Dublin Waste to Energy

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Ms. Jennifer Cope, /Mr. Brian Duggan,
Office of Environmental Enforcement,
Environment Protection Agency,
Richview,
McCumisky House,
Clonskeagh
Dublin 14.

02/09/2022 Reg. No.: W0232-02

Regulation 10(2)(b)(ii) of the EPA (Industrial Emissions) (Licensing) Regulations 2013, in respect of a licence review from Dublin Waste to Energy Limited for an installation located at Dublin Waste to Energy Limited, Pigeon House Road, Poolbeg Peninsula, Dublin 4, Dublin, D04N2P2

Dear Ms. Cope,

Dublin Waste to Energy Limited hereby responds to the request for additional information with respect to the license review application W0232-02. Please see attached response.

If you require anything further, please do not hesitate to contact the undersigned.

Yours Sincerely,

Mark Heffernan,
Environmental Manager,
Covanta Europe Operations Limited,
For and on behalf of
Dublin Waste to Energy Limited.

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Project name:

Project ref:
Project number 60587300

From:
Peter Hassett

Date:
02 September 2022

To:
Mr. Mark Heffernan
Regional Environmental Manager (Europe)
Dublin Waste to Energy Limited
Pigeon House Road
Dublin 4
D04 N2 P2

CC:

Memo

Subject: EPA Request for Further Information dated 06-July-2022, IE Licence reference: W0232-02. Application Reference LA003577

Dear Mr. Heffernan

As follows are responses to the EPA request for further information in the EPA letter dated 06-July-2022 requested under Regulation 10(2)(b)(ii) of the EPA (Industrial Emissions)(Licensing) Regulations 2013.

Each of the EPA requests are set out followed by a response.

Surface Water

1. *Complete Section 7.2 Emissions to Surface Water Attachment of the EPA licence application form.*

Response:

A completed Attachment 7.2 Emissions to Surface Water Attachment is presented in Appendix A to this memo. The attachment is completed for the cooling water discharge SW-1. There are no other discharges to surface water from the Dublin Waste to Energy (DWtE) activity at Pigeon House Road.

2. *According to section 4.6 of the application form DWtE propose to abstract surface water for use at the installation, however in attachment 4.6.1 Water and Energy Usage, no details are provided as to the current or future usage of surface water abstraction (m^3/year). Please provide current and future usage of surface water abstraction (m^3/year).*

Response:

Surface water is abstracted for non-contact cooling, i.e., condensation of steam in a condenser associated with the steam turbine, and is returned to source. The abstraction location and quantity abstracted is registered with the EPA through the Water Abstraction registration portal on EDEN registration reference number R00181.

Current annual surface water abstraction, based on 8,688 hours approx. of operation per year and at a maximum rate of 14,040 m^3/hr, is 121,979,520 m^3/year. This will not change in future years.

An updated Attachment 4.6.1- Water and Energy Usage is presented in Appendix B.

Air Emissions

3. *Complete Section 7.4.1 Emissions to Atmosphere – Minor and Potential Emissions Attachment of the EPA licence application form.*

Response:

A completed Attachment 7.4.1 Emissions to Atmosphere – Minor and Potential Emissions is presented in Appendix C to this memo.

4. *Provide a simple or detailed odour assessment to confirm the impact of odour emissions*

Response:

The following assessment points are raised:

- The design of the DWtE facility is such as to prevent the potential for nuisance odour emissions. Details of the odour prevention are set out in a DWtE document called "Odour and Dust Abatement Document", dated 21-April-2017 and previously submitted to the Agency and was approved by the EPA (refer Appendix D to include EPA response notice reference LR028568). In summary, all operations with the potential to create odour, including waste intake, waste storage, bottom ash storage, chemical storage and residue handling, occurs within the building footprint. These building operational areas are designed with a negative air pressure internally. The resulting air flow is used as combustion air (primary and secondary) for the waste combustion process and therefore prevents odour emissions. The negative air flow design was demonstrated to the EPA during commissioning of the facility.
- DWtE maintains a weekly 'odour patrol' at various points around the licensed site boundary. A blank template record sheet for the weekly odour patrols is presented in Appendix E.

5. *Air dispersion model:*
    a. *Provide the model input source data, actual emission rate (g/s), actual temperature, stack height, stack co-ordinates, actual volume flow (m^3/s) and exit (Efflux) velocity (m/s).*
    b. *Rerun the air dispersion model to include five years of met data in line with the EPA Air Dispersion Modelling Guidance Note (AG4) 2020 (AG4).*
    c. *Provide the model results in graphical format and isopleths.*
    d. *Provide model input building data – building elevations, heights, layout and nearby buildings greater than 40% of stack height.*
    e. *Provide an assessment of the highest predicted environmental concentration based on 75% flow rate in line with AG4.*
    f. *Provide a cumulative assessment of the impact of industrial installations/waste facilities emissions sources in the region.*
    g. *Provide an assessment of the impact of emissions during abnormal operations compared to air quality standards.*
    h. *Confirm whether fumigation was accounted for in the air dispersion modelling and if not rerun the model to take account of fumigation.*

Response:

A revised air dispersion model is presented in Appendix F entitled "Dublin Waste to Energy, RFI Response to Air Quality Assessment". The report in Appendix F addresses each of the above points raised by the EPA.

6. *Confirm the location of the weather monitoring station agreed with OEE under Condition 3.2 of the current licence W0232-01*

Response:

The weather monitoring station is located at the GPS Irish Grid Reference E 319899, N233691 on the site. The location of the weather station was originally submitted and agreed under license return LR025185 on 10/10/2016 (refer Appendix G).

7. *Attachment 7.4.1 Emissions to Atmosphere – Main and Fugitive Emissions Attachment.*

   a. *In the waste gas emissions table, it is proposed to reduce the monitoring frequency of antimony (as Sb), arsenic (as As), lead (as Pb), chromium (as Cr), cobalt (as Co), copper (as Cu), manganese (as Mn), nickel (as Ni) and vanadium (as V) and their compounds from quarterly to once every six months. Please provide justification for the proposed reduction in monitoring frequency, including monitoring data to support this proposal.*

   b. *Confirm whether the SNCR is operated on urea, if yes provide the proposed monitoring frequency of nitrous oxide (N_2O) and the proposed monitoring and analysis method to monitor channelled emissions to air. Include monitoring data in support of the response.*

   c. *It is noted that in Revised Attachment 4.7.2 Waste Incineration BAT of the application form that DWtE proposes that it is not required to monitor ammonia in the flue gases. However, in attachment 7.4.1 Emissions to Atmosphere it is proposed that the monitoring frequency for ammonia be continuous. Please confirm whether a derogation under Section 86A(6) of the EPA Act 1992 as amended is being sought and the specific reasons for such derogation. I refer you to the EPA (2016), Draft Guidance on Article 15 of Industrial Emission Directive (2010/75/EU) for your reference.*

Response:

- **Point a**. The request to reduce frequency of metals indicated in Point a. above is consistent with the minimum monitoring frequency (once every 6 months) indicated in BAT 4 of CID 2019/2010 on wase incineration. The table in BAT 4 of the CID for these metals also refers to BAT 25 related to techniques for the reduction of channelled emissions to air of dust, metals and metalloids from the incineration of waste. The DWtE plant is compliant with BAT 25. In addition, a summary of monitoring data for metals for the past 5 years is set out in Table 1:

Table 1. Summary Heavy Metals Flue Gas Monitoring Data, 5 Years

Parameter	Units	EPA License Limit	A2-1	A2-1	A2-1	A2-2	A2-2	A2-2
			Average	Maximum	Minimum	Average	Maximum	Minimum
Heavy Metals (sum of Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V)	mg/m³	0.5	0.031033	0.159	0.005	0.039	0.207	0.0046

Source: DWtE Monitoring Reports

- **Point b**. Urea is not used in the selective non-catalytic reduction (SNCR) system. Instead, ammonia water (NH_4OH) is injected. Furthermore, the incineration process is not based on fluidised bed technology and consequently, monitoring of N_2O is not required as per BAT 4.
- **Point c**. DWtE wishes to clarify that monitoring for ammonia is not required in the current licence W0232-01., If required under the terms of the revised IE licence, continuous monitoring for ammonia will be undertaken. DWTE can confirm that no derogation is being sought.

8. *Attachment 4.7.2 Waste Incineration BAT of the application form*

   a. *It is noted that it is proposed to measure mercury (Hg) quarterly at the installation and within the minimum period set out in footnote (5) to BAT 4 in the WI CID. Please provide evidence including monitoring data to demonstrate that the wastes incinerated at the installation have a low and stable mercury content.*

   b. *Provide evidence, where available that emissions of dioxin-like PCBs emission levels are proven to be sufficiently stable in line with BAT 30 of the WI CID and that the channelled emissions of dioxin – like PCBs are proven to be less than 0.01 ng WHO-IEQ/Nm3 in line with BAT 4 and therefore monitoring of dioxin – like PCBs does not apply.*

Response:

- **Point a**. a summary of monitoring data for mercury (Hg) for the past 5 years is presented in Table 2 to support the proposed periodic (quarterly) monitoring frequency for Hg in flue gases and demonstrating low and stable mercury content.

Table 2. Summary Mercury Flue Gas Monitoring, 5 Years

Parameter	Units	EPA License Limit	A2-1	A2-1	A2-1	A2-2	A2-2	A2-2
			Average	Maximum	Minimum	Average	Maximum	Minimum
Mercury	mg/m³	0.05	0.0007825	0.00292	0.00027	0.000905	0.0037	0.00023

Source: DWtE Monitoring Reports

- **Point b**. Detail on DWtE adherence to BAT 30 of CID 2019/2010 is provided on pages 45 and 46 of the revised Attachment 4.7.2-Waste Incineration BAT Assessment submitted with the IE licence review application. Monitoring for dioxin-like PCBs is not available as it is not a current licence requirement. However, DWTE propose to monitor for dioxin like PCB's as per the BAT 4.0 requirements (Note 8).

Waste

1. Confirm whether there will be an increase in incinerator bottom ash, boiler ash and air pollution control residues.

Response

A summary of the quantities of waste residues removed from thermal treatment activities at the DWtE facility for the years 2017 through to 2021 inclusive are presented in Table 3. It is envisaged that the increase in residue production will be relative to the amount of waste processed. Increases in residues will be in the region of approximately 16,500 tonnes of incinerator bottom ash (19 01 12), Air Pollution Control Residues (19 01 07*) 3,750 tonnes and boiler ash (19 01 15*) 100 tonnes.

A revised Attachment 8-1- Waste Generated to reflect the above is presented as Appendix H.

Table 3. Summary of Thermal Treatment Waste Residues

Year	19 01 12 (tonnes)	19 01 07* (tonnes)	19 01 15* (tonnes)	Waste Processed (tonnes)
2017	38,159	9,527	-	272,483
2018	104,061	26,179	636	599,421
2019	117,748	28,586	848	605,092
2020	115,057	28,962	809	603,581
2021	108,568	25,124	277	598,547
Future years(approx.)	134,500	32,750	1,000	

Source: DWtE

2. *Provide details on the existing abatement and its capacity to handle the proposed increase in waste to be accepted at the installation. Confirm that there is sufficient storage at the installation for the raw materials, intermediates and products used or generated on the site and waste.*

Response

The existing abatement system has sufficient capacity as has been shown previously with high monthly tonnages processed. In addition there will be no significant increase in air flow rates per hour through the plant (and will not exceed current maximum licensed air flow rates). There is also sufficient storage at the facility for raw materials, intermediates and products used as there will be no material increase in consumption rates per hour. A summary of significant materials storage is set out in Appendix I.

3. *Provide details on what are the main waste sources, including list of waste codes to be increased and accepted (municipal and commercial & industrial waste) at the installation. It is noted that it is proposed to increase the commercial and industrial waste from 100,000 tonnes per annum (tpa) to 150,000 tpa. It is proposed to increase the municipal waste from 500,000 tpa to 540,000 tpa (with the maximum annual quantity to be accepted to not need exceed 690,000 tpa)?*

Response

Waste received at the DWTE facility is predominately from the Greater Dublin region with waste also supplied from other facilities in Leinster and to a lesser extent nationally. Waste is delivered by permitted waste contractors who have waste supply agreements with DWTE. Waste received is residual municipal solid waste with lesser amounts of commercial and industrial waste also delivered. It is proposed that the revised Schedule A.1 to IE licence W0232-0 as shown in Table 4 allows the required flexibility based on projected deliveries. The total amount of waste received will not exceed 690,000 tonnes per annum.

Table 4. Proposed Revised Schedule A.1.

Maximum annual quantity to be accepted shall not exceed: 690,000 tonnes

Waste Type	European Waste Catalogue (EWC)[Note 1]						Maximum Annual Tonnage [Note 3]
Non-hazardous Residual Waste Mixed Municipal Waste [Note 1]	20 03 01						600,000
Wastes from Markets	20 03 02						
Street Cleaning Residues	20 03 03						
Bulky Waste	20 03 07						
Wastes from Aerobic Treatment of solid waste [Note 2]	19 05 01						
Sludges from treatment of urban waste water [Note 4]	19 08 05						
Combustible waste (refuse derived fuel) [Note 2]	19 12 10						25,000
Commercial & Industrial Wastes [Note 5]	02 01 01	02 01 02	02 01 03	02 01 04	02 01 06	02 01 07	100,000
	02 01 09	02 01 99	02 02 01	02 02 02	02 02 03	02 02 04	
	02 02 99	02 03 01	02 03 02	02 03 03	02 03 04	02 03 05	
	02 03 99	02 04 03	02 04 99	02 05 01	02 05 02	02 05 99	
	02 06 01	02 06 03	02 06 99	02 07 01	02 07 02	02 07 03	
	02 07 04	02 07 05	02 07 99	03 01 01	03 01 05	03 01 99	
	03 02 99	03 03 01	03 03 02	03 03 05	03 03 07	03 03 08	
	03 03 10	03 03 11	03 03 99	04 01 01	04 01 02	04 01 07	
	04 01 09	04 01 99	04 02 99	04 02 10	04 02 15	04 02 17	
	04 02 20	04 02 21	04 02 22	04 02 99	05 01 10	05 01 13	
	05 01 99	05 06 99	05 07 99	06 01 99	06 02 99	06 03 99	
	06 04 99	06 05 03	06 06 99	06 07 99	06 08 99	06 09 99	
	06 10 99	06 11 99	06 13 03	06 13 99	07 01 12	07 01 99	
	07 02 12	07 02 13	07 02 15	07 02 17	07 02 99	07 03 99	
	07 04 12	07 04 99	07 05 12	07 05 14	07 05 99	07 06 12	
	07 06 99	07 07 12	07 07 99	08 01 12	08 01 14	08 01 16	
	08 01 18	08 01 20	08 01 99	08 02 01	08 02 02	08 02 99	
	08 03 07	08 03 08	08 03 13	08 03 15	08 03 18	08 03 99	
	08 04 10	08 04 12	08 04 14	08 04 16	08 04 99	09 01 07	
	09 01 08	09 01 10	09 01 99	10 01 21	10 01 99	10 02 15	
	10 02 99	10 04 99	10 05 99	10 06 99	10 07 99	10 08 99	
	10 09 99	10 10 99	10 11 18	10 11 99	10 12 13	10 12 99	
	10 13 99	11 01 10	11 01 99	11 02 99	11 05 99	12 01 05	
	15 01 01	15 01 02	15 01 03	15 01 04	15 01 05	15 01 06	
	15 01 07	15 01 09	15 02 03	16 01 03	16 01 19	16 01 20	
	16 01 22	16 01 99	16 02 16	16 03 04	16 03 06	16 07 99	
	17 02 01	17 02 02	17 02 03	17 06 04	18 01 04	18 01 07	
	18 01 09	18 02 08	19 02 03	19 02 06	19 02 10	19 02 99	
	19 05 02	19 05 03	19 05 99	19 06 04	19 06 06	19 06 99	
	19 08 01	19 08 09	19 08 12	19 08 14	19 08 99	19 09 01	

	19 09 02 19 09 03 19 09 04 19 09 05 19 09 06 19 09 99 19 10 04 19 10 06 19 11 06 19 11 99 19 12 01 19 12 02 19 12 03 19 12 04 19 12 05 19 12 07 19 12 08 19 13 02 19 13 04 19 13 06 20 01 01 20 01 08 20 01 10 20 01 11 20 01 25 20 01 28 20 01 30 20 01 32 20 01 38 20 01 39 20 01 40 20 01 41 20 01 99 20 02 01 20 02 03 20 03 04 20 03 06 20 03 99	
Waste from Mechanical Treatment of Waste Note 2	19 12 12	150,000

Note 1: See IE licence Glossary of terms
Note 2: Derived from the treatment of the residual fraction of mixed municipal waste
Note 3: The individual limitation on waste streams may be varied with the Agreement of the Agency subject to the overall total limit of 690,000tonnes staying the same.
Note 4: Annual tonnage shall not exceed 10,000 tonnes. This may be increased to a maximum of 80,0000 tonnes annually subject to the submission of a detailed assessment report to the Agency and written approval of the Agency.
Note 5: Annual tonnage shall be limited to 12,000 tonnes per individual waste code. This may be increased with the written agreement of the Agency.

Other Document Updates

Storm Water

DWtE has attached a proposed amended Attachment 7-7-1- Storm Water Emissions document as Appendix J. The original Attachment 7-7-1 submitted to the EPA in 2019 contained trigger limit values for emissions of storm water from the DWtE facility which are not relevant as the storm water overflow from the site attenuation pond flows to the Ringsend Municipal Waste Water Treatment Plant.

Site Plan

To reflect changes to minor and potential emissions Attachment 7-4-2 (refer Appendix C), a revised Site Layout is presented in Appendix to include the location of minor and potential emission points.

This response to the EPA Regulation 10 request for further information dated 06-July-2022, and associated Appendices contained in this response, does not materially change the information provided to the EPA in other IE licence W0232-02 application documentation.

Quality information

Prepared by	Checked by	Verified by	Approved by
Peter Hassett Technical Director	Fergus Hayes Contract Environmental Consultant Truc Vo Senior Environmental Consultant	Peter Hassett Lead Verifier	Shauna Woods Project Director

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Appendix A : Completed Attachment 7.2 Emissions to Surface Water

EPA Application Form

7.2 - Emissions to Surface Water - Attachment

Organisation Name: *	Dublin Waste to Energy Limited
Application I.D.: *	LA003577

* indicates required field

Amendments to this Application Form Attachment

Version No.	Date	Amendment since previous version	Reason
V.1.0	July 2017	N/A	Online application form attachment
As above	Mar 2018	Identification of required fields	Assist correct completion of attachment

Emissions to Surface Water

This part of the application form collects data on waste water emissions to surface water.

Please note that the emission limit values and monitoring requirements specified in a licence, if granted, shall be based on the information supplied hereunder. (Details of discharges to storm water are NOT to be entered here but should be included in tab 7.7 of the application form (Discharges to Storm Water).

Waste Water to Surface Water - Emission Point Details - one row per emission point * (see Note i at end of this attachment)

(Details for discharges to storm water are NOT to be entered here)

Emission Point Code [1]	What is the Emission Source?	Easting [2] (6 digit)	Northing [3] (6 digit)	Typical Days Usage/ Year	Measures to reduce /minimise / prevent emissions (list techniques) *Where EQS considerations require measures stricter than BAT, highlight these measures in bold*	Type of Receiving Water [4]	Receiving Water Code *(or name where no code is available)*
SW-1	Cooling Water Discharge	320045	233780	360	Continuous monitoring as per license of residual Chlorine, flow and temperature	Estuary	IE_EA_090_0300 Liffey Estuary Lower

* add rows to the table as necessary

[1] The following convention should be observed when labelling emission points to surface water:
SW1, SW2, etc.

[2] Six Digit GPS Irish National Grid Reference

[3] Six Digit GPS Irish National Grid Reference

[4] Type of Receiving Water options: ‘River’, ‘Ditch’, ‘Estuary’, ‘Lake’, ‘Land Drain’ or ‘Other’ (where ‘Other’ is selected please enter a description)

Waste Water to Surface Water - Emission Monitoring Points (See Note ii at end of this attachment)

Complete the table below for each emission point, by entering the Emission Point Code, the associated Monitoring Point Code and the grid reference of the Monitoring Point(s) *.

Emission Point Code	Monitoring Point Code	Monitoring Point Grid Reference	
		Easting [5]	Northing [6]
SW-1	M-SW-1	320043	233765

* add rows to the table as necessary

Note: Map(s)/drawing(s) uploaded under 'Site Plans' in Tab 3 of the application form should identify the emission and monitoring points.

