annual | 34.0 | 40 |
| | | 90th percentile of 24-hour values | 57.0 | 50 |
| $PM_{2.5}$ | Continuous analyser between September 2003 and October 2005 (sixty (60) 24-hour samples) | Annual | 11.0 | 25 |
| $SO_2$ | Diffusion tubes between July 2003 and August 2005 (24 monthly results) | Annual | 4.8 | 20 |
| | Diffusion tubes between January 2004 and March 2005 (2 monthly results only) | Annual | 4.7 to 11.7 | |
| $C_6H_6$ | Diffusion tubes between July 2003 and August 2005 (16 weekly results) | Annual | 2.0 | 5 |
| HCl | Nylon Membrane Filter analysis between August 2003 and August 2005 (16 weekly results) | Annual | 0.18 | 20 |
| HF | Nylon Membrane Filter analysis between August 2003 and August 2005 (16 weekly results) | Annual | 0.01 | 0.3 |
| Hg | ICP monitoring between August 2003 and August 2005 (16 weekly results) | Annual | 0.001 | 1 |
| Cd | ICP monitoring between August 2003 and August 2005 (16 weekly results) | Annual | 0.001 | 0.005 |
| As | ICP monitoring between August 2003 and August 2005 (16 weekly results) | Annual | 0.001 | 0.006 |
| V | ICP monitoring between August 2003 and August 2005 (16 weekly results) | Annual | 0.005 | 5 |
| Ni | ICP monitoring between August 2003 and August 2005 (16 weekly results) | Annual | 0.006 | 0.02 |

1. Statutory limits for $NO_x$, $NO_2$, $PM_{10}$, $SO_2$, derived environmental assessment levels (EALs) for other parameters.



# Reported Predicted Impacts

The results of the dispersion modelling assessment to inform the 2006 EIS are summarised in Table 2.2, which are based on the impact from maximum operation at the location of maximum impact. The results reported in the 2006 EIS refer to the inclusion of the cumulative and site traffic contributions within the background (ambient) concentrations reported.

Table 2.2 provides the relevant Environmental Assessment Levels (EALs) for each pollutant (including statutory air quality standards, where applicable), the background concentration (intended to represent existing conditions), the Process Contribution (the impact of emissions associated with the DWtE site's stack emissions) and the Predicted Environmental Concentration (the Process Contribution added to the background concentration), as well as the proportion of the Process Contribution and Predicted Environmental Concentration to the relevant EAL.

The predicted results suggested that impacts would not be significant and that the Process Contribution would be less than 10% of the EAL for the majority of pollutants, and that there would be no exceedances of the EALs considered.

### Table 2-2: Predicted Air Quality Values, as reported in the 2006 EIS

| Pollutant | Averaging Period | Environmental Assessment Level (µg/m$^3$ unless stated) | Background/ Ambient Concentration (µg/m$^3$) | Process Contribution (PC) (µg/m$^3$ unless stated) | PC % of EAL | Predicted Environmental Concentration (PEC) (µg/m$^3$ unless stated) | PEC % of EAL |
|---|---|---|---|---|---|---|---|
| $NO_2$ | 1-Hour | 200 | 55.2 | 39.1 | 20 | 94.3 | 47 |
| | Annual | 40 | 27.6 | 3.3 | 8 | 30.9 | 77 |
| $NO_x$ | Annual | 30 | 19.8 | 3.7 | 12 | 23.5 | 78 |
| $SO_2$ | 1-hr | 350 | 28.0 | 19.3 | 6 | 47.3 | 14 |
| | 24-hr | 125 | 14.0 | 7.1 | 6 | 21.1 | 17 |
| | Annual | 20 | 14.0 | 0.9 | 5 | 14.9 | 75 |
| $PM_{10}$ | 24-hr | 50 | 30.0 | 0.6 | 1 | 30.6 | 61 |
| | Annual | 40 | 30.0 | 0.2 | 1 | 30.2 | 76 |
| $PM_{2.5}$ | Annual | 25 | 10.5 | 0.2 | 1 | 10.7 | 43 |
| CO | 8-hr | 10,000 | 120.0 | 51.0 | 1 | 171.0 | 1.2 |
| TOC | Annual | 5 | 1.7 | 0.2 | 5 | 1.9 | 38 |
| HF | 1-hr | 3 | 2.0 x10$^{-02}$ | 0.3 | 9 | 0.3 | 9 |
| | Annual | 0.3 | 1.0 x10$^{-02}$ | 2.0x10$^{-02}$ | 7 | 3.0 x10$^{-02}$ | 10 |
| PCDD/PCDF | N/A | N/A | 5.5 x10$^{-05}$ | 2.3x10$^{-06}$ | N/A | 5.9 x10$^{-05}$ | N/A |
| PAHs | Annual | 1,000 | 180.0 | 2.3x10$^{-02}$ | <1 | 180.0 | 18 |
| Hg | Annual | 1 | 1.0 x10$^{-03}$ | 1.1x10$^{-03}$ | <1 | 2.1 x10$^{-03}$ | 0 |
| Cd | Annual | 5.0 x10$^{-03}$ | 1.0 x10$^{-03}$ | 1.1x10$^{-03}$ | 22 | 2.1 x10$^{-03}$ | 42 |
| As | Annual | 6.0 x10$^{-03}$ | 1.0 x10$^{-03}$ | 4.0x10$^{-04}$ | 7 | 1.4 x10$^{-03}$ | 23 |
| V | Max 1-Hour | 1 | 1.0 x10$^{-02}$ | 8.0x10$^{-03}$ | 1 | 1.8 x10$^{-02}$ | 2 |

It is noted that additional modelling, including the use of CALPUFF, was completed in 2007/2008 to support the Waste Management Licensing Process. However, the predicted air quality impacts did not differ materially from those presented in the 2006 EIS.

# 3. DWtE, Commissioning and Operation 2017/2018/2019

The DWtE plant was commissioned in the summer of 2017 and began accepting waste as an annual run rate equivalent of 600,000 tonnes in September 2017.

Emissions to air through the main stack have been constantly monitored since commissioning by means of a permanently installed continuous emission monitoring (CEM) system and quarterly independent testing by a stack gas testing company.

The CEM systems (one for each line), plus a redundant system, continuously monitors flue gas flow, $NO_x$, $SO_2$, particulate, HCl, and Total Organic Carbon (as C). The CEM systems were designed, commissioned and calibrated in accordance with *IS EN 14181 Stationary source emissions. Quality Assurance of automated measuring systems.*

The independent quarterly testing has been completed by Exova Catalyst, a UKAS ISO/IEC 17205 accredited testing laboratory. The parameters tested included all the parameters measured by the CEMs system as well as Hg, Cd & Tl, other heavy metals, hydrogen fluoride, and PCDD/PCDF.

AECOM has reviewed the independent test data for eight sets of quarterly tests and this data is summarised in Tables 3.1a, 3.1b and 3.2 below. Tables 3.1a and 3.1b contains a summary of the actual data while Table 3.2 details the average for each parameter over the series of tests, the relevant Emission Limit Value (ELV) as defined in the site IE Licence issued by the EPA, the actual average mass flow of the pollutant as released to atmosphere, the licensed mass flow (ELV multiplied by the maximum permitted flue gas flow rate) and indicative percentages of the ELV and mass flow represented by the average data.

The data indicates that emissions to air from the DWtE facility are generally running at less than 10% of the licence limits with respect to the concentration ELVs and mass flows.  The mass flow of PCDD/PCDF is less than 1% of the licence limit, while the mass flow of HCl is less than 0.5% of the limit value.

The only exception to the statements in the paragraph above is with respect to $NO_2$ which is averaging 72.44% of the ELV and 62.6% of the mass flow limit, values still well below relevant limit values.

AECOM has also reviewed the 2018 CEM data and available 2019 data which consists of validated 30-minute average values for flue gas flow, $NO_x$, $SO_2$, particulate, HCl, and Total Organic Carbon (as C). This data is continuous and contains over 200,000 data-points per incineration line and is consistent with the data generated in the quarterly reports. The CEM data indicates no exceedance of any 30 minute or daily average values and long-term average results well within the minimum and maximums described in Table 3.1 below.

The ELVs in the sites IE licence are transcribed from Chapter IV and Annex VI of the Industrial Emission Directive (IED) (2010/75/EU). The ELVs are consistent with BAT as defined in the relevant Reference Document on the Best Available Techniques for Waste Incineration (August 2006). It is noted that a revised reference document on best available techniques is currently being finalised by the European IPPC Bureau and this will ultimately lead to revised and binding BAT conclusions and BATAELs.  AECOM has reviewed the draft BAT AELs (*Best Available Techniques (BAT) Reference Document for Waste Incineration Final Draft December 2018*) and the performance of both lines of the DWtE plant and concluded that the plant is currently operating not only well within the ELVs as provided in the current licence but also well within the 2018 draft BAT AELs.

The data indicates a waste to energy plant operating within its design envelope with regard to capacity and also generating emission to air well below those anticipated and modelled in 2006 as part of the air quality impact assessment.