[5] Six Digit GPS Irish National Grid Reference
[6] Six Digit GPS Irish National Grid Reference

Waste Water to Surface Water – Emissions (See Note iii at the end of this attachment)

Complete the table below for each emission point (include one row for each identified parameter) *

Emission Point Code	Parameter	Monitoring Point Code	Proposed Emission Limits					BAT Associated Emission Range (if applicable)	Sampling / Monitoring			
			Max Hourly	Max Daily	Average Month	Average Annual	How was the Emission Limit Derived?		Proposed Monitoring Frequency	Sample Method	Analysis Method and Technique	Compliant with BAT Monitoring Requirement?
SW-1	Flow rate	SW-1	14040	570000	-	-	Current IE licence		Continuous	Flow meter		Yes
SW-1	Change in Temperature ΔT	SW-1	$9.0^{\circ}C$ relative to intake. No temperature value, calculated as an hourly average, shall exceed the emission limit value by more than $0.5^{\circ}C$				Current IE licence		Continuous	Temperature Probe		Yes
SW-1	Total Residual Chlorine (as HOCl)	SW-1	0.5 mg/l	0.2 mg/l	-	-	Current IE licence		Concentration and Interval	Continuous Residual Chlorine Monitor as per license		Yes

* add rows to the table as necessary

Note i Complete the following table for each emission point having regard to the guidance hereunder.
The following convention should be observed when labelling emission points: Surface water SW1, SW2, etc.,
A National Grid Reference (12 digit, 6E, 6N) must be given for each emission point.
Describing the source of the emission helps explain the nature of the emission such as process or contaminated run-off etc.
Measures are usually required to reduce, minimise or prevent emissions from occurring. They may involve the application of a single technique or a combination of techniques including process integrated, recovery, abatement and treatment techniques. List all techniques proposed/employed. Technique(s) employed must comply with BAT. Highlight additional measures required for the purposes of protecting the environment, i.e., EQS considerations. The measures or techniques to be taken must be capable of complying withthe proposed/known emission level(s).
The measures required shall be informed by the following:

1. BAT techniques with BAT-AEL
2. BAT techniques without BAT-AEL
3. Stricter measures/techniques than BAT (due to EQS)
4. BAT determined by competent authority in consultation with the applicant
5. Measures to minimise pollution over long distances or in the territory of other states.
6. Emerging techniques
7. Less strict measures than BAT (due to derogation)
8. Other measures

Note ii An individual record (i.e., row) is required for each monitoring and sampling point. A National Grid Reference (12 digit, 6 Easting, 6 Northing) must be given for each monitoring point.

Note iii Complete the following table for each emission point having regard to the guidance hereunder.
Characterise the emissions (identify the parameters) under normal operation. The parameters also cover volumes and rates of emission. Those substances which are likely to be emitted in significant quantities, having regard to their potential to transfer pollution from one medium to another must be identified and the applicant must determine emission levels having considered the following:

To identify the chemical parameters:

1. substances listed in the Schedule of EPA (Industrial Emissions)(Licensing) Regulations 2013, S.I. No. 137 of 2013,
2. IED chapters III, IV, V VI where relevant
3. The fate of materials/substances, intermediates, products and by products used or produced through the process particularly substances of very high concern, substances carrying the Hazard statement H400 to 413 (hazardous to the aquatic environment) and hazardous substances with damaging effects on sensitive plants and ecosystems.
4. Any reaction substances likely to appear as a result of treatment or natural breakdown processes with damaging effects on sensitive plants and ecosystems.
5. any substances with the potential to cause odour nuisance off site.

6. List I and List II substances listed in the Annex to EU Directive 2006/11/EC (as amended).

To determine the emission levels:
The applicant must consider the following:
1. Decision(s) on BAT conclusions /conclusions on Bat (BREF)/ EPA BAT guidance notes
2. Other BAT determined in consultation
3. Environmental quality standards and objectives
4. Measures or controls identified in a pollution reduction plan for the river basin district prepared in accordance with Part V of the EC Environmental Objectives (Surface Waters) Regulations 2009 for the reduction of pollution by priority substances or the ceasing or phasing out of emissions, discharges and losses of priority hazardous substances.
5. If relevant, the Urban Waste Water Treatment Regulations 2001 (S.I. No. 254 of 2001) as amended by the Urban Waste Water Treatment (Amendment) Regulations 2004 (S.I. No. 440 of 2004) or any further amendment thereof
   The applicant is wholly responsible for a true and accurate description of the emission. Any person who gives to the Agency information which is false or misleading in a material respect is guilty of an offence.

   The applicant must provide the basis upon which the emission level was determined. There are five categories as follows:
   a. Emission levels based on BAT
   b. Emission levels that are stricter than BAT due to the EQS
   c. Temporary Emissions levels associated with an emerging technique (less strict than BAT)
   d. Emission levels based on a derogation (less strict than BAT)
   e. Emission levels for other substances based on EQS

   Monitoring requirements must be in line with any conclusion on monitoring as described in the decision on BAT conclusion/ BAT conclusion/ BAT guidance.

Appendix B : Updated Attachment 4.6.1-Water and Energy Usage

EPA Application Form

4. Activity and Capacity

4.6.1 - Water and Energy Usage - Attachment

Organisation Name: *	Dublin Waste to Energy Limited
Application I.D.: *	LA003577

* indicates required field

4. Activity and Capacity

4.6. Water and Energy Usage

Water Usage

Complete the table below with summary details of current and proposed maximum water usage
(The following table contains additional guidance for certain fields where you see the small red triangle in the cell. To view the guidance simply hover over the cell).

Water Type	Current Usage Per Calendar Year (m3/yr) *	Future Usage Per Calendar Year if Authorisation Granted (m3/yr) *
Groundwater Abstraction	0	0
Surface Water Abstraction	121,979,520	121,979,520
Public Supply	50,000	50,000
Other	Rainwater 20000	Rainwater 20000
Total	122029520	122029520

Energy Usage

Electricity Usage

Complete the table below with summary details of current and proposed electricity usage
(The following table contains additional guidance for certain fields where you see the small red triangle in the cell. To view the guidance simply hover over the cell).

Electricity type	Current Usage Per Calendar Year (MWH) *	Future Usage Per Calendar Year if Authorisation Granted (MWH) *
Electricity Purchased	2,500	2,500
Total Renewable Electricity Generated and Used at the Site	530,000	610,000
Total Non-Renewable Electricity Generated and Used at the Site	-	0
Total Electricity Generated and Used	530,000	610,000
Total Electricity Used	532,500	612,500

* indicates required field

Describe the types of renewable enery being generated (if applicable)

Boilers are fueled by non hazardous waste (MSW) producing steam which drives a Steam Turbine coupled directly to a generator. The plant is also built with large district heating capability.

Are you using wind turbines at the installation/facility for renewable energy? (Yes/No) * No

Are you exporting energy generated at the installation/facility to the grid? (Yes/No) * Yes

Amount of generated electricity exported (MWHrs) 475,000

Thermal Energy Consumption

Complete the table below with summary details of current and proposed electricity usage.
(Select the 'Fuel Type' from the dropdown list, select 'm^3' or 'Tonnes' in the 'Unit' column and enter the annual usage)

Fuel Type	Amount Used Annually	Unit
Waste	600000(current)	tonnes
Heavy Fuel Oil	2115.5 (current)	m3
Waste	690000(proposed)	tonnes
Heavy Fuel Oil	2000 (proposed)	m3

Appendix C : Attachment 7.4.1 Emissions to Atmosphere – Minor and Potential Emissions

EPA Application Form

7.4.2 - Emissions to Atmosphere - Minor and Potential Emissions - Attachment

Organisation Name: *	Dublin Waste to Energy Limited
Application I.D.: *	LA003577

Amendments to this Application Form Attachment

Version No.	Date	Amendment since previous version	Reason
V.1.0	July 2017	N/A	Online application form attachment
As above	Mar 2017	Identification of required fields	Assist consistent completion of attachment

EMISSIONS TO ATMOSPHERE

Emissions to air/atmosphere include the following:

Main Emissions

Main emissions include all emissions of environmental significance. Where a mass emission threshold is specified in a BAT document (BAT Conclusions, National BAT note or BREF), emissions which exceed this threshold prior to abatement are regarded as significant, i.e., 'main emissions'. (In some cases emissions below the threshold can still be significant and qualify as Main Emissions).

Minor Emissions

Emissions below the mass emission threshold may be considered minor emissions and therefore do not generally need to be specifically controlled by the conditions or schedules of the licence (i.e., setting of ELVs, abatement control measures, or monitoring requirements). Emissions may also be deemed minor by virtue of their source/nature (e.g., laboratory fume hoods, workspace extractions, passive vents from storage tanks, HVAC exhausts), or composition (e.g., water vapour emissions).
For combustion plant such as boilers, these can be considered minor where the rated thermal input is < 1MW where natural gas is the main fuel, and for liquid and solid fuels where its < 250kW.

Fugitive Emissions

Fugitive emissions include emissions from non-point sources and diffuse sources.

Potential Emissions

These are emissions which only operate under abnormal process conditions. Typical examples include bursting discs, pressure relief valves, and emergency generators. Bypasses and flares may also fall within this category, depending on how they are operated or designed to operate. Although the Agency does not normally set controls in licences for potential emissions, it may do so for the purposes of environmental protection.

This attachment collects information on main and fugitive emissions to atmosphere. Waste gas means the final gaseous emission from a stack or abatement equipment.

For main and fugitive emissions to atmosphere, complete the separate '*Emissions to Atmosphere - Main* and *Fugitive Emissions'* attachment.

EMISSIONS TO ATMOSPHERE - Minor Emissions - one row per emission point

In completing this attachment for minor emissions, the applicant should supply sufficient information to justify the determination of the emission as minor. Notwithstanding the guidance provided on minor emissions, the Agency may consider any emission to be significant (i.e., a main emission) on the basis of environmental impact.

Complete the table below with summary details for all minor emission points to atmosphere.

Emission Point Code [(1)]	Easting [(2)]	Northing [(3)]	Description of source of emission(s)	Emission details [(4)]				Abatement system employed (if relevant)
				Parameter/ Material	$mg/Nm^{3(5)}$	kg/h	kg/year	
A3-1	319922	233568	HVAC -Building ventilation from administration building	Air / moisture	n/a	n/a	n/a	Not applicable

*add rows to the table as necessary

Note: Map(s)/drawing(s) uploaded under 'Site Plans' in Tab 3 of the application form should identify the emission and monitoring points.

(1) The following convention should be observed when labelling minor atmospheric emission points: A3-1, A3-2, A3-3,...etc.
(2) Six Digit GPS Irish National Grid Reference.
(3) Six Digit GPS Irish National Grid Reference.
(4) The maximum emission should be stated for each parameter emitted; the concentration should be based on the maximum 30 minute mean and must be the PRE-ABATEMENT level.
(5) Concentrations should be based on Normal conditions of temperature and pressure, (i.e. 0oC101.3kPa). Wet/dry should be clearly stated. Include reference oxygen conditions for combustion sources.

EMISSIONS TO ATMOSPHERE – Potential Emissions to Atmosphere

Potential emissions are emissions that are not active under normal operation and would include by-passes or pressure relief valves.

Complete the table below with summary details of all potential emissions to atmosphere

Emission Point Code [6]	Description of source of emission	Malfunction which could cause an emission	Emission details (Potential max. emissions) [(7)]		
			Parameter/Material	mg/Nm^3	kg/hour
A4-1 (Note 1)	Site Emergency Diesel Generator	Loss of power to the licensed activity	Nitrogen Oxides (NOx) Sulphur Oxides (SOx) Carbon Monoxide (CO) Total Organic Carbon Total Particulate Matter	1890 170 220 45 150	17 4.1 2 0.4 3.6
A4-2	Pressure relief valve	Loss of power /turbine trip	Steam	-	-
A4-3	Pressure relief valve	Loss of power/turbine trip	Steam	-	-

*add rows to the table as necessary

Note 1: Originally labelled in the application for IE licence W0232-01 as A2-3. Re-labelled here to be consistent with EPA nomenclature for potential emission points

[6] The following convention should be observed when labelling potential atmospheric emission points:
A4-1, A4-2, A4-3,...etc.

[7] Estimate the potential maximum emission for each malfunction identified.

Appendix D : Odour and Dust Abatement Document (21-April-2017) and EPA Approval Notice, reference LR028568

Dublin Waste to Energy

Odour and Dust Abatement Document

By

M. Heffernan

Environmental Manager

Dublin Waste to Energy Limited

Dated: 21st April 2017

Table of Contents

Dublin Waste to Energy Odour and Dust Abatement Document

1.0 Introduction

This document outlines the measures for the control of odours and dust emissions from the Dublin Waste to Energy facility. Industrial Emissions license W0232-01 condition 3.10 states the following:

"Prior to the date of commencement of the waste activities at the facility, the licensee shall install and provide adequate measures for the control of odours and dust emissions, including fugitive dust emissions from the facility. Such measures shall at a minimum include the following:

"Installation and maintenance of negative pressure at the waste reception, waste bunker, waste storage and incinerator residue storage/loading areas of the incineration plant to ensure no significant escape of odours or dust"

Condition 8.9 also states the following:

"hazardous boiler ash and flue gas cleaning residues shall be stored at dedicated areas within enclosed structures (incorporating dust curtains or equivalent approved, and vented through self- cleaning filters) or sealed bins on concrete hard standing with contained drainage"

The following pages outline the odour and dust abatement systems in place to ensure that both odour and dust emissions do not migrate outside of the facility.

Waste Handling Practices

When the waste arrives at the facility it will be logged electronically at the weighbridge. The waste is then tipped and stored in the waste bunker. The bunker will have a capacity of 9,500 tonnes which, at a minimum, will provide for the storage of scheduled waste deliveries for five days. The size of the waste bunker will make mixing of the waste prior to thermal treatment possible. The mixing creates a more homogenous fuel, which is important for an optimum combustion process. In order to ensure maximum availability of plant and the process, two cranes will be installed, each with sufficient capacity to handle the waste in the bunker and to feed both process lines.

Thermal Processing

Waste will be fed to the combustion chamber via a hopper situated above the waste feeding chute. The waste feeding hoppers will be kept filled with solid waste in order to reduce air ingress into the combustion chamber. The waste is fed into the furnace by means of a number of feed rams, which are integrated in the control of the combustion process. The combustion grate, where the incineration of the waste occurs, is of the moving grate type. The moving grate is a well-proven technology.

The boiler is a natural circulation boiler of the horizontal type with three empty vertical passes and one horizontal convection pass with evaporator, superheaters and economisers. The combustion chamber is a fully evaporator-cooled chamber consisting of fully welded, gas proof membrane pipe walls (panels). Primary combustion air is drawn from the waste bunker, thus keeping the waste reception hall and the waste bunker area under negative pressure and preventing the release of odours and dust from these areas. Secondary air is drawn from the top of the boiler house and from the bottom ash extraction area.

The waste feed rate, the supply of primary and secondary combustion air and the grate speed are controlled by an advanced combustion control system which measures flow rate, flue gas oxygen and combustion temperature in order to obtain the best possible operational conditions. A secondary combustion zone will be established after the last combustion air injection. It will be dimensioned in order to comply with the requirements of Article 6 of the *Waste Incineration Directive 2000/76/EEC* regarding flow conditions, residence time and maintaining a temperature of 850° C for two seconds as a minimum in the normal load range and without auxiliary firing.

The boiler will be equipped with light oil auxiliary burners, which will be able to fire the boiler up to 850°C for start-up. The auxiliary burner installation will not be in use under normal operation.

The boiler system has been designed to ensure the simplest possible operation (as well as straightforward monitoring and maintenance). The boiler will be cleaned using a combination of online and offline boiler cleaning techniques to reduce dust residence and accumulation in the boiler and will have a thermal conversion efficiency of >90%.

Energy Recovery

The facility is currently designed to optimise power output. The facility is also designed for district heating purposes and if a district heating system comes into operation this can be implemented with minor modifications to the equipment. The turbine design optimises the power output and thus the electricity supply regime, as no heat supply regime is in place at present. The condenser pressure is minimised using cooling water from the River Liffey thus securing a higher electrical efficiency compared to that obtained with air-cooled condensers and/or wet cooling towers.

The design results in a net power output of approximately 60 MW equivalent to a net power efficiency of approximately 29%.

Flue Gas Treatment

The flue gas cleaning process comprises an active carbon and semi-dry lime scrubbing process followed by particle removal in a fabric filter followed by a two-stage wet scrubbing process. The wet scrubbing process will remove HF, HCl, SO_2 and Hg left from the semi-dry stage. In order to avoid wastewater from the flue gas cleaning process, the small amount of wastewater from the wet process is evaporated in the semi dry scrubber.

The reduction of dioxin takes place by adding activated carbon to the flue gas prior to the fabric filter, where the dioxin and activated carbon is collected together with fly ash and FGT-residues.

The reduction of NO_x from the combustion process will take place in a selective non-catalytic reduction (SNCR) process by injecting ammonia water (NH_4OH) into the first pass of the boiler, ensuring compliance with the *Waste Incineration Directive 2000/76/EEC*.

Site Emissions

A site layout map identifying the locations of all air, wastewater and surface water emission and monitoring points is included in Figure 2 *(note this drawing was prepared in 2007 and there may be slight changes in the site layout)*.

Atmospheric Emissions

The facility will have two separate waste treatment lines and separate stacks for emissions to atmosphere (A2-1 and A2-2). These emission points will be monitored and controlled in accordance with Schedules B and C of the facility IED licence. The maximum permitted discharge from each stack is 275,000Nm^3 per hour (dry) and the average expected discharge is approximately 238,900Nm^3 per hour (dry). Future monitoring and analysis will confirm the actual emissions, once the facility is operational. It is anticipated that these emissions will occur 24/7 once the facility is operational.

There are specific limit values for twelve parameters imposed on the emission including total dust, dioxins/furans, carbon monoxide (CO) and sulphur dioxide (SO_2).

Boiler Emissions

The facility will include an emergency diesel generator and there is one atmospheric emission point associated with the exhaust fumes (A2-3).

The boiler emission points will be monitored for carbon monoxide (CO), nitrous oxides (NO_x), particulates and total organic carbon (TOC).

Fugitive Emissions

It is not anticipated that there will be fugitive particulate emissions to atmosphere from incoming waste, ash or flue gas cleaning consumables. All cleaning, loading, unloading and consumables storage will be internal and as the building will be under negative pressure, any fugitive releases will become part of the combustion air.

Some fugitive emissions of dust may arise from site access roads and general traffic. Roads will be regularly swept and will be wetted in dry periods.

Odour Emissions

Again, as all waste handling will be internal, it is not anticipated that there will be any odour emissions to atmosphere.

Emissions to Sewer

There will be no discharge of process wastewater from the facility. Process wastewaters from the facility, such as boiler blow down, boiler water treatment reject water and scrubber water will be collected for recycling in the flue gas treatment system or used for humidification/cooling of the bottom ash outlet. Wash water discharged to the floor drains in the boiler house, etc. will also be collected and used in the process water recirculation system.

Separate drainage systems will be provided in the facility for foul drainage and for storm water drainage from roofs, roads and parking areas. Surface water run-off will be captured and stored in a 725m^3 underground attenuation tank and reused in the facility process, where possible. Overflow from the attenuation tank will discharge to the combined municipal sewer along Pigeon House Road and into the Ringsend WWTP.

Foul water will discharge to the municipal sewer via emission point SE-1. It is anticipated that the average emission rate will be 15m^3 per day.

In the event of a fire at the facility, the surface water overflow discharge to the public sewer will automatically be shut off. All firewater will be retained in the facility, until the incident has passed and the contents of the attenuation tank have been tested and passed as being within the limits set by the IED Licence. If contaminated, the firewater and rainwater in the attenuation tank will be sent for disposal to the furnace or to an off-site licensed disposal facility.

Emissions to Surface Water

Raw water supply from the River Liffey will be required to cool the steam from the turbine, after which it will be returned to the Port through the outfall channel. The discharged water will have a higher temperature than the receiving water but is not expected to have a significant impact on water in the Port. Hypochlorite is proposed to be added to the cooling water system to prevent marine growth.

Cooling water discharge will be via emission point SW-1 and is limited to 14,040m^3 per hour. The permitted temperature difference (ΔT) between the intake water and the discharged water is limited to 9°C.

Emissions to Ground and Groundwater

There will be no emissions to ground or groundwater from the facility.

Noise Emissions

The noise emissions from the development were predicted using a 3D sound calculation model. The sound power level for some of the noise sources (e.g. stacks and ventilation systems) was based on experienced values from other similar waste-to-energy plants. Other sources (e.g. from delivery trucks) are standard values taken from acoustics tables. The sound power level of the building façade was based on the attenuation values of the material. Depending on the receiver position, various noise sources dominate. In general, low positioned noise sources (i.e. noise from trucks) are likely to dominate at the site boundary and noise sources at high positions (i.e. from stack tops) are likely to dominate in more distant areas.

Emission limit values of 55 dB (A) (L_{eq} (30 minutes)) for daytime and 45 dB(A) (L_{eq}(30 minutes)) for night-time have been applied.

Waste

Waste materials will be accepted at the facility as feedstock for the incineration and energy recovery process. The facility is permitted to accept up to 600,000 tonnes of non-hazardous residual, commercial and industrial waste per year. The permitted waste types (by EWC code) are detailed in Schedule A of the facility IED Licence.

Waste sludge can be accepted at the facility and provision has been made to allow sludge from the neighbouring Ringsend WWTP to be pumped directly to the WtE facility through a pipeline.

Ash and residue will be generated in the incineration process. There will be three main solid waste residues and the anticipated quantities of each are presented in Table 1.0.

Ash Type	Tonnes per Annum
Bottom Ash	135,000
Boiler Ash	3,000
Flue Gas Treatment Residues	24,000
Total	**162,000**

Table 1.0 Estimated ash and residues from facility

Bottom ash is what remains at the end of the grate after the burnout of the waste and is classified as a non-hazardous material. Bottom ash will be stored on-site in the bottom ash bunker and exported for recycling and/or reuse. DWTEL is investigating local alternatives for acceptance of bottom ash material.

Boiler ash is contained in the flue gases from the combustion process and accumulates in the boiler. Depending on its content, the boiler ash will either be stored with the bottom ash (if non-hazardous) or with the flue gas treatment residues (if hazardous), prior to removal offsite for either reuse or disposal overseas.

Flue gas treatment residues are the residues removed from the flue gases in the treatment processes. Flue gas treatment residues will be collected and stored in an enclosed system. The flue gas treatment residue, due to its composition, will be classified as hazardous for transportation and disposal. The residue will be transported offsite in sealed containers for appropriate treatment.

Dublin Waste to Energy

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Powering Today. Protecting Tomorrow.

Emissions Abatement for Waste Bunker and Waste Reception Areas

Odour and Dust control is provided in the Waste Reception Area and Waste Bunker areas with the operation of the Induced Draft (ID) Fans. Once the ID fans are operational the air is drawn from the waste reception and waste storage areas into the primary air duct which supplies air for the combustion process. If the ID fans shutdown or breakdown, the main waste reception entrance door on the ramp can be closed.

Measures provided for the control of odours and dust emissions from the Waste bunker and tipping floor area include the following:

- Primary combustion air is pulled from the waste reception, tipping floor and waste bunker areas.
- All of the primary combustion air is supplied through the single entrance/exit opening where vehicles travel in & out of the Tipping Hall.
- In the event that both combustion units are temporarily off-line and the primary air fans are not operating, a rollup door provided at the Tipping Hall opening is closed.

These measures are adequate to ensure no significant escape of odours or dust from the facility.

The EPA visited the facility on Wednesday 19th April 2017 for a demonstration of the odour and dust abatement systems in the Waste reception and waste bunker areas. This was demonstrated to the Agency using smoke tests on the ramp area and in tipping bay number 3. See Images below of smoke test which demonstrated the direction of air flow towards the duct above the charging floor area. The smoke testing commenced at 16:15 hrs and were competed at 16:35 hrs to the satisfaction of the EPA inspector. See Images 1 and 2 below.

Image 1: EPA Smoke Test in Tipping Bay

Image 2: EPA Inspector witnessing Smoke Test on Ramp at Dublin Waste to Energy 19th April 2017 at 16:15hrs.

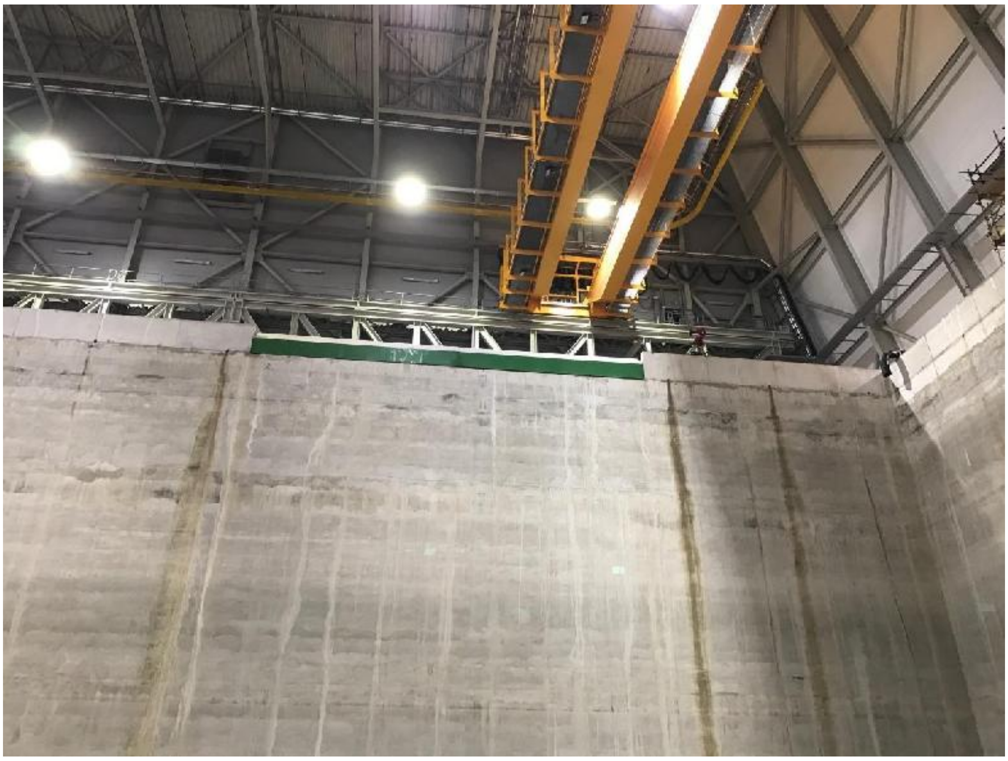


Image 3: Odour abatement duct above charging floor

Demonstration of Compliance:

- Air velocity calculations were previously provided to the EPA and submitted on 23rd November 2016 which demonstrates adequate air flow through the entrance into the waste reception area.
- Smoke testing was demonstrated successfully to the Environmental Protection Agency on Wednesday 19th April 2017 on the ramp and tipping bay of the waste reception area.
- All operations take place within the confines of the structure based on the containment principle.
-

The tipping floor main entrance floor will remain open during operations but can be closed when required.

Emissions Abatement for Incinerator Bottom Ash (IBA) Bunker Area

Measures provided for the control of odours and dust emissions from the Incinerator Bottom Ash (IBA) bunker, loading area and conveyor include the following:

- IBA passes through a wet bath at the bottom of the IBA discharger (Image 4). The IBA then becomes a moist product that prevents any significant dust
- IBA does not emit any significant odours
- A duct supplying air to the Unit 1 secondary air fan draws air from just above the IBA discharger (See Image 6)
- A duct supplying air to the Unit 1 secondary air fan draws air from just above the end of the ash conveyor (where ash drops into the bunker) – this duct extracts air from the IBA bunker area (See Image 7)
- The partitioning of the IBA loading area from the Product Storage Area (PSA) will also assist in minimizing the dust emissions (See Image 8)
- Roof vents provide a natural draft releasing warmed air entering from openings at the lower elevation of the IBA loading area. Air velocity approaching the roof vents is very low allowing any dust to settle within the enclosure rather than exhausting outside the facility. (See Images 9 & 11)
- Dust curtains are provided at each of the dischargers onto the conveyor and at the end of the conveyor into the IBA bunker (See Images 3 and 5)

These measures ensure no significant escape of odours or dust from these locations.

Image 4: Bottom Ash Discharger Wet Bath (Dust elimination)

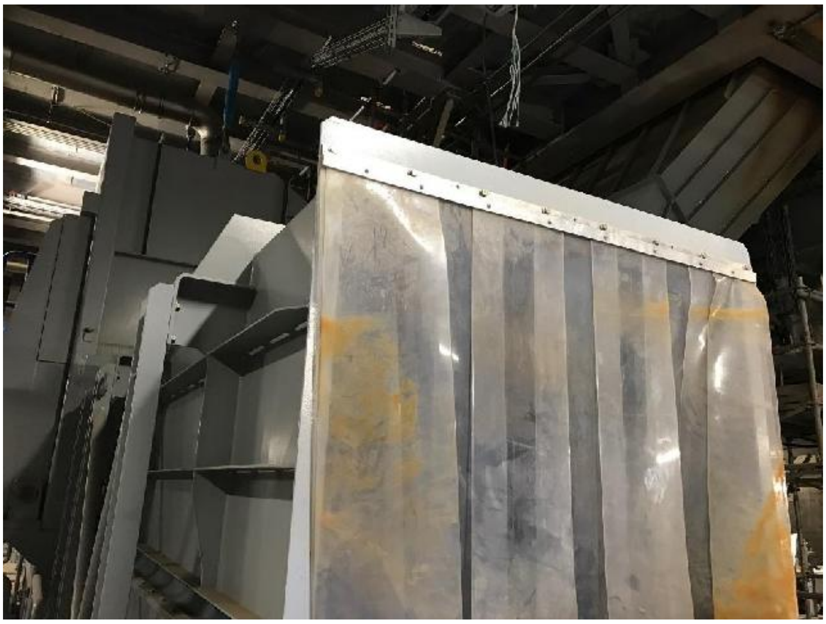


Image 5: Dust Curtain on Bottom Ash Conveyor

Image 6: Secondary Air Feed Extracting from the Bottom Ash Discharger

Image 7: Secondary Air Extraction over the Bottom Ash Bunker with Dust Curtain

Image 8: Partition wall (behind Scaffold) between IBA loading area and FGTR/PSA Areas.

Demonstration of Compliance:

- Observation during initial operations will be conducted to confirm the measures are adequate to ensure no significant escape of odours or dust from the facility.
- All operations take place within the confines of the structure based on the containment principle.

Emissions Abatement for Flue Gas Treatment Residue Area (FGTR) and Product Storage Areas (PSA)

Measures provided for the control of odours and dust emissions from the FGTR and PSA areas are as follows:

- Flue Gas Treatment Residue (FGTR) does not emit any significant odours.
- Dust will be controlled during pneumatic transfer of FGTR to the storage silos, by a HEPA (High Efficiency Particulate Air) located on top of each silo. The air flow from the filters is ejected into the building.
- Closed tanker loading system - There is an "elephant's trunk" connection from the silo outlet to the tanker fill ports, which forms a seal to prevent escape of the material during loading of FGTR. Displaced air from the tanker cavity will be vented to the building at the top of the "elephant's trunk" loader via a mini baghouse.
- Roof vents provide a natural draft releasing warmed air entering from openings at the lower elevation of the FGTR Storage area. (See Images 9 and 11) Air velocity approaching the roof vents is very low allowing any dust to settle within the enclosure rather than exhausting outside the facility.

These measures ensure no significant escape of odours or dust from the facility.

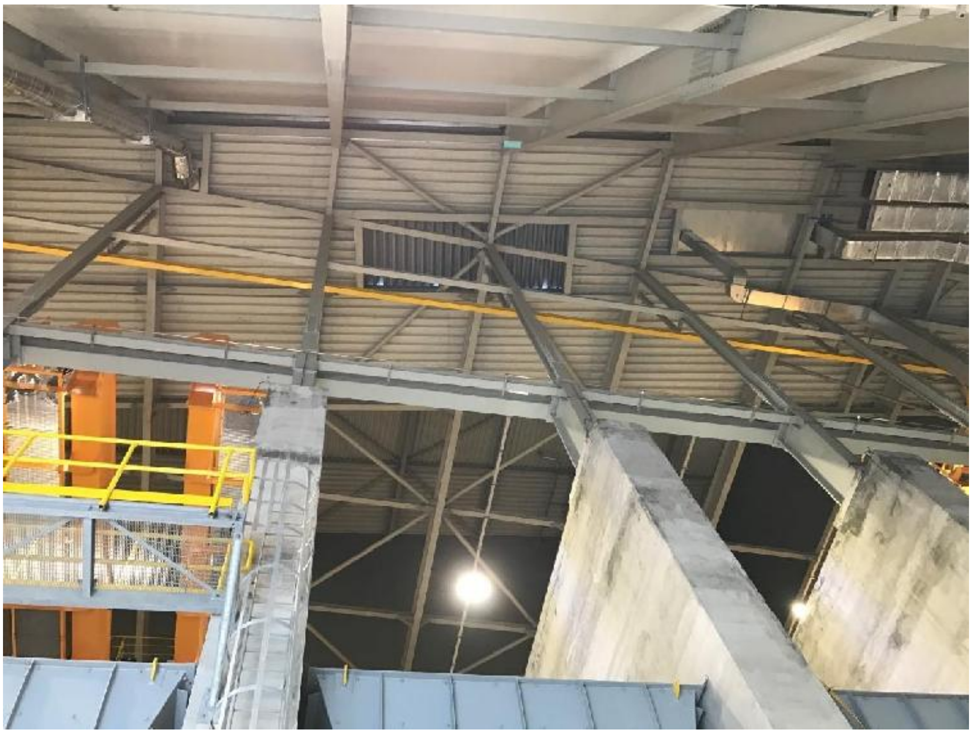


Image 9: Roof Vents

Image 10: Filters on the roof of the FGTR Silos

Demonstration of Compliance:

- The FGTR is transported pneumatically in a closed system into the FGTR storage silos
- Observation during initial operations will be conducted to confirm the measures are adequate to ensure no significant escape of odours or dust from the FGTR storage silos
- Loading of the FGTR into containers is via the “elephant’s trunk” system (See Image 11) is a closed sealed system.
- All operations take place within the confines of the structure based on the containment principle.

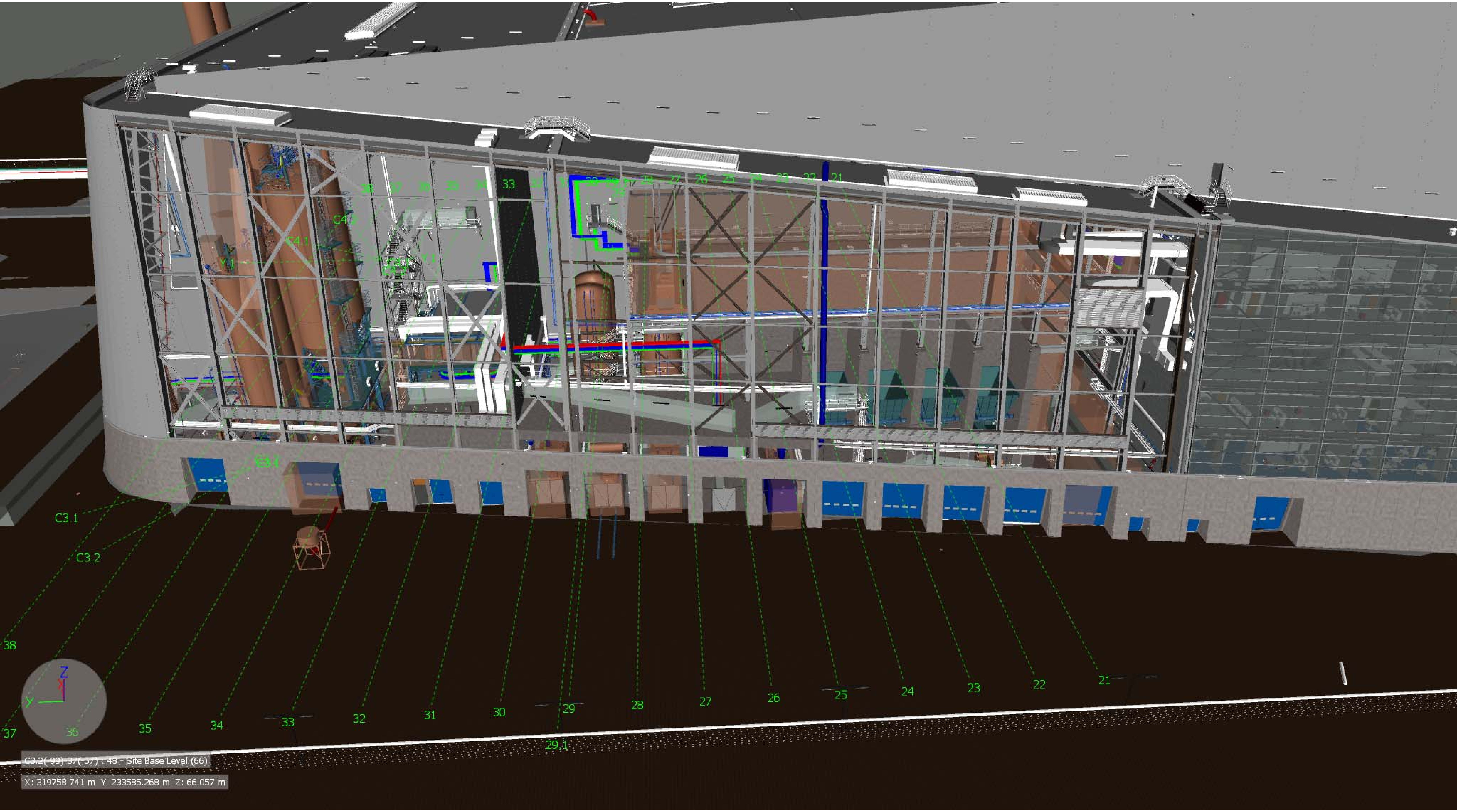
Image 11: Louvres at the FGTR/PSA Area on West Wall

Image 12: Roller Door System at FGTR and PSA Area

Conclusion:

Dublin Waste to Energy Limited are committed to complying with Industrial Emissions License W0232-01. All operations and storage of materials are confined within the footprint of the building. The measures outlined in this document and as demonstrated to the Environmental Protection Agency on the 19th April 2017 ensures Dublin Waste to Energy complies with all conditions relating to odour and dust abatement.

APPENDIX A – Air Flow Louvre Diagram


C3.1
C3.2
38
37
36
35
34
33
32
31
30
29
29.1
28
27
26
25
24
23
22
21
C3.2(-99) 37(-57) : 48 - Site Base Level (66)
X: 319758.741 m Y: 233585.268 m Z: 66.057 m

APPENDIX B – Primary Air System

B2 Operating Instruction

12AAF1

Primary Air System

B2.12AAF1 Primary Air System.docx
2016-06-15

Project: P-3270 Dublin Waste to Energy Facility

Placed on the market by: Hitachi Zosen Inova AG Hardturmstrasse 127 CH-8037 Zürich

Manufacturer: Hitachi Zosen Inova AG Hardturmstrasse 127 CH-8037 Zürich

Table of Contents

0 Register of Revisions

0.1 Revisions after hand-over of the definitive Operating Manual

Seq. no.	Rev. date/initials	Type of revision	Location Chap./tab no.	Approved by:
1				
2				
3				
4				
5				
6				
7				
8				
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1 General

1.1 Intended use

The system is part of the plant to which this documentation refers. The intended use of the system is defined in chapter «1.3 Description of system» and the system may only be employed within the boundaries defined in accordance with the document <B2.10 Plant related chapter 1.2>.

Any other or use that goes beyond that described herein shall be deemed to be improper use and will invalidate any warranty.

Technical changes to the system are considered to be contrary to normal use and may only be carried out following consultation with the distributor.

1.2 Qualified personnel

The plant may only be operated by qualified personnel. The personnel must be familiar with all warnings according to these operating instructions.

Qualified personnel are individuals, who have been authorised by the person responsible for the system to carry out the required activities and who are, therefore, based on their training, experience and instruction as well as their knowledge regarding appropriate standards, regulations and the conditions prevailing at the appropriate works, able to recognise and avoid possible dangers that may arise.

(Definition according to IEC 364)

1.3 Description of system

The primary air system supplies the combustion system with the "primary" (combustion) air.

The supplied air is sucked from the waste bunker with the aid of the primary air fan. In in case of fire in the waste bunker the suction point of the primary air is switched over to the boiler house.

The primary air is heated using a multistage heat exchanger and fed through the grate hoppers into the individual grate zones.

The total air flow as well as the primary air flow and temperature to the individual grate zones is calculated in the combustion control system.

1.4 Disposal

The disposal of the system may only be carried out by specialised and qualified personnel.

The plant operator is responsible for ensuring that plant components are disposed of in accordance with the law.

The environmental regulations of the respective country must be observed.