## Table 3-1a: Independent Emissions Data from 2017 and 2018 Quarterly Tests

| | | 20-21st September 2017 | | 4th-8th December 2017 | | | 8th-19th January 2018 | | 30th April- 4th May 2018 | | 17th - 26th Sept 2018 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Units | Result | | Result | | | Result | | Result | | Result | |
| | Line | 1 | 2 | 1 | 2 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| Total Particulate Matter | mg/m³ | 1.35 | 0.83 | - | - | - | 0.434 | 1.25 | 0.48 | 0.948 | 0.095 | 0.31 |
| Hydrogen Chloride | mg/m³ | 0.03 | 0.072 | - | - | - | <0.018 | <0.017 | <0.018 | <0.015 | 0.02 | <0.019 |
| Cadmium & Thallium | mg/m³ | < 0.00071 | <0.00056 | 0.00067 | 0.00065 | 0.00068 | <0.00063 | <0.00066 | 0.00068 | <0.00065 | <0.00081 | <0.001 |
| Heavy Metals | mg/m³ | 0.159 | 0.13 | 0.052 | 0.105 | 0.040 | 0.019 | 0.020 | 0.03526 | 0.023 | 0.0114 | 0.0181 |
| Mercury | mg/m³ | < 0.00030 | 0.00091 | 0.00292 | 0.00056 | 0.00124 | 0.00056 | 0.00056 | <0.00027 | 0.00084 | 0.00048 | 0.00073 |
| Dioxins & Furans (NATO I-TEQ) | ng/m³ | 0.0035 | 0.00022 | 0.00235 | 0.00016 | 0.00016 | 0.00063 | 0.00060 | 0.00169 | 0.00080 | 0.00082 | 0.00124 |
| Hydrogen Fluoride | mg/m³ | < 0.036 | 0.042 | 0.092 | 0.051 | 0.051 | <0.040 | 0.074 | <0.049 | <0.05 | <0.038 | 0.09 |
| Sulphur Dioxide | mg/m³ | 0.062 | 0.068 | - | - | - | 3.59 | 2.95 | 0.37 | 0.36 | 0.84 | 0.41 |
| Total VOCs (as Carbon) | mg/m³ | 2 | 0.29 | - | - | - | 0.342 | 1.350 | 0.28 | 0.30 | 0.26 | 0.26 |
| Oxides of Nitrogen (as $NO_2$) | mg/m³ | 103.2 | 106.7 | - | - | - | 150.6 | 156.7 | 139.2 | 173.20 | 117.74 | 163.03 |
| Carbon Monoxide | mg/m³ | 1.82 | 0.23 | - | - | - | 11.11 | 15.03 | 6.29 | 5.30 | 2.75 | 14.80 |
| Volumetric Flow Rate (REF) | Nm³/hr | 211,623 | 236,824 | 226,647 | 240,009 | 234,447 | 227,461 | 223,451 | 229,496 | 232,687 | 245,802 | 240,015 |

**Table 3-1b: Independent Emissions Data from 2018 and 2019 Quarterly Tests**

| Parameter | | 12th – 15th Nov 2018 | | 21st – 25th January 2019 | | 2nd – 11th April 2019 | |
|---|---|---|---|---|---|---|---|
| | Units | Result | | Result | | Result | |
| | Line | 1 | 2 | 1 | 2 | 1 | 2 |
| Total Particulate Matter | mg/m³ | 0.09 | 0.40 | 0.336 | 0.54 | 0.114 | 0.317 |
| Hydrogen Chloride | mg/m³ | 0.016 | 0.025 | 0.018 | 0.02 | 0.03 | 0.018 |
| Cadmium & Thallium | mg/m³ | 0.00073 | <0.00061 | 0.00062 | 0.001 | 0.00062 | 0.00065 |
| Heavy Metals | mg/m³ | 0.037 | 0.014 | 0.024 | 0.028 | 0.024 | 0.0072 |
| Mercury | mg/m³ | <0.00023 | 0.00034 | 0.00043 | 0.00036 | 0.00069 | 0.00125 |
| Dioxins & Furans (NATO I-TEQ) | ng/m³ | 0.0022 | 0.00035 | 0.00160 | 0.00060 | 0.00040 | 0.00043 |
| Hydrogen Fluoride | mg/m³ | 0.42 | 0.50 | 0.11 | 0.05 | 0.17 | 0.051 |
| Sulphur Dioxide | mg/m³ | 3.88 | 6.95 | 24.62 | 11.46 | 2.13 | 4.95 |
| Total VOCs (as Carbon) | mg/m³ | 0.28 | 0.26 | 0.28 | 0.35 | 0.28 | 1.28 |
| Oxides of Nitrogen (as $NO_2$) | mg/m³ | 143.9 | 111.53 | 127.30 | 140.48 | 179.70 | 163.40 |
| Carbon Monoxide | mg/m³ | 7.68 | 10.26 | 11.47 | 13.09 | 3.69 | 10.17 |
| Volumetric Flow Rate (REF) | Nm³/hr | 260,869 | 248,468 | 261,910 | 248,059 | 245,562 | 229,680 |

### Table 3-2: Average Emission Test Results

| Parameter | Average mg/m$^3$ | ELV[1] mg/m$^3$ | % of ELV % | Licenced Mass Flow kg/hr | Actual Mass Flow kg/hr | % of Licensed Mass Flow % |
|---|---|---|---|---|---|---|
| Total Particulate Matter | 0.535 | 10 | 5.35 | 2.75 | 0.128 | 4.63 |
| Hydrogen Chloride | 0.024 | 10 | 0.24 | 2.75 | 0.0077 | 0.21 |
| Cadmium & Thallium | 0.0007 | 0.05 | 1.4 | 0.01375 | 0.0002 | 1.21 |
| Heavy Metals | 0.044 | 0.5 | 8.8 | 0.1375 | 0.01 | 7.6 |
| Mercury | 0.00075 | 0.05 | 1.49 | 0.01375 | 0.0002 | 1.29 |
| Dioxins & Furans (NATO I-TEQ) | 0.001 (ng/m$^3$) | 0.1 (ng/m$^3$) | 1.04 | 0.0275 (g/hr) | 0.0002 (g/hr) | 0.9 |
| Hydrogen Fluoride | 0.113 | 2 | 5.63 | 0.55 | 0.027 | 4.87 |
| Sulphur Dioxide | 4.47 | 50 | 8.95 | 13.75 | 1.06 | 7.74 |
| Total VOCs (as Carbon) | 0.56 | 10 | 5.58 | 2.75 | 0.1327 | 4.83 |
| Oxides of Nitrogen (as $NO_2$) | 144.87 | 200 | 72.44 | 55 | 34.45 | 62.6 |
| Carbon Monoxide | 8.44 | 100 | 8.44 | 27.5 | 2.01 | 7.3 |
| Volumetric Flow Rate (REF) | 237,824 | 275,000 | 86.48 | n/a | n/a | n/a |