2 Safety

2.1 Personal safety

The use of the following Personal Protective Equipment (PPE) is mandatory for personnel working on or with the system:

	DANGER
	Hard hat (according to EN 397)
	Ear protection (according to EN 458, daily exposure < 85 dB, ideally between 80 and 75 dB at the ear).
	Eye protection (offering class B impact resistance according to EN 166)
	Tight-fitting workwear (e.g. boiler suit)
	Safety gloves (level 2 according to EN 388)
	Safety boots (classified SBP according to EN 345)

When working in hot environment, the following specialised PPE must be worn:

	DANGER
	Flame-resistant workwear, including balaclava hood (protection levels A B1 C1 according to EN ISO 11612)
	Flame-resistant gloves (protection levels 2 2 2 2 2 2 according to EN 407)
	Eye protection (offering thermal protection of min. 5 min at 250 °C/500 °F according to NFPA 1971-2013, and class B impact resistance according to EN 166)

When handling hazardous substances, the following specialised PPE must be worn:

	DANGER
	Respirator (at least half-face mask according to EN 140) with particle filter (protection level P2 according to EN 14387)

When working at height, a fall protection must be worn.

DANGER

Safety belt in accordance to the applicable national standards, if required with fall arrestor.

NOTE

Hard hats lose durability over time. In general, it is suggested to change hard hats if the date of manufacture is more than 3 years past. For further information, see the PPE manufacturer's instructions.

Exchange any PPE that has been worn out or damaged immediately.

Flame-resistant clothing can lose its protective ability after a given number of washings. For further information, see the PPE manufacturer's instructions.

DANGER

The following points must be observed in order to avoid personal injury when working on the system/plant:

- The fan may only be used, serviced and repaired by persons who are familiar with the machine and its potential dangers.
- All protection devices, such as emergency stop switches, shaft and coupler protection etc. must be in place.
- The fan's danger area must be cordoned off to keep unauthorised persons well away.
- The fan may only be used when it is in faultless technical condition; it may only be used for its intended purpose and in accordance with the operating manual, taking into account potential hazards and safety precautions. Any faults that may have an adverse effect on safety must be eliminated immediately.
- Contact with the impeller can lead to injuries. Nobody should be in the coupler and impeller area during start-up.
- You should always be accompanied by a second person when carrying out work.
- Before working on the fan, secure the fan against an unintentional restart (switch off the electric drives). Wait until the impeller has come to a standstill after being switched off. In order to prevent the fan from starting up unintentionally you have to remove the coupler elements.
- Do not remove or bridge the protective equipment.
- The dampers must be secured against being inadvertently actuated. Switch off the drive motor and remove the coupler elements.

Risk of crushing

Checking the limit switches of the feed hopper cylinder bears the risk of crushing the hands when carried out during operation.

- Do not reach into the opening with your hands. Use appropriate tools.

DANGER

Opening manholes or inspection hatches can cause injuries

When opening manholes or inspection hatches, hot substances or waste particles can escape. This may cause fatal burns, scalds or other injuries.

- Do not open manholes or inspection hatches during operation
- Do not open manholes or inspection hatches without a working permit for the system
- Allow the system to cool down before starting work
- Wear fire-/heat-resistant protective clothing

Working on the poke holes and measurement nozzles can cause injuries.

When poking in the poke holes or opening the blind flanges of measurement nozzles, hot substances or waste particles may be blown out. This may cause burns or other injuries.

- Open the poke holes carefully
- Wear fire-/heat-resistant protective clothing

Risk of burning from hot or cold surfaces

During operation, surface temperatures from 225 °C to -10 °C can occur. There is an acute risk here of injury from hot surfaces.

These parts must be protected, insulated and carry appropriate warning signs. Pay special attention to parts that can be touched accidentally.

Do not carry out service work (e.g. checking the impeller) until the fan interior has cooled down.

Electric shock

There is a risk of injury through electric shock. Electrical charges can build up and discharge during the operation of the fan.

For this reason, all equipment should be earthed.

(observe the requirements of DIN EN 50081 Part 1 and 2 s)

2.2 Plant protection

NOTICE Operating the system without functional safety devices can result in damage to the plant. The system must only be operated if all safety and fail-safe devices and installations are fully functional.

NOTICE Operating the system in unsafe conditions can result in damage to the plant. The system or respective component must be stopped if any malfunction or fault occurs.

NOTICE Work on the system by untrained personnel, or disregarding the instructions given in the OM manuals can result in damage to the plant.

Operation and maintenance must be conducted by qualified and instructed personnel only. The instructions given in the OM manuals must be observed carefully.

NOTICE Storage of highly inflammable materials close to unprotected heat sources results in an increased fire hazard. Do not store flammable materials close to heat sources.

NOTICE The fan is intended exclusively for conveying the media listed on the machine's data sheet, using the operating parameters listed. Any other use or any deviation from the operating parameters is considered not in accordance with the intended purpose. The manufacturer does not accept any liability for damage resulting from such usage.

NOTICE Factory settings may not be changed without approval by the distributor. Where motors are provided by third parties, the distributor does not accept any warranty for function and layout or for the safe operation of the coupler in the case of electrical failures.

NOTICE Avoid damage to the bearings caused by unacceptable heating of the bearings and insufficient grease level for lubrication. Check the grease level regularly and make sure that the bearings are lubricated. Attention: Do not overfill.

NOTICE Blocking of the primary air flow (e.g. due to closed dampers before/after the preheater or due to closeness of all primary air element dampers) will lead to under pressure in the post combustion chamber and the downstream systems. This will cause a shutdown of the combustion line and bears the risk of material damage. Make sure that either the preheater dampers or the bypass is open during operation.

NOTICE The vibration monitoring unit may react to radios and mobile phones. Do not use this equipment near the fan equipment.

NOTICE Operation above the alarm limit is only permitted for short periods for analysing the cause of any vibrations.

3 Process

3.1 Technical specifications

Description	KKS no.
Primary Air Fan	See B4.10 Chap.1.3 Equipment List and catalogues: 1 HLB10 AN001
Primary Air Preheater	See B4.10 Chap.1.3 Equipment List and catalogues: 1 HLC10 AC001
Primary Air Dampers (Feed)	See B4.10 Chap.1.4 Fittings List and catalogues: 1 HLA10 AA300, 1 HLA10 AA310, 1 HLA10 AA050, 1 HLA10 AA070, 1 HLA10 AA090
Primary Air Dampers (Distribution)	See B4.10 Chap.1.4 Fittings List and catalogues: 1 HHL11 AA410, 1 HHL12 AA410, 1 HHL13 AA410, 1 HHL14 AA410, 1 HHL21 AA410, 1 HHL22 AA410, 1 HHL23 AA410, 1 HHL24 AA410, 1 HHL31 AA410, 1 HHL32 AA410, 1 HHL33 AA410, 1 HHL34 AA410, 1 HHL41 AA410, 1 HHL42 AA410, 1 HHL43 AA410, 1 HHL44 AA410, 1 HHL51 AA410, 1 HHL52 AA410, 1 HHL53 AA410, 1 HHL54 AA410

3.2 Description of process and equipment

The primary air system compromises the following plant equipment:

- Primary Air Fan 1 HLB10 AN001
- Primary air preheater 1 HLC10 AC001
- Primary air element control dampers for zone 1 to 5
  1 HHL11 AA410, 1 HHL12 AA410, 1 HHL13 AA410, 1 HHL14 AA410, 1 HHL21 AA410, 1 HHL22 AA410, 1 HHL23 AA410, 1 HHL24 AA410, 1 HHL31 AA410, 1 HHL32 AA410, 1 HHL33 AA410, 1 HHL34 AA410, 1 HHL41 AA410, 1 HHL42 AA410, 1 HHL43 AA410, 1 HHL44 AA410, 1 HHL51 AA410, 1 HHL52 AA410, 1 HHL53 AA410, 1 HHL54 AA410.
- Flow metering per zone
  1 HHL10 CF901, 1 HHL20 CF901, 1 HHL30 CF901, 1 HHL40 CF901, 1 HHL50 CF901
- Switchover damper 1 HLA10 AA300 / 1 HLA10 AA310.

3.2.1 Air intake

In normal operation the primary air is extracted from the waste bunker and passes through the flow metering 1 HLA10 CF901 (by the means of Venturi) and the silencer 1 HLA10 BS001 to the primary air fan 1 HLB10 AN001.

In the case of fire, the switchover damper 1 HLA10 AA300 / 1 HLA10 AA310 is automatically actuated and the air is extracted from the boiler room. This is indicated by a temperature increase of the primary air upstream the air fan (temperature measurement 1 HLA10 CT001). In this case the air intake dampers will switch the primary air intake from the waste bunker to the boiler house.

While cleaning the suction mesh 1 HLA10 AT001, it is important to suck the primary air from the boiler house, to avoid the removed dust to be sucked through the primary air system..

3.2.2 Primary air fan

The primary air fan 1 HLB10 AN001 (incl. drive motor and housing) is mounted on a base frame which in turn rests on appropriately sized vibration dampers to reduce the transmission of vibrations.

The motor's drive shaft is connected with the impeller shaft via an elastic coupling. Changes in length due to heat and temperature influences are accommodated in the floating bearing that is located on the side of the impeller. The fixed bearing is arranged on the drive side to absorb the axial forces.

The ducts of the primary air fan on the intake and delivery side are connected via soft material expansion joints. In this way, no machine vibrations are transferred to the duct system on the one hand and no external forces (e.g. thermal expansion) are transferred to the fan on the other.

3.2.3 Primary air preheater

The primary air preheater is installed after the fan. It consists of two different and independent steam pressure stages with the corresponding sub-cooling stages. Due to better temperature differences and with that better heat transfer from steam/condensate to the air, the high-pressure sub-cooling stage is divided into two sections. The one with the higher temperatures is placed between the low pressure (LP) stage and the high pressure (HP) stage. The second half of the sub-cooling stage is placed directly before the LP-Steam-Stage (in air flow direction).

In direction of the air flow the stages of the primary air are as follows:

LP sub-cooling → HP sub-cooling 2 → LP-steam → HP sub-cooling 1 → HP steam

The primary air which is sucked from the waste bunker contains dust. For this reason the free passage cross-sections are generously dimensioned, and aligned piping assemblies are used as heat-exchanger surfaces. For inspection and cleaning purposes, there are several openings on the primary air preheater. Depending on the waste type it is necessary to clean the primary air preheater. The differential pressure measurement indicates degree of built up in the heat exchanger. If the preheater has to be cleaned the primary air has to be rerouted through the bypass, which his designed for 60% of the maximum primary air amount. The steam and condensate bundles have to be shut down and safely closed for avoiding injuries due to heat. Before opening / cleaning of the preheater, read the B3 Maintenance Instructions for the primary air system carefully.

3.2.4 Routing of air flow to the combustion chamber

The primary air is sucked from the waste bunker through a volume flow measurement (Venturi-Type) and a silencer by the primary air fan. On the pressure side of the fan, the primary air goes through the preheater and is distributed to the five grate zones and is injected through holes in the grate blocks into the furnace.

The set points for the primary air flow and the temperature are calculated in the combustion control system and forwarded to the lower-level controllers of the primary air system. The volume flow is controlled with the frequency converter of the primary air fan. The temperature is controlled with the HP-Steam Control Valve 1 LBG20 AA400.

The division of the partial air streams to the individual grate zones is achieved by the downstream zone control dampers. This allows adjusting the primary air supply in the grate zones according to the requirements of the combustion, which is depending on the quality of waste.

4 Operation

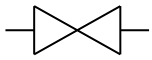
4.1 Preparations for system start-up

The following measures must be carried out prior to the system start-up or following a prolonged standstill (revisions).

4.1.1 Local checks

Set the valves to home position in accordance with the PID.


Closed valve


Open valve

Start the inspection, when the installation/revision is completed.

NOTE

For the initial commissioning, it is recommended to consult specialists from the fan manufacturer. No liability is assumed for errors that result from improper commissioning by the customer.

General checks:

1. Check the fan (impeller, housing), primary air preheater with connected air ducts for foreign bodies, tools, scaffolding, insulating material etc.
2. Check that the inspection doors are firmly closed.
3. Check that the system is complete in accordance with the PID
4. Check that the expansion joints are free from damage
5. Make sure that there is no device at the fan frame with which the transport is secured (by protecting the vibration dampers against traction force when lifting the fan with its support frame).

Primary air fan:

1. Install all protective equipment, e.g. coupler protection.
2. Check that the bearings are sufficiently lubricated and the oil level is sufficient.
3. Check that all screw connections on the bearings, motor feet, the machine frame etc. are properly tightened.
4. Turn the impeller manually and check for any scraping noises.
5. Check whether the motor and the impeller shaft are aligned.
6. Check whether the coupler is installed properly (alignment of impeller shaft and motor shaft).
7. Attach the warning notices near the fan (e.g. "Caution - drive starts automatically") or cordon the area off.

8. Check the direction of rotation.

Shut-off- and element control dampers:

1. Check the installation position and drive mounting of the shut-off and control dampers.
2. Check the shut-off and control dampers for any contamination (foreign bodies) and damage.
3. Check the variable-speed drives (direction of rotation, limit switches, position feedback).

Silencers:

1. Check the silencer for damage and foreign objects.
2. Check, that the baffles were installed in the silencer hood

Primary air ducts:

1. Check the expansion joints for damage.
2. Close all inspection holes/manholes.
3. Mount the insulation cover.
4. Check that the fresh air intake opening is free from any foreign objects.

Primary air preheater:

DANGER

Risk of injury

Danger from fluids due to incomplete drainage or cleaning.

1. Check the steam and condensate pipes for possible leaks.
2. When filling the plant, make sure that the deaeration is perfect.

4.1.2 Control room checks

1. Check the signal paths of all binary and analogue MCR equipment parts.
2. Check the logic diagram on the DCS (protection shut-downs, alarms etc.).
3. Cancel any simulated values and forced values.

4.1.3 Mechanical settings

See document: B2.10 Chap.8.5 Mechanical Settings.xls

4.1.4 Configuration and parameter specifications

No details for this chapter.

4.2 Start-up the system

After the inspections have been carried out according to chap. 4.1.1, the primary air system can be started up on the DCS in auto function "ON" (by manual command).

All process control functions can also be carried out manually.

NOTE

This mode of operation must be secured by instruction to the operating personnel.

In manual operation the plant equipment is subject to the supervision by, and is the responsibility of, the system operator.

4.3 Start-up within the line/plant

For the permanent conditions and start releases refer to B4.10 Chap.1.2b (Functional Design Specification).

DANGER

Risk of injury

For safety reasons nobody should be in the vicinity of the impeller and the coupling when starting the fan.

Fan and dampers

The function group primary air system is started manually. The fan automatically starts at minimum speed.

When starting up the plant, the primary air system must be put into operation to purge the flue gas path (before starting the start-up and auxiliary burners).

The purging program provides the primary air control with a set point for the air flow to ensure a sufficient purging.

After completing of the purging program, the set point for the primary air flow is set to zero. The frequency converter reduces the primary air fan to the minimum speed. The zone control dampers are brought into a predefined position.

After the burners have been started and are operating at minimum load, the primary air flow must be adjusted manually so that the temperature start-up curve, defined by the boiler refractory (see 12BAM1), is respected.

After furnace has been heated up to a temperature > 850 °C waste can be fed in.

After the first waste grabs have been fed, the individual element dampers must be opened successively, depending on the position of the waste bed on the grate (zone 1 first, and then zone 2, etc.)

As soon as the waste has ignited, the waste feed can be slowly increased with the ram feeder.

At the same time, the grate set point and the primary air supply have to be adapted manually to the waste and combustion conditions.

While the first waste is burning on the grate, the individual zone dampers have to be adjusted depending on the position of the waste bed on the grate. The adjustment of the dampers has to be started in zone 1 and should be proceed from zone to zone in waste flow direction.

Primary air preheater

The air preheater can be put into operation as soon as steam is present.

NOTE

☞ Drain and preheat the steam system of the primary air preheater well beforehand.

4.4 Normal operation

Normal operation means that all aggregates work in automatic mode, that all control loops are either in AUTO or in CASCADE mode, that all functional groups and automatic operating modes are switched on and that neither alarms are activated nor any faults present.

The primary air system is continuously in operation and thereby ensures the supply of primary combustion air to the combustion system.

The primary air flow is controlled by the frequency converter of the primary air fan. The set point for the primary air flow is calculated in the combustion control system (CCS).

The set points of the individual primary air flows for each grate element are also calculated in the CCS. The individual air flows are controlled via the element dampers.

Therefore the functional groups primary air and CCS have to be switched on and in AUTO mode when the system is in automatic operation.

All process control functions can also be carried out manually by overriding the 'Auto operating mode'.

NOTE

☞ In manual operation the plant equipment is subject to the supervision by, and is the responsibility of, the system operator.

Primary air preheater

When the primary air preheater is in automatic mode, the function group primary air preheating must be started. At the same time, the temperature control, the pressure control and the level control of the condensate container are in AUTOMATIC.

4.4.1 Checks during operation

See document: B2.10 Chap.8 Control and observe lists operation.xlsx

4.5 Restricted operation

Plant is still running, however not all requirements for the normal operation of the system are given.

Primary air fan
In the case of problems with the primary air fan (vibrations, very high bearing temperatures, bearing damage), the plant must be shut down.

Primary air preheater:

In the case of leaks in the system (e.g. cracked pipes), an emergency shutdown of the primary air preheater is obligatory. For this purpose, all steam valves must be closed immediately and the inlet/outlet/bypass dampers have to be switched to "bypass".

Otherwise, no special measures are necessary for an emergency shut-down of the entire system. Proceed as with a normal shut-down.

Primary air zone dampers:

If the drive of one of the primary air zone dampers is faulty, the drive must be removed and the damper fixed in place in an appropriate position.

If necessary, the steam load must be reduced to partial load, since the primary air distribution can no longer be controlled properly.

CCS not active:

If the CCS is not active, the primary air control does not receive a calculated set point. The primary air must be operated manually.

The operator needs to enter a set point in the primary air set point block in the CCS. The value must appropriate for the fire position, the thickness of the waste layer and the steam flow.

4.6 Shut-down within the line/plant

For the stop releases see document: B4.10 Chap.1.2b (Functional Design Specification).

Primary air fan
The functional group primary air fan is put out of operation according to the shut-down program of the plant, i.e. as soon as the grate has been emptied or no more waste is in the combustion chamber, the function group primary air system can be stopped by the auto function "STOP" (by manual command).

Primary air preheater:

The functional group primary air preheater is put out of operation according to the shut-down program of the line, i.e. as soon as the grate has been emptied or no more waste is in the combustion chamber, the functional group Primary Air Preheater can be stopped by the auto function "STOP" (by manual command).

Shut-down

1. Close the steam and condensate valves.

2. Open the drains.
3. Open the steam valves slightly until steam comes out of the drains.
4. Close the steam valves again.
5. Leave the drain valves open until put back into operation.

4.7 Shut-down and conservation

When there is a risk of frost or when the system is out of service for several months, conserving and anti-freeze measures have to be taken for the fans/air preheater:

- The unit must be stored where it is protected from rain and frost.
- Close the intake and outlet openings.
- In order to avoid damage to the bearings of the fans, the impeller unit needs to be rotated every second week.
- The heat exchanger bundles of the air preheater must be completely emptied of condensate and dried.
- If the storage time is to be longer than six months, it is imperative to apply corrosion protection on the inside of the air pre-heater.

The inspections and conserving measures to be carried out are specified in the supplier documentation for the fan and the air preheater.

NOTE

Should prolonged standstill periods occur within the warranty period, the supplier has to be informed so that he can prepare special conserving directives.

If no notification takes place, the manufacturer cannot assume any warranty for subsequent damage.

5 Malfunctions

5.1 System alarms

All alarms will be listed and described according to the KKS no. in the following chapters.

5.1.1 1 HLB10 AN001, Collective alarm MCC

Measurement	EAL
Place of installation	MCC in electrical container
PID	90056815
FDS number	90057089

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Failure MCC	Air flow no longer controllable

Cause	Remedy
Malfunction of MCC feeder to variable frequency drive	Check MCC-feeder

Notes: None

5.1.2 1 HLB10 AN001, Collective alarm variable frequency drive (VFD)

Measurement	EAL
Place of installation	VFD in electrical container
PID	90056815
FDS number	90057089

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Failure of variable frequency drive	Air flow no longer controllable

Cause	Remedy
Malfunction of variable frequency drive	Reset alarm (Remote acknowledge). Check malfunction record of variable frequency drive

Notes: None

5.1.3 1 HLB10 AN001, Fan motor temperature high

Measurement	TAH
Place of installation	Primary air fan motor
PID	90056815
FDS number	90057089

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Motor winding temperature is high	Warning increased motor temperature

Cause	Remedy
Malfunction of temperature sensor	Check instrument
Motor overloaded	Check electrical and/or mechanical part of equipment local

Notes: None

5.1.4 1 HLB10 AN002, Cooling Fan alarm, MCC

Measurement	EAL
Place of installation	Electrical room
PID	90056815
FDS number	90057089

Display: ☒ in the control room ☐ locally

Malfunction	Consequence
Collective alarm MCC	Air flow no longer controllable
	Failure of primary air

Cause	Remedy
Malfunction of Cooling Fan	Check Cooling Fan

Notes: None

5.1.5 1 HLB10 CT001, 1 HLB10 CT002, Fan bearing temperature high

Measurement	TAH
Place of installation	Bearing of fan
PID	90056815
FDS number	90057089

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Bearing temperature is high	Pre-alarm, in the case of further temperature increase, failure of primary air fan possible.