**Note 1: ELVs are B 30-minute averages from W0232-01.**
**Note 2: less than (<) values included in average at detection limit**

# 4. Receiving Environment 2018

## Existing Air Quality

Since the completion of the EIS in 2006, monitoring of $NO_2$, $NO_X$, $SO_2$ and $PM_{10}$ has been undertaken for several periods at the Dublin City Council Recycling Centre, Sean Moore Road, Ringsend, Dublin 4 using a continuous analyser. This data is summarised in Table 4-1. The equivalent data gathered at the Glass Bottle site in 2003 - 2005 is also provided again for comparison. Both the Glass Bottle site and Sean Moore Road site monitoring locations could be described as roadside, in that they are both located adjacent to Sean Moore Road (R131) and the concentrations measured directly influenced by the vehicles emissions from road traffic movements on that road.

**Table 4-1: EPA Pollutant Monitoring Data, gathered at the Glass Bottle Factory (2003 – 2005) and Sean Moore Road (2009 – 2011, 2017 and 2018)**

| Pollutant | Averaging Period | Air Quality Limit Value | Years | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2003 – 2005[1] | 2009 | 2010 | 2011 | 2017 | 2018 |
| $NO_2$ µg/m$^3$ | 1-Hour (99.8$^{th}$ percentile) | 200 | 101.0 | (6)[2] | (1)[2] | (0)[2] | 99.5 | 87.9 |
| | Annual | 40 | 30.5 | 27.7 | 30.4 | 28.1 | 27.3 | 21.9 |
| $NO_x$ µg/m$^3$ | Annual | N/A | N/A | 56.6 | 58.0 | 50.0 | 49.7 | 54.3 |
| $SO_2$ µg/m$^3$ | 1-hr (99.7$^{th}$ percentile) | 350 | N/A | N/A | 17.3 | N/A | 24.7 | N/A |
| | 24-hr (99.2$^{nd}$ percentile) | 125 | N/A | N/A | 12.9 | N/A | 17.4 | N/A |
| | Annual | 20 | 4.8 | 5.7 | 3.5 | 2.5 | 4.3 | N/A |
| $PM_{10}$ µg/m$^3$ | 24-hr (90.4$^{th}$ percentile) | 50 | 57.0 | (6)[3] | (16)[3] | (6)[3] | 21 | 30.5 |
| | Annual | 40 | 34.0 | 17.7 | 23.0 | 17.8 | 13.4 | 13.3 |

[1] As reported in Table 2.1, [2] Number of exceedances of the 1 hour mean $NO_2$ air quality standard, [3] Number of exceedance of the 24 hour $PM_{10}$ air quality standard.



There is no significant variation in the trend of monitoring data gathered at the Sean Moore Road site, between 2009 and 2018, other than the dip in annual mean $NO_2$ concentrations in 2018. The $NO_X$, $NO_2$ and $SO_2$ data gathered at the Sean Moore Road site from 2009 to 2017 is also fairly consistent with pollutant data gathered at the Glass Bottle site from 2003 to 2005, albeit generally slightly lower. However, annual mean and 1 hour mean $PM_{10}$ concentrations monitored at the Sean Moore Road site are markedly lower than those monitored at the Glass Bottle site.

Any suggestion of a reduction in pollutants associated with road traffic emissions ($NO_X$, $NO_2$, $PM_{10}$ and $PM_{2.5}$) can potentially be attributed to improvements in vehicles emissions technology that has occurred over the years, and the evolution of that technology into the local vehicle fleet. However, the effect of such improvements on concentrations of $NO_X$, $NO_2$, $PM_{10}$ and $PM_{2.5}$ is partially offset by the year on year increase in vehicle movements on the local road network, due to general growth and vehicle movements associated with nearby developments.

The 2006 EIS also noted a number of other industrial point sources (especially for $NO_x$) in the general vicinity of the Poolbeg peninsula i.e.:

- Synergen Power Limited operates a 750 MWth gas-fired power station on Pigeon House Road. The site environmental licence was revised in 2012 and again by technical amendment in 2015 to bring it into line with the ELVs for large combustion plant in the IED;
- The ESB operates Poolbeg Power Station. The 510 MWe thermal power station closed in 2010. The 470 MWe CCGT plant was subject to licence review in 2012 and again in 2015 to ensure conformity with the ELVs in the IED.
- North Wall Generating Station consisted of two gas turbine generators with a combined 272 MWe. One of the turbines ceased operation in 2010 with the other continuing as a limited-hours peaking plant. Since 2016, the operational hours of this plant have been further limited and final closure is anticipated by 2023.

Consequently, there has been a significant reduction in point source emissions of NOx since 2006 as a result of plant closures and reduced ELVs as plants are updated to bring them into line with the IED.

The monitoring data reported in Table 2-1 and Table 4-1, as well as the reported 2006 EIS impacts summarised in Table 2-2, were influenced by local meteorology. Figure 4-1 provides a set of windroses based on wind speed and wind direction data gathered at Dublin Airport (2015 -2017). The updated windroses (which are similar to those used in the 2006 EIS) demonstrate that the predominant wind direction is blowing from west to east, although the wind does blow from all directions on occasions throughout the year. Therefore, maximum annual mean impacts from the DWtE stacks are likely to occur to the east of the site, in Dublin Bay, rather than at any of the sensitive receptors located to the north, south or west of the site. Because winds still blow from other directions over the course of the year, this assumption is unlikely to apply to maximum short term mean impacts.

Figure 4-1 also provides a windrose plot for 2018, gathered by a meteorological station located at the DWtE site. It demonstrates a similar pattern frequency in winds blown from each direction at Dublin Airport, but does suggest wind speeds are often lower at this location.

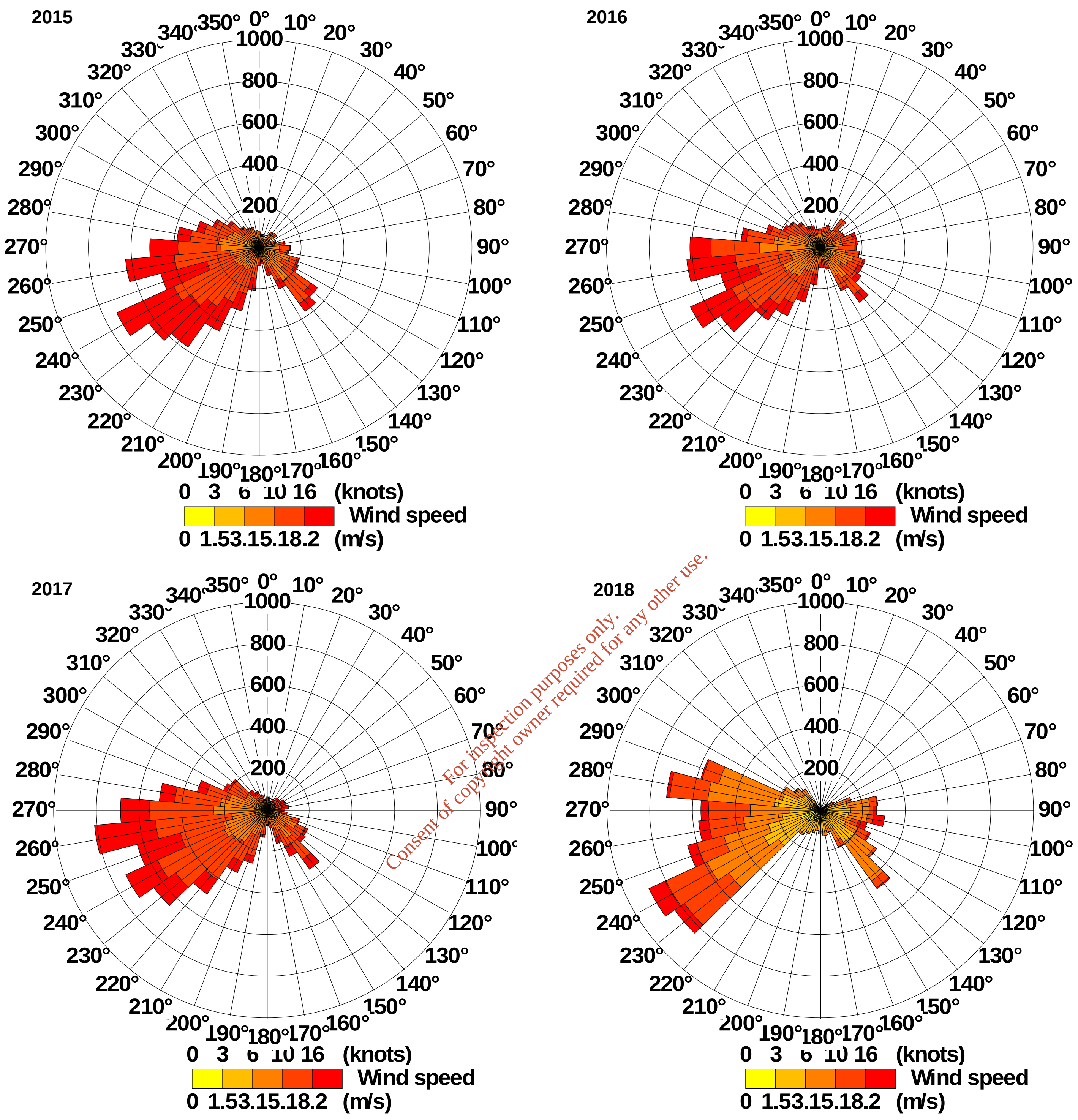


**Figure 4-1: Dublin Airport Windrose Plots (2015 – 2017) and Site-Specific Windrose Plot (2018)**

There are a number of human health sensitive receptor located in the vicinity of the DWtE site that could be impacted by emissions to air from the site's stacks and from the site's associated vehicle movements on the public road network. Selected human health sensitive receptors are shown in Figure 4-2 and include residential properties at Ringsend. In addition to the human health sensitive receptors, there are also a number of ecologically sensitive receptors nearby, which form part of the EU's Natura 2000 Network, that could be impacted by emissions to air from the DWtE site's stacks. Selected locations that represent these ecological receptors are also shown on Figure 4-2.




**Figure 4-2: Air Quality Sensitive Receptors**

# 5. Updated Air Quality Impact

## Updated Dispersion Model Results

The assessment of air quality impacts associated with the operation of the DWtE site has been revisited. The contribution of the facility's stack emissions to pollutant concentrations have been quantified, at their currently permitted levels (maximum ELVs and maximum flue gas flow rate), at the worst affected offsite location. Modelling has been undertaken using three years of meteorological data for Dublin Airport (2015 – 2017), and one year of meteorological data from the DWtE site (2018). These results are provided in Table 5-1. It is noted that the ELVs set by the IE Licence for arsenic (As) differ to the Emission Limits included in the assessment that accompanied the 2006 EIS (i.e. 0.2 mg/m$^3$ in the licence and 0.5 mg/m$^3$ included in the 2006 EIS).