Cause	Remedy
Bearing damage	Replace bearing
Faulty reading of the temperature sensor	Check the electronics
Not enough lubricant	Check lubricant level local.

Notes: None

5.1.6 1 HLB10 CT001, 1 HLB10 CT002, Fan bearing temperature too high

Measurement	TAHH
Place of installation	Bearing of fan
PID	90056815
FDS number	90057089

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Bearing temperature is too high	Alarm, bearing damaged, failure of fan due to fan protection stop

Cause	Remedy

	Reduce steam production
Imbalance on impeller due to deposits	Remove deposits
Bearing damage	Replace bearing
Faulty reading of the temperature sensor	Check the electronics
Not enough lubricant	Check lubricant level local.

Notes: None

5.1.7 1 HLB10 CY001, Fan bearing vibrations high

Measurement	YAH
Place of installation	Fixed bearings of fan
PID	90053729
FDS number	90057089

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Bearing vibrations are high	Bearings may be damaged if vibrations increase further

Cause	Remedy
Imbalance on impeller due to deposits	Remove deposits
Bearing damage	Replace bearing
Measurement faulty	Check, vibration measurement, shielding insufficient
Not enough lubricant	Refill lubricant
Wear/corrosion	Balancing
Rotating parts scraping against static parts - impeller damage	Repair, replace impeller

Notes: None

5.1.8 1 HLB10 CY001, Fan bearing vibrations too high

Measurement	YAHH
Place of installation	Fixed bearings of fan
PID	90056815
FDS number	90057089

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Bearing vibrations are too high	Alarm, bearing damage, failure of fan due to fan protection stop.

Cause	Remedy
Imbalance on impeller due to deposits	Remove deposits
Bearing damage	Replace bearing
Measurement faulty	Check, vibration measurement, shielding insufficient
Not enough lubricant	Refill lubricant
Wear/corrosion	Balancing
Rotating parts scraping against static parts - impeller damage	Repair, replace impeller

Notes: None

5.1.9 1 HLA10 CP002, Primary air preheater pressure loss high

Measurement	PDAH
Place of installation	Primary Preheater Inlet hood / Outlet hood
PID	90056815
FDS number	90057089

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Primary air preheater pressure loss is high	Inefficient air preheating. Fluctuating and drop in steam output.

Cause	Remedy
Dirty heat exchanger elements	Check of instrumentation, cleaning of preheater.
Malfunction of primary air fan	Check primary air fan

Notes: None

5.1.10 1 HLA10 CF901, Primary air flow < low

Measurement	FAL
Place of installation	Venturi tube of primary air duct on intake side
PID	90056815
FDS number	90057089

Display: ☒ in the control room ☐ locally

Malfunction	Consequence
Primary air flow < low	Note: this is only used for purging; as a consequence of it, the purging is stopped and has to be restarted

Cause	Remedy
Control error	Check control parameters
Primary air preheater dirty	Clean primary air preheater
Intake opening, silencer dirty	Clean aggregates
Failure of primary air fan	Eliminate malfunction of primary air fan and start up
Measurement connections leaky	Check measurement connection for tight and sealed screw connections
Measurement connections blocked	Blow or poke through the measurement connections in the direction of the Venturi tube.
Transmitter faulty	Check transmitter

Notes: None

5.1.11 1 HLA10 CT001, Temperature primary air before fan high

Measurement	TAH
Place of installation	Primary air duct before fan
PID	90056815
FDS number	90057089

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Temperature of extracted primary air is high	Pre-alarm, temperature from waste bunker too high
	Primary air duct could be damaged by further temperature increase
	Automatic switch-over to air extraction from boiler house will take place when temperature increases further

Cause	Remedy
Faulty reading of the temperature sensor	Check the electronics
Fire in the waste bunker	Manual switch-over to air from the boiler house if necessary.
	Fight fire in the bunker

Notes: None

5.1.12 1 HLA10 CT001, Temperature primary air before fan too high

Measurement	TAHH
Place of installation	Primary air duct before fan
PID	90056815
FDS number	90057089

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Temperature of extracted primary air is too high	Air extraction is automatically switched to boiler house

Cause	Remedy
Faulty reading of the temperature sensor	Check the electronics
Fire in the waste bunker	Extinguish fire

Notes: None

5.1.13 1 LCN10 CL001, condensate level high (LP)

Measurement	LAH
Place of installation	Preheater
PID	90056816
FDS number	90057090

Display: ☒ in the control room ☐ local

Malfunction	Consequence
LP steam condensate level is high	Efficiency of primary air preheater is reduced

Cause	Remedy
Control error	Check of control circuit
Malfunction of valve	Manual operation of valve
Blocked pipe	Local inspection

Notes: None

5.1.14 1 LCN10 CL001, condensate level low (LP)

Measurement	LAL
Place of installation	Preheater
PID	90056816
FDS number	90057090

Display: ☒ in the control room ☐ local

Malfunction	Consequence
LP steam condensate level is low	Efficiency of primary air preheater is reduced

Cause	Remedy
Control error	Check of control circuit
Malfunction of valve	Manual operation of valve
Steam supply insufficient	Analyse steam supply
Leakage	Local inspection

Notes: None

5.1.15 1 LCN30 CL001, condensate level high (HP)

Measurement	LAH
Place of installation	Preheater
PID	90056816
FDS number	90057090

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Saturated steam condensate level is high	Efficiency of primary air preheater is reduced

Cause	Remedy
Control error	Check of control circuit
Malfunction of valve	Manual operation of valve
Blocked pipe	Local inspection

Notes: None

5.1.16 1 LCN30 CL001, condensate level low (HP)

Measurement	LAL
Place of installation	Preheater
PID	90056816
FDS number	90057090

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Saturated steam condensate level is low	Efficiency of primary air preheater is reduced

Cause	Remedy
Control error	Check of control circuit
Malfunction of valve	Manual operation of valve
Steam supply insufficient	Analyse steam supply
Leakage	Local inspection

Notes: None

6 Functional Design Specification

See documents
B4.10 Chap.1.2b 90057089 PRIMARY AIR SYSTEM
B4.10 Chap.1.2b 90057090 PRIMARY AIR PREHEATING

APPENDIX B - Secondary Air System

B2 Operating Instruction

12AAG1

Secondary Air System

B2.12AAG1 Secondary Air System.doc
2016-06-15

Project: P-3270 Dublin Waste to Energy Facility

Placed on the market by:
Hitachi Zosen Inova AG Hardturmstrasse 127 CH-8037 Zürich

Manufacturer:
Hitachi Zosen Inova AG Hardturmstrasse 127 CH-8037 Zürich

Table of Contents

7 Register of Revisions

7.1 Revisions after hand-over of the definitive Operating Manual

Seq. no.	Rev. date/initials	Type of revision	Location Chap./tab no.	Approved by:
1				
2				
3				
4				
5				
6				
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9				
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11				
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8 General

8.1 Intended use

The system is part of the plant to which this documentation refers. The intended use of the system is defined in chapter «1.3 Description of system» and the system may only be employed within the boundaries defined in accordance with the document <B2.10 Plant related chapter 1.2>.

Any other or use that goes beyond that described herein shall be deemed to be improper use and will invalidate any warranty.

Technical changes to the system are considered to be contrary to normal use and may only be carried out following consultation with the distributor.

8.2 Qualified personnel

The plant may only be operated by qualified personnel. The personnel must be familiar with all warnings according to these operating instructions.

Qualified personnel are individuals, who have been authorised by the person responsible for the system to carry out the required activities and who are, therefore, based on their training, experience and instruction as well as their knowledge regarding appropriate standards, regulations and the conditions prevailing at the appropriate works, able to recognise and avoid possible dangers that may arise.

(Definition according to IEC 364)

8.3 Description of system

The secondary air required for the combustion is sucked from the boiler house, the bottom ash extractor and the bottom ash transport (as exhaust vapours). On the pressure side of the secondary air fan a part of the recirculating flue gas is mixed into the secondary air. The use of recirculating flue gas is an improvement of the boiler efficiency, as the heat loss of flue gas at the stack is reduced. The mix of boiler house air, exhaust vapours from the bottom ash system and the recirculating flue gas is injected in an upper level in the combustion chamber. The lower injection level is only supplied by recirculating flue gases. The needed amount of secondary air and recirculating flue gas is calculated in the CCS logic. In addition it is possible to enter a value manually on the DCS screen in the control room. Manual intervention in the CCS is not recommended without clear reasons.

The nozzle arrangement is optimized for getting a swirling flow in the first boiler pass, which ensures a good mixing of the flue gases and improves the burn out of the flue gases.

8.4 Disposal

The disposal of the system may only be carried out by specialised and qualified personnel.

The plant operator is responsible for ensuring that plant components are disposed of in accordance with the law.

The environmental regulations of the respective country must be observed.

9 Safety

9.1 Personal safety

The use of the following Personal Protective Equipment (PPE) is mandatory for personnel working on or with the system:

DANGER
Hard hat (according to EN 397)
Ear protection (according to EN 458, daily exposure < 85 dB, ideally between 80 and 75 dB at the ear).
Eye protection (offering class B impact resistance according to EN 166)
Tight-fitting workwear (e.g. boiler suit)
Safety gloves (level 2 according to EN 388)
Safety boots (classified SBP according to EN 345)

When working in hot environment, the following specialised PPE must be worn:

DANGER
Flame-resistant workwear, including balaclava hood (protection levels A B1 C1 according to EN ISO 11612)
Flame-resistant gloves (protection levels 2 2 2 2 2 2 according to EN 407)
Eye protection (offering thermal protection of min. 5 min at 250 °C/500 °F according to NFPA 1971-2013, and class B impact resistance according to EN 166)

When handling hazardous substances, the following specialised PPE must be worn:

DANGER
Respirator (at least half-face mask according to EN 140) with particle filter (protection level P2 according to EN 14387)

When working at height, a fall protection must be worn.

DANGER

Safety belt in accordance to the applicable national standards, if required with fall arrestor.

NOTE

Hard hats lose durability over time. In general, it is suggested to change hard hats if the date of manufacture is more than 3 years past. For further information, see the PPE manufacturer's instructions.

Exchange any PPE that has been worn out or damaged immediately.

Flame-resistant clothing can lose its protective ability after a given number of washings. For further information, see the PPE manufacturer's instructions.

DANGER

Risk of injury

The following points must be observed in order to avoid personal injury when working on the system/plant:

- The fan may only be used, serviced and repaired by persons who are familiar with the machine and its potential dangers.
- All protection devices, such as emergency stop switches, shaft and coupler protection etc. must be in place.
- The fan's danger area must be cordoned off to keep unauthorised persons well away.
- The fan may only be used when it is in faultless technical condition; it may only be used for its intended purpose and in accordance with the operation manual, taking into account potential hazards and safety precautions. Any faults that may have an adverse effect on safety must be eliminated immediately.
- You should always be accompanied by a second person when carrying out work.
- Nobody should be in the coupler and impeller area during start-up.
- Avoid working on running machines.
- Do not remove or bridge the protective equipment.
- In order to prevent the fan from starting up unintentionally you have to remove the coupler elements.
- NEVER open the inspection opening unless the machine is at a complete standstill and secure the fan against an unintentional restart (switch off the electric drives). Wait until the impeller has come to a standstill after being switched off.
- The dampers must be secured against being inadvertently actuated. Switch off the drive motor and remove the coupler elements.

DANGER

Risk of crushing

Working on rotating or moving machine parts (shaft, couplers, dampers…etc.) bears the risk of crushing the hands when carried out during operation.

- Avoid working on running machines
- In order to prevent the fan from starting up unintentionally you have to remove the coupler elements.
- Switch off the dampers' drive motor and remove the coupler elements

Opening manholes or inspection hatches can cause injuries

When opening manholes or inspection hatches, hot substances or waste particles can escape. This may cause fatal burns, scalds or other injuries.

- Do not open manholes or inspection hatches during operation
- Do not open manholes or inspection hatches without a working permit for the system
- Allow the system to cool down before starting work
- Wear fire-/heat-resistant protective clothing

Working on the poke holes and measurement nozzles can cause injuries.

When poking in the poke holes or opening the blind flanges of measurement nozzles, hot substances or waste particles may be blown out. This may cause burns or other injuries.

- Open the poke holes carefully
- Wear fire-/heat-resistant protective clothing

Risk of burning from hot surfaces

During operation, surface temperatures of 150 °C can be present. There is an acute risk of injury from hot surfaces.

These parts must be protected, insulated and carry appropriate warning signs. Pay special attention to parts that can be touched accidentally.

Do not carry out service work (e.g. checking the impeller) until the fan interior has cooled down.

Man holes of the air preheater may not be opened during operation.

Electric shock

There is a risk of injury through electric shock. Electrical charges can build up and discharge during the operation of the fan.

For this reason, all equipment should be earthed.

(observe the requirements of DIN EN 50081 Part 1 and 2 s)

9.2 Plant protection

NOTICE Operating the system without functional safety devices can result in damage to the plant. The system must only be operated if all safety and fail-safe devices and installations are fully functional.

NOTICE Operating the system in unsafe conditions can result in damage to the plant. The system or respective component must be stopped if any malfunction or fault occurs.

NOTICE Work on the system by untrained personnel, or disregarding the instructions given in the OM manuals can result in damage to the plant.

Operation and maintenance must be conducted by qualified and instructed personnel only. The instructions given in the OM manuals must be observed carefully.

NOTICE Storage of highly inflammable materials close to unprotected heat sources results in an increased fire hazard. Do not store flammable materials close to heat sources.

NOTICE The fan is intended exclusively for conveying the media listed on the machine's data sheet, using the operating parameters listed. Any other use or any deviation from the operating parameters is considered not in accordance with the intended purpose. The manufacturer does not accept any liability for damage resulting from such usage.

NOTICE Factory settings may not be changed without approval by the distributor. Where motors are provided by third parties, the distributor does not accept any warranty for function and layout or for the safe operation of the coupler in the case of electrical failures.

NOTICE Caused by unacceptable heating of the bearings and insufficient grease level for lubrication. Check the grease level regularly and make sure that the bearings are lubricated. Attention: Do not overfill.

NOTICE The vibration monitoring unit reacts to radios and mobile phones.

NOTICE Operation above the alarm limit is only permitted for short periods for analysing the cause of any vibrations.

10 Process

10.1 Technical specifications

Description	KKS no.
Secondary Air Fan	See B4.10 Chap.1.3 Equipment List and catalogues: 1 HLB20 AN001
Secondary Air Preheater	See B4.10 Chap.1.3 Equipment List and catalogues: 1 HLC20 AC001
Secondary Air Dampers	See B4.10 Chap.1.4 Fittings List and catalogues: 1 HLA30 AA605, 1 HLA21 AA010, 1 HLA22 AA010

10.2 Description of process and equipment

The secondary air system comprises the following plant equipment:

- Fan with variable frequency drive 1 HLB20 AN001
- Secondary air preheater: 1 HLC20 AC001
- Manual dampers for secondary air distribution 1 HLA21 AA010, 1 HLA22 AA010
- Flow measurement 1 HLA20 CF901

10.2.1 Air intake

The secondary air is sucked from the upper part of the boiler house, mixed with the exhaust air from the bottom ash extractor and the bottom ash transport and then passes through the venture flow meter 1 HLA20 CF901. Afterwards it is preheated in the secondary air preheater 1 HLC20 AC002.

After having passed the secondary air preheater, a part of the recirculating flue gases is mixed into the secondary air. The mixture of secondary air, exhaust air and recirculating flue gas is injected into the furnace through the upper injection level. In normal operation the lower injection level is only used for recirculating flue gases.

10.2.2 Secondary air fan

The secondary air fan 1 HLB20 AN001 (incl. drive motor) is mounted on a base frame which in turn rests on appropriately sized vibration dampers to reduce the transmission of vibrations.

The motor's drive shaft is connected to the impeller shaft via an elastic coupling.

The ducts of the secondary air fan on the intake and delivery side are connected via soft material expansion joints. In this way, neither machine vibrations are transferred to the duct system nor are external forces (e.g. thermal expansion) is transferred to the fan.

Changes in length due to thermal effects are compensated for in the floating bearing, which is located on the side of the impeller. The fixed bearing is arranged on the drive side to absorb the axial forces.

10.2.3 Control of secondary air and recirculating flue gas volumetric flow and ratio

The frequency converter of the secondary air fan is used to control the sum of the secondary air and the recirculating flue gas flow. This sum is called “total secondary air flow set point” and is given to the total secondary air controller. The mixing ratio for secondary air and recirculating flue gas recirculating flue gas is calculated in the combustion control system (CCS) and controlled by the controlling damper and 1 HNF10 AA410 and an associated ratio controller.

10.2.4 Routing of air flow to the post-combustion chamber

After having passed the fan, the secondary air flows through the secondary air preheater 1 HLC20 AC001. Here the heat of the heating medium is transferred to the secondary air. The secondary air preheater has two manholes for checking and cleaning purposes when the preheater is not in operation (1 HLC20 BE010 and 1 HLC20 BE030).

After the preheater, the main duct of the secondary air splits up into the two distribution headers 1 HLA21 BR100 and HLA22 BR100 with the manual dampers 1 HLA21 AA010, 1 HLA22 AA010.

With the help of the manual dampers 1 HLA21 AA010 (distribution of secondary air on the bunker side) and 1 HLA22 AA010 (distribution of secondary air on the boiler side) the secondary air distribution is permanently adjusted during commissioning.

The nozzles are arranged on two sides of the boiler so that a swirling movement is created in the post-combustion chamber. This helps to ensure that the flue gases mix very well with the secondary air and that the flow distribution is even in the main flow direction.

Nozzles at bunker side	Nozzles at boiler side
1 HLA21 BN110	1 HLA22 BN110
1 HLA21 BN120	1 HLA22 BN120
1 HLA21 BN130	1 HLA22 BN130
1 HLA21 BN140	1 HLA22 BN140
1 HLA21 BN150	1 HLA22 BN150
1 HLA21 BN160	1 HLA22 BN160
1 HLA21 BN170	1 HLA22 BN170
1 HLA21 BN180	1 HLA22 BN180
1 HLA21 BN190	1 HLA22 BN190
1 HLA21 BN200	1 HLA22 BN200
1 HLA21 BN210	1 HLA22 BN210
1 HLA21 BN220	1 HLA22 BN220
1 HLA21 BN230	1 HLA22 BN230
1 HLA21 BN240	1 HLA22 BN240
1 HLA21 BN250	1 HLA22 BN250
1 HLA21 BN260	1 HLA22 BN260
1 HLA21 BN270	1 HLA22 BN270
1 HLA21 BN280	1 HLA22 BN280

Nozzles at bunker side	Nozzles at boiler side
1 HLA21 BN290	1 HLA22 BN290
1 HLA21 BN300	

11 Operation

11.1 Preparations for system start-up

The following measures must be carried out prior to the system start-up or following a prolonged standstill (revisions).

11.1.1 Local checks

Set the valves to home position in accordance with the PID.

Closed valve   Open valve

Start the inspection, when the installation/revision is completed.

NOTICE For the initial commissioning, it is recommended to consult specialists from the fan manufacturer. No liability is assumed for errors that result from improper commissioning by the customer.

General checks:

1. Check the fan (impeller etc.), preheater with connected air ducts for foreign objects, tools, scaffolding, insulating material etc.
2. Check that the manholes and inspection hatches are firmly closed.
3. Check that the system is complete in accordance with the PID.
4. Check that the expansion joints are free from damage.

Secondary air fan:

1. Install all protective equipment, e.g. coupler protection.
2. Check that the bearings are sufficiently lubricated and the oil level is sufficient.
3. Check that all screw connections on the bearings, motor feet, the machine frame etc. are properly tightened.
4. Turn the impeller manually and check for any scraping noises.
5. Check whether the motor and the impeller shaft are aligned.
6. Check whether the coupler is installed properly (alignment of impeller shaft and motor shaft).

7. Attach the warning notices near the fan (e.g. "Caution - drive starts automatically") or cordon the area off.
8. Check the direction of rotation.

Secondary air and recirculating flue gas ducts:

1. Check the expansion joints for damage.
2. Close all inspection holes/manholes.
3. Mount the insulation cover.
4. Check that the intake openings are free from any foreign objects.

Secondary air preheater:

	DANGER
⚠	**Risk of injury** Danger from fluids due to incomplete drainage or cleaning.

1. Check the steam and condensate pipes for leaks.
2. When filling the plant, make sure that the deaerating is perfect.

11.1.2 Control room checks

1. Check the signal paths of all binary and analogue MCR equipment parts.
2. Check the logic diagram on the DCS (protection shut-downs, alarms etc.).
3. Cancel any simulated values and forced values.

11.1.3 Mechanical settings

See document: B2.10 Chap.8.5 Mechanical Settings.xlsx

11.1.4 Configuration and parameter specifications

No details for this chapter.

11.2 Start-up the system

After the checks have been carried out according to chap. 4.1, the secondary air system can be started up on the DCS in auto function "START" (by manual command).

All process control functions can also be carried out manually.

NOTICE In manual operation the plant equipment is subject to the supervision by, and is the responsibility of, the system operator.

The manual mode of operation must be secured by instruction to the operating personnel.

11.3 Start-up within the line/plant

For permanent conditions and start releases, see document: B4.10 Chap.1.2b (Functional descriptions and logic diagrams).

DANGER

Risk of injury

For safety reasons, nobody should be in the coupler and impeller area during start-up.

The functional group secondary air is started manually. The fan starts automatically at minimum speed.

When starting up the plant, the secondary air system for purging the flue gas path must be started up (prior to starting the start-up and auxiliary burners).

The purging programme provides a set point for the secondary air flow to ensure sufficient purging.

After completing the purging program, the set point for the secondary air flow is set to zero.

After the combustion chamber has been heated up to >850°C waste can be fed to the plant. During the manual start-up process the oxygen content of the combustion gases must be kept at approx. 7-8 % with the help of the secondary air.

11.4 Normal operation

Normal operation means that all aggregates work in automatic mode, that all control loops are either in AUTO or in CASCADE mode, and that all function groups and automatic operating modes are switched on. No alarms or faults are present.

The secondary air system is in operation as the secondary air is part of the total air which is needed for the combustion. The secondary air and the recirculating flue gases are also used for cooling down the post-combustion temperature to a defined adiabatic combustion temperature.

The total secondary air flow is controlled via the frequency converter of the secondary air fan. The set point for the secondary air is calculated by the combustion control system (CCS)

Therefore the function groups Secondary air and CCS have to be switched on and in AUTO mode when the system is in automatic operation.

All process control functions can also be carried out manually by overriding the “Auto” operating mode. Manual mode without specific reasons is not recommended.

NOTE

☞ In manual operation, the plant equipment is subject to the supervision by, and is in the responsibility of the system operator.

4.4.1 Checks during operation

See document: B2.10 Chap.8 Control and observe lists operation.xlsx

11.5 Restricted operation

The line is still running, however not all requirements for the normal operation of the system are given.

Secondary air fan

In the case of problems with the secondary air fan (vibrations, very high bearing temperatures, bearing damage), the line must be shut down.

Recirculating flue gas fan

In case of problems with the recirculating flue gas fan (vibrations, very high bearing temperatures, bearing damage, blackout of the fan), the path to the recirculating flue gas is automatically closed to prevent back flow of hot gases from the furnace into the secondary air and recirculating flue gas duct system.

Secondary air preheater:

In the case of leaks in the system (e.g. cracked pipes), a shutdown of the secondary air preheater is obligatory. This involves closing the steam valves and then the condensate valves, and finally opening the drain valves. It is not required in this case to perform an emergency shut-down of the entire plant

CCS not active:

When the CCS is not active, no set point is calculated for the secondary air control. The total secondary air has to be controlled manually.

The operator needs to enter a reasonable set point into the secondary air controller based on the O_2 value, the steam flow and the furnace ceiling temperature.

11.6 Shut-down within the line/plant

For the stop releases see document B4.10 Chap.1.2b (Functional Design Specification).

Secondary air fan

The function group “secondary air system” is stopped according to the shut-down program of the plant, i.e. as soon as the grate has been emptied or no more waste is in the combustion chamber; the function group Secondary air system can be stopped by pressing the STOP button on the DCS screen

Secondary air preheater:

The function group “secondary air preheater” is stopped according to the shut-down program of the line, i.e. as soon as the grate has been emptied or no more waste is in the furnace, the function group “secondary air preheater” can be stopped by pressing the STOP button on the DCS screen

Shut-down

1. Close the steam and condensate valves.
2. Open the drains.
3. Open the steam valves slightly until steam comes out of the drains.
4. Close the steam valves again.
5. Leave the drain valves open until put back into operation.

11.7 Shut-down and conservation

When there is a risk of frost or when the system is out of service for several months, conserving and anti-freeze measures have to be taken for the fans/air preheater:

- The unit must be stored where it is protected from rain and frost.
- Close the intake and outlet openings.
- In order to avoid damage to the bearings of the air fan, the impeller unit needs to be rotated from time to time.
- The heat exchanger bundles of the air preheater must be completely emptied of condensate and dried.
- If the storage time is to be longer than six months, it is imperative to apply corrosion protection on the inside of the air pre-heater.

The inspections and conserving measures specified in the supplier documentation for the fan and the air preheater have to be carried out.

NOTE

Should prolonged standstill periods occur within the warranty period, the supplier has to be informed so that he can prepare special conserving directives.

If no notification takes place, the manufacturer cannot assume any warranty for subsequent damage.

12 Malfunctions

12.1 System alarms

All alarms will be listed and described according to the KKS no. in the following chapters.

12.2 Alarm description

12.2.1 1 HLA20 CF901, Secondary air flow low

Measurement	FAL
Place of installation	Venturi tube of secondary air duct on intake side
PID	90056817
FDS number	90057091

Display: ☒ in the control room ☐ locally

Malfunction	Consequence
Secondary air flow < low	Note: this is only used for purging; it means that the purging timer is restarted

Cause	Remedy
Control error	Check control parameters
Failure of secondary air fan	Eliminate malfunction of secondary air fan and start up
Secondary air nozzles are badly soiled	Check collector nozzles
Measurement connections leaky	Check measurement connection for tight and sealed screw connections
Measurement connections blocked	Blow or poke through the measurement connections in the direction of the Venturi tube.
Transmitter faulty	Check transmitter

Notes: None

12.2.2 1 HLA20 CF901, Secondary air flow too low

Measurement	FALL
Place of installation	Venturi tube of secondary air duct on intake side
PID	90056817
FDS number	90057091

Display: ☒ in the control room ☐ locally

Malfunction	Consequence
Secondary air flow < low	Note: this is only used for purging; it means that the purging timer is restarted

Cause	Remedy
Failure of the controller	Check control parameters and the function of the Controller
Failure of secondary air fan	Eliminate malfunction of secondary air fan and start up
Secondary air nozzles are badly soiled	Check collector nozzles
Condensate collection	Check the measuring line
Measurement connections blocked	Blow or poke through the measurement connections in the direction of the Venturi tube.
Transmitter faulty	Check transmitter

Notes: None

12.2.3 1 HLA20 CT002, Temperature before flue gas injection low

Measurement	TAL
Place of installation	Secondary air duct before flue gas injection
PID	90056817
FDS number	90057091

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Tailback message Temperature decreases	Mixing temperature drops below 120°C. Temperature drops below the dew point Formation of condensate possible -> corrosion

Cause	Remedy
Mixing of secondary air with flue gas (in the direction of the preheater)	Check the preheater, function (steam, blockage, valves)

Notes: None

12.2.4 1 HLA20 CT004, Temperature after flue gas injection low

Measurement	TAL
Place of installation	Secondary air duct after flue gas injection
PID	90056817
FDS number	90057091

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Tailback message Temperature decreases	Mixing temperature drops below 120°C. Temperature drops below the dew point Formation of condensate possible -> corrosion

Cause	Remedy
Flue gas temperature may be too low	Check the flue gas recirculation system (fan, temperature measurement venturi)

Notes: None

12.2.5 1 HLA30 AN001, Collective alarm MCC exhaust vapour fan

Measurement	EAL
Place of installation	MCC in electrical container
PID	90056817
FDS number	90057091

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Failure MCC	Insufficient vapour extraction

Cause	Remedy
Motor overloaded	Check electrical and/or mechanical part of equipment

Notes: None

12.2.6 1 HLB20 AN001, Collective alarm MCC air fan

Measurement	EAL
Place of installation	MCC in electrical container
PID	90056817
FDS number	90057091

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Failure MCC	Plant shut down, see Chapter 4.5 Restricted operation

Cause	Remedy
Malfunction of MCC feeder to variable frequency drive	Check MCC-feeder

Notes: None

12.2.7 1 HLB20 AN001, Collective alarm VFD air fan

Measurement	EAL
Place of installation	Electrical room
PID	90053732
FDS number	90053924

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Collective alarm of variable frequency drive fan	Air flow no longer controllable
	Failure of secondary air

Cause	Remedy
Malfunction of variable frequency drive of fan	Check malfunction record of frequency converter. Reset alarm (remote acknowledge).

Notes: None

12.2.8 1 HLB20 AN001, Fan motor temperature high

Measurement	TAH
Place of installation	Secondary air fan motor
PID	90056817
FDS number	90057091

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Motor winding temperature is high	Warning increased motor temperature

Cause	Remedy
Malfunction of temperature sensor	Check instrument
Motor overloaded	Check electrical and/or mechanical part of equipment

Notes: None

12.2.9 1 HLB20 AN002, Cooling Fan alarm, MCC

Measurement	EAL
Place of installation	Electrical room
PID	90056817
FDS number	90057091

Display: ☒ in the control room ☐ locally

Malfunction	Consequence
Collective alarm MCC	Air flow no longer controllable. Failure of secondary air

Cause	Remedy
Malfunction of Cooling Fan	Check Cooling Fan

Notes: None

12.2.10 1 HLB20 CT001, 1 HLB20 CT002, Fan bearing temperature high

Measurement	TAH
Place of installation	Bearing of fan
PID	90056817
FDS number	90057091

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Bearing temperature is high	Pre-alarm, in the case of further temperature increase, failure of secondary air fan possible.

Cause	Remedy
Bearing damage	Replace bearing
Faulty reading of the temperature sensor	Check the electronics
Not enough lubricant	Check lubricant level local

Notes: None

12.2.11 1 HLB20 CT001, 1 HLB20 CT002, Fan bearing temperature too high

Measurement	TAHH
Place of installation	Bearing of fan
PID	90056817
FDS number	90057091

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Bearing temperature is too high	Alarm, bearing damaged, failure of fan due to fan protection stop

Cause	Remedy
Imbalance on impeller due to deposits	Remove deposits
Bearing damage	Replace bearing
Faulty reading of the temperature sensor	Check the electronics
Not enough lubricant	Check lubricant level local.

Notes: None

12.2.12 1 HLB20 CY001, Fan bearing vibrations high

Measurement	YAH
Place of installation	Fixed bearings of fan
PID	90056817
FDS number	90057091

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Bearing vibrations are high	Bearings may be damaged if vibrations increase further

Cause	Remedy
Imbalance on impeller due to deposits	Remove deposits
Bearing damage	Replace bearing
Measurement faulty	Check, vibration measurement, shielding insufficient
Not enough lubricant	Refill lubricant
Wear/corrosion	Balancing
Rotating parts scraping against static parts - impeller damage	Repair, replace impeller

Notes: None

1 LCN40 CL001, Level condensate is high (LP)

Measurement	LAH
Place of installation	Preheater
PID	90056818
FDS number	90057113

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Condensate level is high	Efficiency of secondary air preheater is reduced

Cause	Remedy
Control deviation	Check of control circuit
Malfunction of valve	Manual operation of valve
Blocked pipe	Local inspection

Notes: None

12.2.13 1 LCN40 CL001, Level condensate is low

Measurement	LAL
Place of installation	Preheater
PID	90056818
FDS number	90057113

Display: ☒ in the control room ☐ local

Malfunction	Consequence
Condensate level is low	Efficiency of secondary air preheater is reduced

Cause	Remedy
Control deviation	Check of control circuit
Malfunction of valve	Manual operation of valve
Steam supply insufficient	Analyse steam supply
Leakage	Local inspection

Notes: None

13 Functional Design Specification

See document: B4.10 Chap.1.2b 90056817 SECONDARY AIR SYSTEM

See document: B4.10 Chap.1.2b 90057113 SECONDARY AIR PREHEATING

Office of Environmental Enforcement

Environmental Protection Agency
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LoCall: 1890 33 55 99

Mr Mark Heffernan,
Environmental Manager,
Dublin Waste to Energy Ltd,
Pigeon House Road,
Poolbeg,
Dublin 4.
30/05/2017

Dear Mr Heffernan,

The Agency has reviewed your submission Ref. No. LR028568, received 21/04/2017, regarding the provision of adequate measures for the control of odour and dust emissions at the Dublin Waste to Energy facility.

The submission was made under Condition 3.10 of Industrial Emissions Licence (IEL) Reg. No. W0232-01. The report outlines that an assessment was completed by the licensee to demonstrate negative pressure at the waste reception, waste bunker and waste storage area.

The licensee is reminded that it is required, in accordance with condition 3.10 of the licence, to establish and maintain an odour and fugitive dust emission management system and ensure no significant escape of odours or dust.

If you have any queries, please contact the undersigned on 012680100.

Yours sincerely,

Simon Buckley

Mr Simon Buckley,
Inspector,
Office of Environmental Enforcement,
Dublin.

Appendix E : Blank Odour Patrol Record Sheet

DOCXXXX Odour Assessment Record Form

General	Ref No	Site Licence No	Assessment by:	Date of Assessment	Dublin Waste to Energy / COVANTA Powering Today. Protecting Tomorrow.
		W0232-01			

Pre-Assessment Preparation	Observer is free from medical conditions (colds, sore throat etc.)	Observer abstinence from smoking, flavoured drinks, deodorisers etc.	Reason for odour assessment- complaint verification, routine or other	Map- Has a map showing assessment locations being attached?	Weather Conditions

Notes

Note 1: Observation Point Sensitivity
1. Remote (no housing, commercial/ industrial premises or public area within 500m)
2. Low Sensitivity (no housing, commercial/industrial premises in public area within 100m)
3. Moderate Sensitivity (housing/ commercial/ industrial developments or public area within 100m)
4 High Sensitivity (housing, commercial/industrial premises or public area within area)
5 Extra Sensitive (complaints from residents, businesses and users of public area)

Note 2: Wind Strength
0 Calm Smoke rises vertically
1 Light air Direction of wind shown by smoke drift, but not wind vanes
2 Light Breeze Wind felt on face; leaves rustle, ordinary vane moved by wind
3 Gentle Breeze Leaves and small twigs in constant motion
4 Moderate Breeze Raises dust and loose paper; small branches are moved
5 Fresh Breeze Small trees in leaf begin to sway
6 Strong Breeze Large branches in motion; umbrellas used with difficulty against the wind
7 Near Gale Whole trees in motion; inconvenience felt when walking against wind
8 Gale Twigs break off trees; progress generally impeded
9 Strong Gale Slight structural damage occurs (chimney pots and slates removed)

Note 3: Weather Conditions
Precipitation – dry, rained recently, drizzle, raining, foggy
Temperature – cold, cool, warm, hot

Note 4: Odour Persistence
0 No Odour
1 Intermittent (detected intermittently during the period of assessment)
2 Persistent (detected throughout the period of assessment)

Note 5: Odour Intensity
0 No Detectable Odour
1 Faint Odour (barely detectable, need to stand still and inhale facing into wind)
2 Moderate Odour (easily detectable while walking and breathing normally, possibly offensive)
3 Strong Odour (bearable but offensive – might make clothes / hair smell?)
4 Very Strong Odour (unbearable, difficult to remain in area affected by odour)

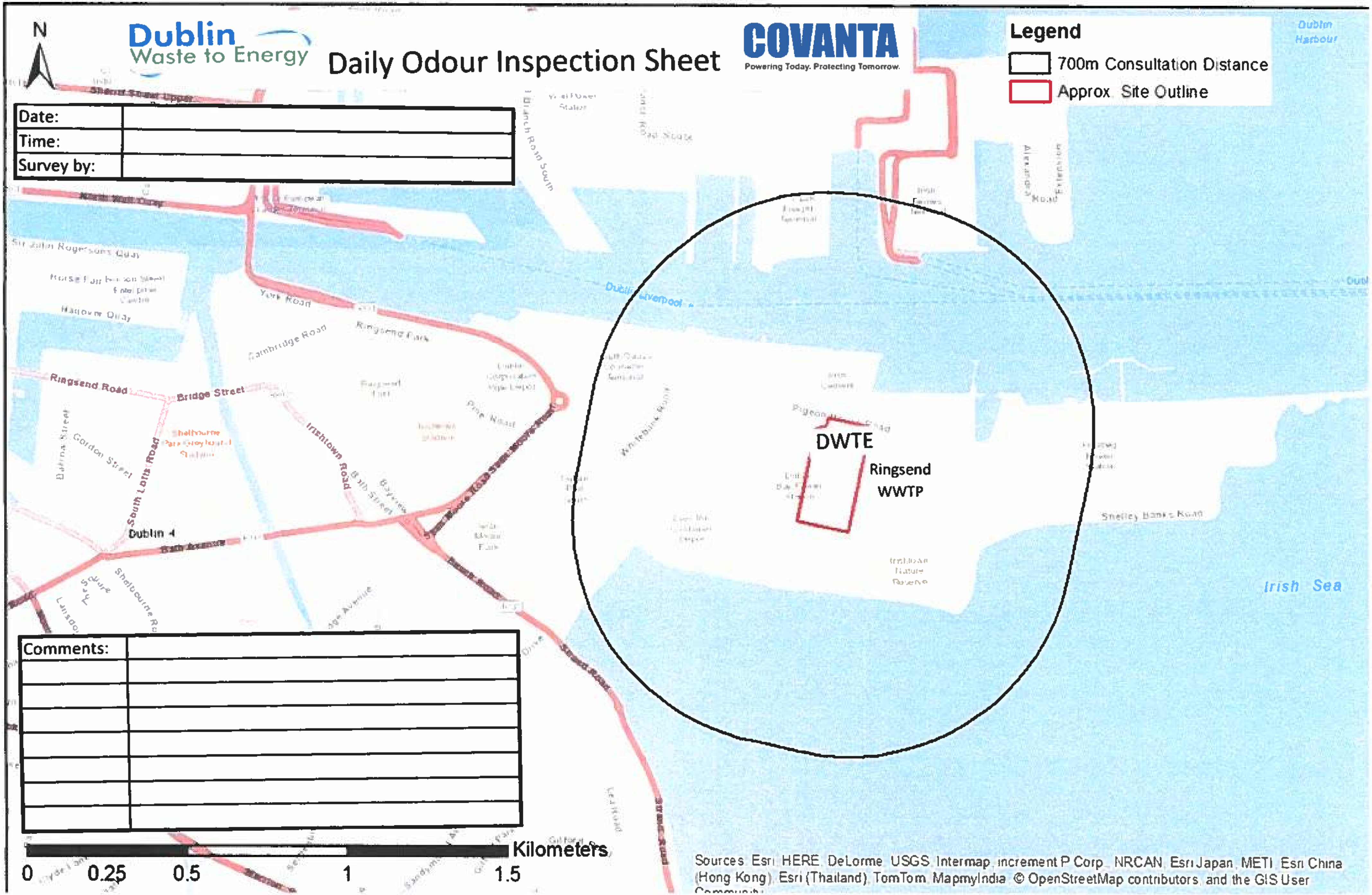
Post Odour survey investigated (only completed if odour detected)	Start Time	Do any of the odours experienced on site match those experienced off site Yes No	Activities occuring on site?	List Areas Inspected
	Finish Time	Potential on-site odour sources identified		

Parameters	Location (must be easily Identifiable)	Sensitivity 1-5 (Note 1)	Wind Direction	Orientation	Wind Strength	Period of Observation	Time	Odour Persistence Note 4	Odour Intensity Note 5	Comments
Limits	-	≥3	-	Upwind, downwind etc.	-	-	-	1 or 2	≥2	Description of odour if detected, also identify possible odour sources
Field Observations										

Comments	Include Details of meetings with members of the public

Daily Odour Inspection Sheet

Date:	
Time:	
Survey by:	



Comments:	

Appendix F : Revised Air Dispersion Modelling Report

AECOM

-

Dublin Waste to Energy

RFI Response Air Quality Assessment

Dublin Waste to Energy Limited

Project number: 60587300

02-September-2022

Delivering a better world

Quality information

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Tables

1. Introduction

1.1 Since the submission of air quality dispersion modelling report in June 2019 (hereafter referred to as 'the 2019 assessment'[1]) which was assessed in line with the guidance at the time, the EPA have released Air Dispersion Modelling Guidance Note (AG4) 2020. This report has been prepared to address the air dispersion model points raised by the Environmental Protection Agency (EPA) in their Regulation 10 letter, dated 6 July 2022, including the changes in guidance provided by AG4.