The results suggest that the licenced impacts are less than 10% of the relevant EALs for the majority of pollutants and averaging periods, with little risk of any exceedance of the EALs considered for the protection of human health. The largest impacts concern hourly mean $NO_2$ and annual mean As, although the Predicted Environmental Concentrations for both pollutants remain well below their relevant EALs.

Appendix A1 provides isopleths for the key pollutants of concern listed in Table 5-1. Plots are provided for annual mean $NO_2$, hourly mean $NO_2$, based on the worst of the meteorological years considered for Dublin Airport, and the 2018 meteorological year for the DWtE site.

### Table 5-1: Predicted Air Quality Values, Point of Maximum Offsite Impact (Stack Emissions Only)

| Pollutant | Averaging Period | Environmental Assessment Level (µg/m³ unless stated) | Background/ Ambient Concentration (µg/m³) | Worst Case Dublin Airport Met Data (2015 – 2017) | | | | Pigeon House Road Site Met Data (2018) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Process Contribution (PC) (µg/m³ unless stated) | PC % of EAL | Predicted Environmental Concentration (PEC) (µg/m³ unless stated) | PEC % of EAL | Process Contribution (PC) (µg/m³ unless stated) | PC % of EAL | Predicted Environmental Concentration (PEC) (µg/m³ unless stated) | PEC % of EAL |
| $NO_2$ | 1-Hour | 200 | 45.2[(1),(2)] | 40.3 | 20 | 85.5 | 43 | 49.1 | 25 | 94.3 | 47 |
| | Annual | 40 | 22.6[(2)] | 1.3 | 3 | 23.9 | 60 | 2.7 | 7 | 25.3 | 63 |
| $SO_2$ | 1-hr | 350 | 8.6[(1),(3)] | 9.9 | 3 | 18.5 | 5 | 12.0 | 3 | 20.6 | 6 |
| | 24-hr | 125 | 8.6[(1),(3)] | 2.8 | 2 | 11.4 | 9 | 4.8 | 4 | 13.4 | 11 |
| $PM_{10}$ | 24-hr | 50 | 26.2[(1),(2)] | 0.2 | <1 | 26.4 | 53 | 0.5 | 1 | 26.7 | 53 |
| | Annual | 40 | 13.1[(2)] | 0.1 | <1 | 13.2 | 33 | 0.1 | <1 | 13.2 | 33 |
| $PM_{2.5}$ | Annual | 25 | 9.5[(2)] | 0.1 | <1 | 9.6 | 38 | 0.1 | <1 | 9.6 | 38 |
| CO | Max 8-hr | 10000 | 2000.0[(2)] | 17.0 | <1 | 2017.0 | 20 | 20.7 | <1 | 2020.7 | 20 |
| TOC | Annual | 5 | 1.7[(4)] | 0.1 | 2 | 1.8 | 36 | 0.1 | 2 | 1.8 | 36 |
| HCl | Max 1-hr | 100 | 0.5[(4)] | 1.0 | 1 | 1.5 | 2 | 1.6 | 2 | 2.1 | 2 |
| HF | Max 1-hr | 3 | $2.0x10^{-2}$[(1),(4)] | 0.2 | 7 | 0.2 | 7 | 0.3 | 10 | 0.3 | 11 |
| | Annual | 0.3 | $1.0x10^{-2}$[(4)] | $1.3x10^{-2}$ | 4 | $2.3x10^{-2}$ | 8 | $2.7x10^{-2}$ | 9 | $3.7x10^{-2}$ | 12 |
| Dioxins | Annual | N/A | $5.6x10^{-8}$[(4)] | $6.6x10^{-7}$ | N/A | $7.2x10^{-7}$ | N/A | $1.4x10^{-6}$ | N/A | $1.5x10^{-6}$ | N/A |
| Hg | Annual | 1 | $1.0x10^{-3}$[(4)] | $3.3x10^{-4}$ | <1 | $1.3x10^{-3}$ | <1 | $6.9x10^{-4}$ | <1 | $1.7x10^{-3}$ | <1 |
| Cd | Annual | $5.0x10^{-3}$ | $1.0x10^{-3}$[(4)] | $3.3x10^{-4}$ | 7 | $1.3x10^{-3}$ | 27 | $6.9x10^{-4}$ | 14 | $1.7x10^{-3}$ | 34 |
| As | Annual | $6.0x10^{-3}$ | $1.0x10^{-3}$[(4)] | $1.3x10^{-3}$ | 22 | $2.3x10^{-3}$ | 38 | $2.7x10^{-3}$ | 45 | $3.7x10^{-3}$ | 62 |
| V | Max 24-Hour | 1 | $1.0x10^{-2}$[(4)] | $4.9x10^{-2}$ | 5 | $5.9x10^{-2}$ | 6 | $6.8x10^{-2}$ | 7 | $7.8x10^{-2}$ | 8 |

(1) Short term Background Contributions are double the long-term contributions, (2) Background sourced from Environmental Protection Agency Monitoring undertaken at background locations in Zone A, in 2016, (3) Background sourced from Environmental Protection Agency Monitoring at Ringsend (2017 & 2018), (4)Background sourced from 2006 EIAR.

Table 5-2 presents updated impacts at nearby ecologically sensitive receptors for the pollutants of ecological concern ($NO_X$ and $SO_2$). The updated results also include consideration of Ammonia ($NH_3$), which was not included in the 2006 EIS.

Table 5-2 suggests that impacts at the worst affected ecologically sensitive location are relatively minor (PC <5% of EAL), but does show that annual mean concentrations (PEC) of $NO_X$ exceed the air quality Limit Value for this pollutant, because of elevated background/ambient conditions, which are already in exceedance.

### Table 5-2: Predicted Air Quality Values, Worst Case Ecological Site Impacts (Irishtown Nature Reserve) (Stack Emissions Only)

| | | | | Worst Case Dublin Airport Met Data (2015 – 2017) | | | | Pigeon House Road Site Met Data (2018) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pollutant | Averaging Period | Environmental Assessment Level (µg/m³) | Background/ Ambient Concentration (µg/m³) | Process Contribution (PC) (µg/m³) | PC % of EAL | Predicted Environmental Concentration (PEC) (µg/m³) | PEC % of EAL | Process Contribution (PC) (µg/m³) | PC % of EAL | Predicted Environmental Concentration (PEC) (µg/m³) | PEC % of EAL |
| $NO_X$ | Annual | 30 | 37.2[(2)] | 1.3 | 4 | 38.5 | 128 | 1.4 | 7 | 38.6 | 129 |
| $NH_3$ | Annual | 3[(1)] | 1.7[(3)] | 0.1 | 3 | 1.8 | 60 | 0.1 | 3 | 1.8 | 60 |
| $SO_2$ | Annual | 20 | 4.8[(4)] | 0.3 | 2 | 5.1 | 26 | 0.4 | 2 | 5.2 | 26 |

[(1)] $NH_3$ EAL based on the standard set by the UK Environment Agency assumed [(2)] Background sourced from Environmental Protection Agency Monitoring undertaken at background locations in Zone A, in 2016, [(3)] Background sourced from Environmental Protection Agency Research (Ambient Atmospheric Ammonia in Ireland, 2013-2014), [(4)] Background sourced from 2006 EIAR.

The impact (Process Contribution) reported in Table 5-1 and Table 5-2 are based on the ELVs as set by the existing IED Licence for the site.

The concentrations reported in Table 5-1 and 5-2 are also considered to be conservative, in that stack monitoring undertaken at the site reported in Section 3 above confirms that actual emission concentrations and mass flows are significantly less than those described in the IE Licence. The monitored emission concentration of HCl, for example, accounts for less than 1% of the licenced emission concentration for that pollutant. The monitored emissions concentrations for $PM_{10}$, Cd, Hg, Heavy metals, HF, $SO_2$, TOC, CO and Dioxins and Furans account for less than 10% of the relevant licenced emission concentrations. The monitored emission concentration of $NO_X$ accounts for 72% of its licenced emission concentration. Stack monitoring suggests that the volumetric flow rate is also lower than licenced, accounting for 86% of that value.

# 6. Conclusions

AECOM has reviewed emissions data from the DWtE facility for 2017, 2018 and 2019 and concluded that emissions to air are well below the ELVs in the sites IE Licence. The data indicates a waste to energy plant operating well within its design envelope with regard to capacity and also generating emission to air well below those anticipated and modelled in 2006 as part of the air quality impact assessment.