1.2 The points raised by the EPA on the air dispersion modelling are:

a) Provide the model input source data, actual emission rate data (g/s) actual temperature, stack height, stack coordinates, actual volume flow (m^3/s) and exit (Efflux) velocity (m/s). This is addressed in Section 2;

b) Rerun the air dispersion model to include five years of met data in line with the EPA Air Dispersion Modelling Guidance Note (AG4) 2020. This is addressed in Section 3;

c) Provide the model results in graphical format and isopleths. This is addressed in Section 4;

d) Provide model input building data – building elevations, heights, layout and nearby buildings greater than 40% of stack height. This is addressed in Section 6;

e) Provide an assessment of the highest predicted environmental concentration based on 75% flow rate in line with AG4. This is addressed in Section 7;

f) Provide a cumulative assessment of the impact of industrial installations/waste facilities emissions in the region. This is addressed in Section 8;

g) Provide an assessment of the impact of emissions during abnormal operations, compared to air quality standards. This is addressed in Section 9;

h) Confirm whether fumigation was accounted for in the air dispersion modelling and if not rerun the model to take account of fumigation. This is addressed in Section 5.

1.3 The 2019 assessment has been updated to specifically address the points listed above. No other changes to the 2019 assessment nor assessment method have been made other than those specified in this report. .

2. Model Input Source Data

2.1 The model source input data for the Dublin Waste to Energy stacks is summarised in Table 2.1 and Table 2.2 for the 100% flow rate scenario. The applicable values when operating at 75% flow rate scenario are presented in Section 7 of this report.

Table 2.1 ADMS 5 Model Source Input Data

Source	Location (Easting, Northing) (1)	Emission Height Ordnance Datum (OD) (m)(2)	Internal Diameter at Release Point (m)	Gas Exit Temperature (ºC)	Exit Velocity (m/s)	Actual Volumetric Flow Rate (m^3/s) (3)
Stack 1	686427, 5913697	105	2.4	54.85	20.3	Max: 91.8
Stack 2	686433, 5913696	105	2.4	54.85	20.3	Max: 91.8

(1) Coordinate system used was UTM_Zone_29N, (2) Modelled as 100m above ground level, (3) at stack conditions

[1] AECOM (2019) *Attachment 7-1-3-2-Emission Impact Assessment, IEL Review Application W0232_01, Application ID LA003577*

2.2 Mass emission rates of the pollutants modelled from Stack 1 and Stack 2 are summarised in Table 2.2.

Table 2.2 ADMS 5 Model Source Emissions Data per Stack

Pollutant	Emission Limit (mg/Nm^3) (3)	Maximum Short Term Emission Limit (mg/Nm^3) (3), (4)	Mass Emission Rate (g/s) (3)	Maximum Short Term Mass Emission Rate (g/s) (3), (4)
Oxides of nitrogen (NO_X as NO_2)	200	400	15.28	30.56
Particulate matter (PM_{10} / $PM_{2.5}$)[1]	10	30	0.76	2.28
Sulphur dioxide (SO_2)	50	200	3.82	15.28
Carbon monoxide (CO)	150	N/A	11.46	N/A
Hydrogen chloride (HCl)	10	60	0.76	4.56
Total Organic Carbon (TOC) (C_6H_6)	10	20	0.76	1.52
Hydrogen fluoride (HF)	1	4	0.08	0.32
Group 1 metals (cadmium (Cd) and thallium (Tl)) and mercury (Hg)	0.05	N/A	3.82×10^{-3}	N/A
Group 3 metals (antimony (Sb), lead (Pb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn), nickel (Ni) and vanadium (V)) excluding Arsenic (As)	0.5	N/A	0.04	N/A
Arsenic (As)	0.2	N/A	0.02	N/A
Dioxins & furans	0.0000001	N/A	7.64×10^{-9}	N/A
Ammonia (NH_3)	10[2]	N/A	0.76[2]	N/A

[1] It has been assumed that PM_{10} and $PM_{2.5}$ emissions are the same, i.e. all particulate emissions are either in the PM_{10} or the $PM_{2.5}$ range, which is considered precautionary for $PM_{2.5}$.
[2] Based on BAT emission limit.
[3] Volumetric flow of 275,000 Nm^3/hr at 272K, 101.3kPA, dry gas at 11% O_2 reference.
[4] Worse case emission limits as per the existing Waste Licence (W0232-01) have been modelled for short term impacts, as set out in Schedule B, Table B.1 of the Licence in column "A".

2.3 A 100% NO_X to nitrogen dioxide (NO_2) conversion rate has been assumed when modelling annual impact of the plant, while for short-term impacts, i.e. hourly, a 50% NO_X to NO_2 conversion rate has been used.

3. Met Data Update

3.1 Since the submission of the 2019 assessment, the EPA have published an updated version of the AG4 dispersion modelling guidance[2], which requires consideration of five years of hourly sequential meteorological data. The assessment submitted in 2019 considered three years of data (2015 – 2017) from Dublin Airport.

3.2 The additional modelling undertaken to satisfy the RFI considers five years of hourly sequential meteorological data (2015 – 2017 and 2020 – 2021). The 2015, 2016 and 2017 model runs used to inform the 2019 assessment have been rerun alongside the new meteorological years, to account for the current use of the ADMS 5 modelling software (v.5.2.4.0). Meteorological data for 2018 and 2019 has not been

[2] EPA (2020) *EPA Air Dispersion Modelling Guidance Note (AG4) 2020* Technical Report template, embedded Dublin (epa.ie)

used due to insufficient sea surface temperature data, which is required for use of the ADMS Coastline module.

3.3 Windrose plots for the five years of meteorological data used to inform this assessment is provided in Appendix A as Figure 3.1.

3.4 The Process Contribution (PC) and Predicted Environmental Concentration (PEC) at the point of maximum offsite impact, over the five-year period considered and for each pollutant and averaging period, is provided in Table 3.1. These results have been modelled based on the current Waste Licence B emission limits. PC and PEC is reported for following three iterations of the model:

- model run with the ADMS coastline module active (see Section 5);
- model run with the ADMS buildings module active (see Section 6);
- model run with neither ADMS buildings module nor coastline module active.

3.5 It should also be noted that HCl and HF Environmental Assessment Levels (EALs) have been updated from the previous assessment to match those presented in the EPA AG4 dispersion modelling guidance.

3.6 Table 3.1 provides the maximum offsite PC and PEC for each pollutant and averaging period in line with guidance. This may or may not coincide with sensitive exposure. Where the PC and PEC for a pollutant and averaging period is elevated, consideration is also given to the PC and PEC experienced at the worst affected discrete receptors, where there is sensitive exposure. The PC and PEC at modelled discrete receptors are presented in Table 3.4.

3.7 The results reported in Table 3.1 demonstrate that under normal operations and licenced B emissions limits, the PC and PEC for all pollutants are all well below their respective EAL at the point of maximum offsite impact, for all model iterations. The PC is less than 20% of the relevant EAL for all of the pollutants and averaging periods, with the exception of Cd and As, with little risk of any exceedance of the EALs considered for the protection of human health. The largest PC as a proportion of the EAL is for annual mean NO_2, Cd and As, although it is noted that monitored emissions of Cd and As are well below the licenced emission rates and the modelling of these pollutants provides a highly precautionary impact. The largest PEC as a proportion of the EAL is again for annual mean NO_2, Cd and As in addition to daily PM_{10} and annual mean PM_{10} and $PM_{2.5}$. For the majority of pollutants with an elevated PEC, this is predominantly due to a larger contribution from background sources that are unrelated to the DWtE facility.

3.8 Section 4 of this report is provided in response to the RFI for the inclusion of isopleths, which are used to illustrate the spatial distribution of the dispersion of emissions. Isopleths are provided as figures in Appendix A and those that represent the dispersion of emissions for pollutants with annual and daily mean averaging periods demonstrate that the point of maximum impact occurs within Dublin Bay, where there is no relevant air quality sensitive exposure.

3.9 The different iterations of the model and comparison of the PC with and without the ADMS Coastline module active demonstrates that fumigation has no material effect on the dispersion of emissions from the facility and the PC reported at the location of maximum offsite impact. Comparison of the PC with the ADMS Buildings module active demonstrates that building downwash has a greater effect on the dispersion of emissions from the facility, with a greater PC predicted for the majority of pollutants and averaging periods.

3.10 The PC and PEC at the point of maximum offsite impact, has also been quantified based on current Waste Licence A emission limits for the site operating under normal conditions. These A limits apply to pollutants that have a short-term EAL within AG4 (NO_2, SO_2, PM_{10}, HCl and HF). The PEC at the point of maximum offsite impact, over the five-year period considered and for each pollutant and averaging period, is provided in Table 3.2

3.11 The results reported in Table 3.2 demonstrate that under normal operations and licenced A emissions limits, the PC and PEC is higher than that reported for the licenced B emissions limits reported in Table 3.1, but remain well below the respective EALs at the point of maximum offsite impact, for all model iterations.

3.12 The different iterations of the model and comparison of the PC with and without the ADMS Coastline module active again demonstrate that fumigation has no material effect on the dispersion of emissions from the facility and the PC reported at the location of maximum offsite impact. Again, it is the ADMS Buildings module and building downwash that has a greater effect on dispersion, with a larger PC predicted for all pollutants and averaging periods.

Table 3.1 Predicted Air Quality Values, Point of Maximum Offsite Impact (worst case (2015 – 2017, 2020 – 2021)) – Waste Licence B Emission Limits

Pollutant	Averaging Period	EAL (µg/m^3)	Background/ Ambient Concentration (µg/m^3)	With Building data [5]				With Fumigation [5]				With no building or fumigation [5]			
				PC (µg/m^3)	PC % of EAL	PEC (µg/m^3)	PEC % of EAL	PC (µg/m^3)	PC % of EAL	PEC (µg/m^3)	PEC % of EAL	PC (µg/m^3)	PC % of EAL	PEC (µg/m^3)	PEC % of EAL
NO_2	1-Hour	200	45.2[1,2]	30.0	15.0	75.2	37.6	23.5	11.7	68.7	34.3	24.2	12.1	69.4	34.7
	Annual	40	22.6[2]	7.7	19.2	30.3	75.7	2.8	7.0	25.4	63.5	2.8	7.0	25.4	63.5
SO_2	1-hr	350	8.6[1,3]	14.8	4.2	23.4	6.7	10.9	3.1	19.5	5.6	11.8	3.4	20.4	5.8
	24-hr	125	8.6[1,3]	10.0	8.0	18.6	14.9	3.9	3.1	12.5	10.0	3.9	3.1	12.5	10.0
PM_{10}	24-hr	50	26.2[1,2]	1.2	2.3	27.4	54.7	0.4	0.8	26.6	53.2	0.4	0.8	26.6	53.2
	Annual	40	13.1[2]	0.4	1.0	13.5	33.7	0.1	0.3	13.2	33.1	0.1	0.3	13.2	33.1
$PM_{2.5}$	Annual	25	9.5[2]	0.4	1.5	9.9	39.5	0.1	0.6	9.6	38.6	0.1	0.6	9.6	38.6
CO	Max 8-hr	10000	2000.0[2]	39.0	0.4	2039	20.4	24.8	0.2	2024.8	20.2	28.5	0.3	2028.5	20.3
TOC	Annual	5	1.7[4]	0.4	7.7	2.1	41.7	0.1	2.8	1.8	36.8	0.1	2.8	1.8	36.8
HCl	Max 1-hr	750	0.5[4]	8.4	1.1	8.9	1.2	4.8	0.6	5.3	0.7	4.2	0.6	4.7	0.6
HF	Max 1-hr	160	$2.0x10^{-2}$[1,4]	0.8	0.5	0.9	0.5	0.7	0.5	0.7	0.5	0.4	0.3	0.4	0.3
	Monthly	16	$2.0x10^{-2}$[1,4]	0.1	0.8	0.2	1.0	$7.9x10^{-2}$	0.5	0.1	0.6	$5.6x10^{-2}$	0.4	$7.6x10^{-2}$	0.5
Dioxins	Annual	N/A	$5.6x10^{-8}$[4]	$3.8x10^{-9}$	N/A	$6.0x10^{-8}$	N/A	$1.4x10^{-9}$	N/A	$5.7x10^{-8}$	N/A	$1.4x10^{-9}$	N/A	$5.7x10^{-8}$	N/A
Hg	Annual	1	$1.0x10^{-3}$[4]	$1.9x10^{-3}$	0.2	$1.9x10^{-3}$	0.2	$7.0x10^{-4}$	0.1	$7.0x10^{-4}$	0.1	$7.0x10^{-4}$	0.1	$7.0x10^{-4}$	0.1
Cd	Annual	$5.0x10^{-3}$	$1.0x10^{-3}$[4]	$1.9x10^{-3}$	38.5	$2.9x10^{-3}$	58.5	$7.0x10^{-4}$	13.9	$1.7x10^{-3}$	33.9	$7.0x10^{-4}$	13.9	$1.7x10^{-3}$	33.9
As	Annual	$6.0x10^{-3}$	$1.0x10^{-3}$[4]	$3.8x10^{-3}$	62.9	$4.8x10^{-3}$	79.6	$1.4x10^{-3}$	23.2	$2.4x10^{-3}$	39.9	$1.4x10^{-3}$	23.2	$2.4x10^{-3}$	39.9
V	Max 24-Hour	1	$1.0x10^{-2}$[4]	0.1	11.1	0.1	12.1	$5.2x10^{-2}$	5.2	$6.2x10^{-2}$	6.2	$4.6x10^{-2}$	4.6	$5.6x10^{-2}$	5.6

(1) Short term Background Contributions are double the long-term contributions, (2) Background sourced from EPA Monitoring undertaken at background locations in Zone A, in 2016, (3) Background sourced from EPA Monitoring at Ringsend (2017 & 2018), (4) Background sourced from 2006 EIAR. 5Three separate scenarios have been modelled due to limitations in the ADMS modelling software: a) scenario with building data but without coastline data, b) scenario with coastline data but without building data and c) a control scenario without building data or coastline data. This has been explained further in Sections 5 and 6.

Table 3.2 Predicted Air Quality Values under the maximum short-term emission limit, Point of Maximum Offsite Impact (worst case (2015 – 2017, 2020 – 2021)) – Waste Licence A Emission Limits

Pollutant	Averaging Period	EAL (μg/m^3)	Background/ Ambient Concentration (μg/m^3)	With Building data [5]				With Fumigation [5]				With no building or fumigation [5]			
				PC (μg/m^3)	PC % of EAL	PEC (μg/m^3)	PEC % of EAL	PC (μg/m^3)	PC % of EAL	PEC (μg/m^3)	PEC % of EAL	PC (μg/m^3)	PC % of EAL	PEC (μg/m^3)	PEC % of EAL
NO_2	1-Hour	200	45.2[1],[2]	60.0	30.0	105.2	52.6	47.0	23.5	92.2	46.1	48.4	24.2	93.6	46.8
SO_2	1-hr	350	8.6[1],[3]	59.4	17.0	68.0	19.4	43.6	12.4	52.2	14.9	47.3	13.5	55.9	16.0
	24-hr	125	8.6[1],[3]	40.1	32.1	48.7	39.0	15.6	12.5	24.2	19.4	15.6	12.5	24.2	19.4
PM_{10}	24-hr	50	26.2[1],[2]	3.5	6.9	29.7	59.3	1.2	2.5	27.4	54.9	1.2	2.5	27.4	54.9
HCl	Max 1-hr	750	0.5[4]	50.3	6.7	50.8	6.8	28.8	3.8	29.3	3.9	25.3	3.4	25.8	3.4
HF	Max 1-hr	160	2.0×10^{-2}[1],[4]	3.4	2.1	3.4	2.1	2.9	1.8	2.9	1.8	1.7	1.1	1.7	1.1
	Monthly	16	2.0×10^{-2}[1],[4]	0.5	3.3	0.6	3.4	0.3	2.0	0.3	2.1	0.2	0.4	0.3	1.5

[1] Short term Background Contributions are double the long-term contributions, [2] Background sourced from EPA Monitoring undertaken at background locations in Zone A, in 2016, [3] Background sourced from EPA Monitoring at Ringsend (2017 & 2018), [4] Background sourced from 2006 EIAR. [5] Three separate scenarios have been modelled due to limitations in the ADMS modelling software: a) scenario with building data but without coastline data, b) scenario with coastline data but without building data and c) a control scenario without building data or coastline data. This has been explained further in Sections 5 and 6.

3.13 The PC and PEC at the point of maximum impact at a designated nature conservation site (receptor E3 (South Dublin Bay SAC/South Dublin Bay and River Tolka Estuary SPA)) of the 8 modelled ecological receptors), over the five-year period considered and for each pollutant and averaging period, are provided in Table 3.3. The locations of the modelled ecological receptors are presented in Table 3.6 and Figure 3.2 of Appendix A.

3.14 The results demonstrate that the PC based on normal operation and the current Waste Licence emission limits, at the worst affected ecologically sensitive location, account for less than 7% of the relevant EALs. The PEC for annual mean NO_X does see an exceedance of the EAL for that pollutant, predominantly due to the background contribution, which already accounts for 124% of the EAL. The background contribution assumed in this assessment for annual mean NO_X remains consistent with that reported in the original assessment, which was based on monitoring data from 2016. It should be noted that this background data is likely to be precautionary of actual background conditions at the nature conservation sites considered in this assessment. Background conditions at the coastal nature conservations receptors will almost certainly be lower than the monitored urban background concentrations gathered in Dublin. This due to the cumulative contribution of nearer road sources within the city area.

3.15 The PC and PEC has also been quantified at 20 human health sensitive receptors within this assessment, with the worst affected discrete receptor locations for the different pollutants provided in Table 3.4. The PC and PEC reported in Table 3.4 are based on the maximum PC predicted across the three model iterations for each receptor (described in Paragraph 3.4). The location of the modelled human health receptors is presented in Table 3.6 and Figure 3.2 of Appendix A. Table 3.4 demonstrates that all pollutants are below their respective EALs for their relevant averaging periods at the selected sensitive receptor locations reported.

3.16 In addition to the results presented in Table 3.4, the PC and PEC for the 20 human health sensitive receptors has also been quantified based on current Waste Licence A emission limits for the site. The PC and PEC at the worst affected discrete receptor locations, over the five-year period considered and for each pollutant and averaging period, is provided in Table 3.5. The results demonstrate that under normal operations and licenced A emissions limits, the PC and PEC is higher than that reported for the licenced B emissions limits, but remain well below their respective EALs at the worst affected discrete receptor locations, for all model iterations.

Table 3.3 Predicted Air Quality Values, Worst Case Ecological Site Impacts (South Dublin Bay SAC/South Dublin Bay and River Tolka Estuary SPA, E3) (worst case (2015 – 2017, 2020 – 2021))

Pollutant	Averaging Period	EAL ($\mu g/m^3$)	Background/ Ambient Concentration ($\mu g/m^3$)	With Building data information [5]				With Fumigation information [5]				With no building or fumigation information [5]			
				PC ($\mu g/m^3$)	PC % of EAL	PEC ($\mu g/m^3$)	PEC % of EAL	PC ($\mu g/m^3$)	PC % of EAL	PEC ($\mu g/m^3$)	PEC % of EAL	PC ($\mu g/m^3$)	PC % of EAL	PEC ($\mu g/m^3$)	PEC % of EAL
NO_x	Annual	30	37.2[2]	2.0	6.6	39.2	130.6	1.4	4.6	38.6	128.6	1.4	4.6	38.6	128.6
NH_3	Annual	3[1]	1.7[3]	0.1	3.3	1.8	60.0	0.1	2.3	1.8	59.0	0.1	2.3	1.8	59.0
SO_2	Annual	20	4.8[4]	0.5	2.5	5.3	26.5	0.3	1.7	5.1	25.7	0.3	1.7	5.1	25.7

[1] NH_3 EAL based on the standard set by the UK Environment Agency assumed [2] Background sourced from EPA Monitoring undertaken at background locations in Zone A, in 2016 – likely to provide a precautionary estimate of the background contribution on the Poolbeg peninsula, [3] Background sourced from EPA Research (Ambient Atmospheric Ammonia in Ireland, 2013-2014), [4] Background sourced from 2006 EIAR, [5] Three separate scenarios have been modelled due to limitations in the ADMS modelling software: a) scenario with building data but without coastline data, b) scenario with coastline data but without building data and c) a control scenario without building data or coastline data. This has been explained further in Paragraph 3.5 and Sections 5 and 6.