AECOM has remodelled emissions to air from the DWtE facility using both updated meteorological data from Dublin Airport (2015 – 2017) and site-specific data from the Pigeon House Road site (2018), using the latest version of the relevant dispersion modelling software ADMs 5. The model also assumed "*worst-case*" emissions at the licensed ELVs and mass flows rather than actual mass-flows.

The modelling results with respect to emissions to air from the DWtE stacks indicate that the worst-case direct air quality impact is *not significant* with the process contribution for most parameters less than 5% of the relevant EAL. The predicted levels for some of the metals (Cd, As and V) are higher. However, emission monitoring indicates emissions of these metals are very low and considerably below the relevant ELVs. Consequently, the metals impacts can again be considered to be *not significant* or *imperceptible*. The worst-case $NO_2$ process contribution is approximately 20% of the 1-hour average EAL.

# Appendix A 1



**Figure A-1: Annual Mean $NO_2$ Process Contribution (Dublin Airport Meteorological Data 2017)**


**Figure A-2: Annual Mean $NO_2$ Process Contribution (DWTE Meteorological Data 2018)**




**Figure A-3: 1hr Mean $NO_2$ Process Contribution (Dublin Airport Meteorological Data 2018)**

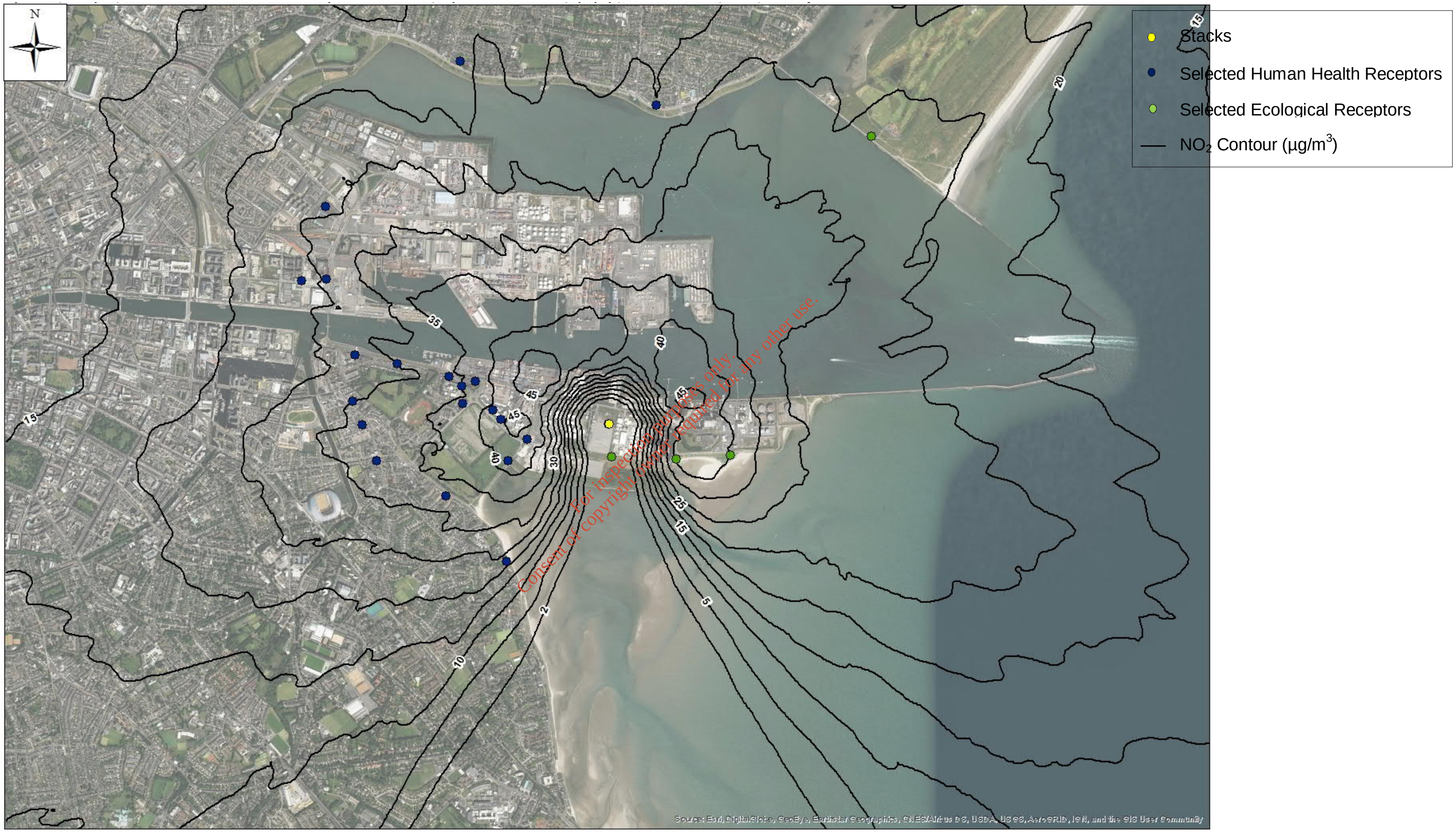


**Figure A-4: 1hr Mean $NO_2$ Process Contribution (DWTE Meteorological Data 2018**

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