Table 3.4 Predicted Air Quality Values, Key Receptor Locations (Worst Case Dublin Airport Met Data (2015 – 2017, 2020-2021))

Pollutant	Averaging Period	EAL ($\mu g/m^3$)	Background/ Ambient Concentration ($\mu g/m^3$)	Receptor R4 (Residential Property on Pigeon House Road) [(5), (6)]				Receptor R6 (Proposed Residential Property on South Bank Road) [(5), (6)]				Receptor R7 (Proposed Residential Property on South Bank Road) [(5), (6)]				Receptor R8 (Proposed Residential Property on South Bank Road) [(5), (6)]			
				PC ($\mu g/m^3$)	PC % of EAL	PEC ($\mu g/m^3$)	PEC % of EAL	PC ($\mu g/m^3$)	PC % of EAL	PEC ($\mu g/m^3$)	PEC % of EAL	PC ($\mu g/m^3$)	PC % of EAL	PEC ($\mu g/m^3$)	PEC % of EAL	PC ($\mu g/m^3$)	PC % of EAL	PEC ($\mu g/m^3$)	PEC % of EAL
NO_2	1-Hour	200	45.2 [(1),(2)]	15.8	7.9	61.0	30.5	22.5	11.2	67.7	33.8	25.5	12.7	70.7	35.3	22.3	11.2	67.5	33.8
	Annual	40	22.6 [(2)]	0.9	2.2	23.5	58.7	1.5	3.7	24.1	60.2	1.6	4.0	24.2	60.5	1.5	3.9	24.1	60.4
SO_2	1-hr	350	8.6 [(1),(3)]	7.6	2.2	16.2	4.6	11.0	3.1	19.6	5.6	12.5	3.6	21.1	6.0	11.1	3.2	19.7	5.6
	24-hr	125	8.6 [(1),(3)]	2.5	2.0	11.1	8.9	4.6	3.7	13.2	10.5	6.4	5.2	15.0	12.0	4.8	3.8	13.4	10.7
PM_{10}	24-hr	50	26.2 [(1),(2)]	0.2	<1	26.4	52.7	0.3	<1	26.5	53.0	0.3	<1	26.5	53.0	0.3	<1	26.5	53.0
	Annual	40	13.1 [(2)]	4.4×10^{-2}	<1	13.1	32.9	0.1	<1	13.2	32.9	0.1	<1	13.2	33.0	0.1	<1	13.2	32.9
$PM_{2.5}$	Annual	25	9.5 [(2)]	4.4×10^{-2}	<1	9.5	38.2	0.1	<1	9.6	38.3	0.1	<1	9.6	38.3	0.1	<1	9.6	38.3
CO	Max 8-hr	10000	2000.0 [(2)]	20.4	<1	2020.4	20.2	26.3	<1	2026.3	20.3	30.5	<1	2030.5	20.3	29.0	<1	2029.0	20.3
TOC	Annual	5	1.7 [(4)]	4.4×10^{-2}	<1	1.7	34.9	0.1	1.5	1.8	35.5	0.1	1.6	1.8	35.6	0.1	1.5	1.8	35.5
HCl	Max 1-hr	750	0.5 [(4)]	3.4	<1	3.9	<1	2.4	<1	2.9	<1	2.9	<1	3.4	<1	2.5	<1	3.0	<1
HF	Max 1-hr	160	2.0×10^{-2} [(1),(4)]	0.3	<1	0.4	<1	0.2	<1	0.3	<1	0.3	<1	0.3	<1	0.3	<1	0.3	<1
	Monthly	16	2.0×10^{-2} [(1),(4)]	3.5×10^{-2}	<1	5.5×10^{-2}	<1	5.6×10^{-2}	<1	7.6×10^{-2}	<1	6.5×10^{-2}	<1	8.5×10^{-2}	<1	6.4×10^{-2}	<1	8.4×10^{-2}	<1
Dioxins	Annual	N/A	5.6×10^{-8} [(4)]	4.4×10^{-10}	N/A	5.6×10^{-8}	N/A	7.4×10^{-10}	N/A	5.7×10^{-8}	N/A	8.1×10^{-8}	N/A	5.7×10^{-8}	N/A	7.7×10^{-10}	N/A	5.7×10^{-8}	N/A
Hg	Annual	1	1.0×10^{-3} [(4)]	2.2×10^{-4}	<1	2.2×10^{-4}	<1	3.7×10^{-4}	<1	3.7×10^{-4}	<1	4.0×10^{-4}	<1	4.0×10^{-4}	<1	3.9×10^{-4}	<1	3.9×10^{-4}	<1
Cd	Annual	5.0×10^{-3}	1.0×10^{-3} [(4)]	2.2×10^{-4}	4.4	1.2×10^{-3}	24.4	3.7×10^{-4}	7.4	1.4×10^{-3}	27.4	4.0×10^{-4}	8.1	1.4×10^{-3}	28.1	3.9×10^{-4}	7.7	1.4×10^{-3}	27.7
As	Annual	6.0×10^{-3}	1.0×10^{-3} [(4)]	4.4×10^{-4}	7.3	1.4×10^{-3}	24.0	7.4×10^{-4}	12.3	1.7×10^{-3}	29.0	8.0×10^{-4}	13.4	1.8×10^{-3}	30.0	7.7×10^{-4}	12.9	1.8×10^{-3}	29.5
V	Max 24-Hour	1	1.0×10^{-2} [(4)]	4.6×10^{-2}	4.6	5.6×10^{-2}	5.6	5.4×10^{-2}	5.4	6.4×10^{-2}	6.4	7.1×10^{-2}	7.1	8.1×10^{-2}	8.1	6.5×10^{-2}	6.5	7.5×10^{-2}	7.5

[(1)] Short term Background Contributions are double the long-term contributions, [(2)] Background sourced from EPA Monitoring undertaken at background locations in Zone A, in 2016, [(3)] Background sourced from EPA Monitoring at Ringsend (2017 & 2018), [(4)] Background sourced from 2006 EIAR. [(5)] Predicted using ADMS 5 2015-2017, 2020-21 meteorological data from Dublin Airport, [(6)] Three separate scenarios have been modelled due to limitations in the ADMS modelling software: a) scenario with building data but without coastline data, b) scenario with coastline data but without building data and c) a control scenario without building data or coastline data. This has been explained further in Paragraph 3.4 and Sections 5 and 6. The maximum impacts across these three scenarios have been presented.

Table 3.5 Predicted Air Quality Values under the maximum short-term emission limit, Key Receptor Locations (Worst Case Dublin Airport Met Data (2015 – 2017, 2020-2021)) – Waste Licence A Emission Limits

Pollutant	Averaging Period	EAL (µg/m³)	Background/ Ambient Concentration (µg/m³)	Receptor R4 (Residential Property on Pigeon House Road) (5), (6)				Receptor R6 (Proposed Residential Property on South Bank Road) (5), (6)				Receptor R7 (Proposed Residential Property on South Bank Road) (5), (6)				Receptor R8 (Proposed Residential Property on South Bank Road) (5), (6)			
				PC (µg/m³)	PC % of EAL	PEC (µg/m³)	PEC % of EAL	PC (µg/m³)	PC % of EAL	PEC (µg/m³)	PEC % of EAL	PC (µg/m³)	PC % of EAL	PEC (µg/m³)	PEC % of EAL	PC (µg/m³)	PC % of EAL	PEC (µg/m³)	PEC % of EAL
NO_2	1-Hour	200	45.2 (1),(2)	31.5	15.8	76.7	38.4	45.0	22.5	90.2	45.1	51.0	25.5	96.2	48.1	44.7	22.3	89.9	44.9
SO_2	1-hr	350	8.6 (1),(3)	30.2	8.6	38.8	11.1	44.0	12.6	52.6	15.0	50.2	14.3	58.8	16.8	44.2	12.6	52.8	15.1
	24-hr	125	8.6 (1),(3)	10.0	8.0	18.6	14.9	18.3	14.7	26.9	21.5	25.8	20.6	34.4	27.5	19.2	15.4	27.8	22.3
PM_{10}	24-hr	50	26.2 (1),(2)	0.5	1.0	26.7	53.4	0.9	1.8	27.1	54.2	0.9	1.8	27.1	54.2	0.9	1.9	27.1	54.3
HCl	Max 1-hr	750	0.5 (4)	20.4	2.7	20.9	2.8	14.7	2.0	15.2	2.0	17.5	2.3	18.0	2.4	15.2	2.0	15.7	2.1
HF	Max 1-hr	160	2.0×10^{-2} (1),(4)	1.4	<1	1.4	<1	1.0	<1	1.0	<1	1.2	<1	1.2	<1	1.0	<1	1.0	<1
	Monthly	16	2.0×10^{-2} (1),(4)	0.1	<1	0.2	1.0	0.2	1.4	0.2	1.5	0.3	1.6	0.3	1.8	0.3	1.6	0.3	1.7

(1) Short term Background Contributions are double the long-term contributions, (2) Background sourced from EPA Monitoring undertaken at background locations in Zone A, in 2016, (3) Background sourced from EPA Monitoring at Ringsend (2017 & 2018), (4) Background sourced from 2006 EIAR. (5) Predicted using ADMS 5 2015-2017, 2020-21 meteorological data from Dublin Airport, (6) Three separate scenarios have been modelled due to limitations in the ADMS modelling software: a) scenario with building data but without coastline data, b) scenario with coastline data but without building data and c) a control scenario without building data or coastline data. This has been explained further in Paragraph 3.4 and Sections 5 and 6. The maximum impacts across these three scenarios have been presented.

4. Isopleths

4.1 Plots showing isopleths of the PC in the worst meteorological year, for the key pollutants of concern (annual mean and hourly mean NO_2), were provided in Appendix A of the 2019 assessment submitted in June 2019.

4.2 Plots have been updated to reflect the wider range of meteorological data considered and use of the current version of the ADMS 5 modelling software for the annual mean and hourly mean NO_2 and these are provided in Appendix A as Figures 4.1 to 4.6.

4.3 In addition to these plots, isopleths have also been created for annual mean Cd, As, V and PM_{10} as well as daily PM_{10} to show the distribution of impact for different pollutants and averaging periods. It should be noted that the model iteration that included the ADMS Buildings module (see Paragraph 3.4) is predicted to cause the largest PC and PEC concentrations for the pollutants plotted. These plots are provided in Appendix A as Figures 4.7 to 4.11.

5. Fumigation

5.1 Fumigation was accounted for in the original assessment and within the updated elements of the assessment described in this report, by use of the Coastline module built into the dispersion modelling software ADMS 5. According to the Cambridge Environmental Research Consultancy, *"for air dispersion modelling in coastline areas, ADMS 5 includes a coastline module to take account of increasing boundary layer height when airflow is from the sea to the land"*. This may be invoked when the following conditions are satisfied:

- the sea is colder than the land;
- there are convective meteorological conditions on land; and
- there is an onshore wind.

5.2 The ADMS 5 dispersion modelling software does not allow the Coastline module to operate in tandem with the Buildings module. As such, this report provides the PC and PEC with the Coastline module active and the Buildings module inactive, and the Buildings module active and the Coastline module inactive. It also provides the PC and PEC with both Buildings module and Coastline module inactive.

5.3 Analysis of the results provided in Section 3 demonstrates that use of the Coastline module and fumigation has a limited effect on the dispersion of emission from the DWtE facility, and it is not considered to represent a material concern with regards to the predicted PC.

6. Buildings Data

6.1 The 2019 assessment did not include buildings as a model input for the following reasons:

- Due to the coastline location of the site, there was the requirement to account for fumigation. The ADMS 5 dispersion modelling software does not allow its Buildings module to be run when the Coastline module is in use.
- At 100m high, there are few buildings in the vicinity of the DWtE stacks that are higher than 40% of the 100m stack height within a 1km radius. Only the upper level of the DWtE building itself is approximately 52% of the stack height and the tallest building at the old Poolbeg power station site is 50% of the stack height.

6.2 The modelling undertaken to satisfy the RFI includes results based on model runs which have the ADMS 5 Buildings module active (but the Coastline module deactivated), to include nearby buildings that are greater than 40% of the DWtE stack height.

6.3 Analysis of the results provided in Section 3 demonstrates that use of the Buildings module and building downwash has greater effect on predicted PC than the Coastline module and fumigation. However, this is not to the extent that there is an exceedance or risk of exceedance of any EALs reported.

6.4 The cumulative assessment reported in Section 8 includes additional buildings to account for those near to the cumulative emissions sources that are more than 40% of the lowest stack height.

6.5 The buildings model input data is summarised in Table 6.1. The location of the buildings considered is shown in Appendix A, Figure 6.3.

Table 6.1 ADMS 5 Model Buildings Data

Building Reference	Building Description	Length (m)	Width (m)	Diameter (m)	Height (m)	Angle (º)
Main Assessment – DwtE Model Only						
A	DWtE1	70.7	154.1	-	52.7	105.0
B	DWtE2	115.2	187.4	-	25.9	105.0
Cumulative Assessment – DwtE, Poolbeg Power Station Site and Ringsend Power Station Site						
A	DWtE1	70.7	154.1	-	52.7	105.0
B	DWtE2	115.2	187.4	-	25.9	105.0
C	Ringsend Workshop	15.1	33.2	-	12.0	102.4
D	Ringsend Turbine Hall	35.3	57.8	-	25.0	101.7
E	Ringsend Cylinders 3[1]	60.8	29.6	-	12.5	100.4
F	Ringsend Cylinders 2[1]	58.6	29.8	-	12.5	99.9
G	Ringsend Cylinders 1[1]	83.8	80.8	-	12.4	100.5
H	Ringsend Cylinder	-	-	9.9	14.0	-
I	Ringsend Open Cycle Gas Turbine	36.2	8.7	-	15.5	102.8
J	Ringsend Heat Recovery Steam Generator	29.9	33.9	-	32.0	101.7
K	Poolbeg Power Station 2	71.2	30.8	-	38.0	88.1
L	Poolbeg Power Station 1	45.5	31.2	-	50.0	88.1
M	Poolbeg Power Station 4	31.0	127.6	-	27.0	178.4
N	Poolbeg Gas Cylinders 2[1]	63.8	31.2	-	13.0	86.9
O	Poolbeg Open Cycle Gas Turbine	10.4	37.4	-	15.5	177.5
P	Poolbeg Gas Cylinders 3[1]	17.0	35.3	-	14.0	87.9
Q	Poolbeg Closed Cycle Gas Turbine 3	58.9	32.0	-	25.3	88.6
R	Poolbeg Closed Cycle Gas Turbine 4	26.0	15.9	-	12.0	88.6
S	Poolbeg Gas Cylinders 1[1]	111.7	140.7	-	13.0	86.1
T	Poolbeg Gas Cylinder	-	-	60.9	13.0	-
U	Poolbeg Closed Cycle Gas Turbine 1	45.2	23.4	-	26.5	89.1
V	Poolbeg Closed Cycle Gas Turbine 2	53.2	30.1	-	15.0	89.2
W	Poolbeg Power Station 3	14.1	127.5	-	35.0	178.4
X	Poolbeg Office	10.9	44.0	-	20.0	179.0
Y	Poolbeg Power Station 5	16.0	126.4	-	23.0	109.6

Notes:
[1] Rectangular polygon used to represent a collection of circular tanks situated close together and of a similar height.

7. 75% Flow Rate

7.1 The EPA AG4 guidance published after the submission of the dispersion modelling assessment requires that a sensitivity test is undertaken to quantify impacts based on 75% of the maximum volumetric flow rate. This has been undertaken for five years of hourly sequential meteorological data (2015 – 2017 and 2020 – 2021). As discussed in Paragraph 3.4 and Sections 5 and 6, there is variation between the PC and PEC results between the different model iterations (with ADMS Building module, with ADMS Coastline module, and the control scenario (without Buildings or Coastline module). The maximum impacts from these different model iterations are presented in this Section.

7.2 Emission parameters based on 75% of maximum flow are summarised in Table 7.1.

Table 7.1 ADMS 5 Model Source Input Data

Source	Location (Easting, Northing)[1]	Emission Height Ordnance Datum (OD) (m)[(2)]	Internal Diameter at Release Point (m)	Gas Exit Temperature (ºC)	75% of Exit Velocity (m/s)	75% of Actual Volumetric Flow Rate (m^3/s)[(3)]
Stack 1	686427, 5913697	105	2.4	54.85	15.2	Max: 68.9
Stack 2	686433, 5913696	105	2.4	54.85	15.2	Max: 68.9

[1]Coordinate system used was UTM_Zone_29N, [(2)] Modelled as 100m above ground level, [(3)] Actual stack conditions equivalent to volumetric flow of 206,250 Nm^3/hr at 272K, 101.3kPA, dry gas at 11% O_2 reference.

7.3 Mass emission rates of the pollutants modelled from Stack 1 and Stack 2 are summarised in Table 7.2.

Table 7.2 ADMS 5 Model Source Emissions Data per Stack

Pollutant	75% of Normalised Volumetric Flow Rate (m^3/s)	Emission Limit (mg/m^3) [(3)]	Maximum Short Term Emission Limit (mg/m^3) [(3), (4)]	75% of Mass Emission Rate (g/s) [(3)]	75% of Maximum Short Term Mass Emission Rate (g/s) [(3)]
Oxides of nitrogen (NO_X)	57.3	200	400	11.46	22.92
Particulate matter (PM_{10} / $PM_{2.5}$)[(1)]	57.3	10	30	0.57	1.71
Sulphur dioxide (SO_2)	57.3	50	200	2.86	8.18
Carbon monoxide (CO)	57.3	150	N/A	8.59	N/A
Hydrogen chloride (HCl)	57.3	10	60	0.57	3.42
Total Organic Carbon (TOC) (C_6H_6)	57.3	10	20	0.57	1.14
Hydrogen fluoride (HF)	57.3	1	4	0.06	0.24
Group 1 metals (cadmium (Cd) and thallium (Tl)) and mercury (Hg)	57.3	0.05	N/A	2.86×10^{-3}	N/A
Group 3 metals (antimony (Sb), lead (Pb), chromium (Cr), cobalt (Co), copper (Cu), manganese (Mn), nickel (Ni) and vanadium (V)) excluding Arsenic (As)	57.3	0.5	N/A	0.03	N/A
Arsenic (As)	57.3	0.2	N/A	0.01	N/A
Dioxins & furans	57.3	0.0000001	N/A	5.73×10^{-9}	N/A
Ammonia (NH_3)	57.3	10[(2)]	N/A	0.57[(2)]	N/A

[(1)] It has been assumed that PM_{10} and $PM_{2.5}$ emissions are the same, i.e. all articulate emissions are either in the PM_{10} or the $PM_{2.5}$ range which is considered conservative, [(2)] Based on BAT emission limit, [(3)] Volumetric flow of 206,250 Nm3/hr at 272K, 101.3kPA, dry gas at 11% O2 reference, [(4)] Worse case emission limits as per the existing Waste Licence (W0232-01) have been modelled for short term impacts, as set out in Schedule B, Table B.1 of the Licence.

7.4 The PC and PEC with a 75% flow rate has been quantified based on current Waste Licence B emission limits for the site operating under normal conditions. Results predicted at the point of maximum offsite impact, for each pollutant and averaging period, is provided in Table 7.3. This may or may not coincide with sensitive exposure. Figures showing isopleths of the PC in the worst meteorological year, for the key pollutants of concern (annual mean and hourly mean NO_2), are provided in Appendix A as Figures 7.1 to 7.2. These demonstrate that the location of maximum offsite impact for pollutants with annual and hourly mean averaging periods is within Dublin Bay where there is no sensitive air quality exposure.

Table 7.3: PC and PECs based on 75% flow rate scenario, Point of Maximum Offsite Impact (worst case (2015 – 2017, 2020 – 2021))

Pollutant	Averaging Period	EAL ($\mu g/m^3$)	Background/ Ambient Concentration ($\mu g/m^3$)	Maximum Offsite Impact [5]			
				PC ($\mu g/m^3$)	PC % of EAL	PEC ($\mu g/m^3$)	PEC % of EAL
NO_2	1-Hour	200	45.2[1],[2]	26.7	13.4	71.9	36.0
	Annual	40	22.6[2]	6.9	17.2	29.5	73.7
SO_2	1-hr	350	8.6[1],[3]	13.2	3.8	21.8	6.2
	24-hr	125	8.6[1],[3]	8.6	6.9	17.2	13.8
PM_{10}	24-hr	50	26.2[1],[2]	1.0	2.0	27.2	54.4
	Annual	40	13.1[2]	0.3	0.9	13.4	33.6
$PM_{2.5}$	Annual	25	9.5[2]	0.3	1.4	9.8	39.4
CO	Max 8-hr	10000	2000.0[2]	34.4	0.3	2034.4	20.3
Total Organic Carbon	Annual	5	1.7[4]	0.3	6.9	2.0	40.9
HCl	Max 1-hr	750	0.5[4]	9.0	1.2	9.5	1.3
HF	Max 1-hr	160	$2.0x10^{-2}$[1],[4]	0.9	0.6	0.9	0.6
	Monthly	16	$2.0x10^{-2}$[1],[4]	0.1	0.7	0.1	0.8
Dioxins	Annual	N/A	$5.6x10^{-8}$[4]	$3.4x10^{-9}$	N/A	$5.9x10^{-8}$	N/A
Hg	Annual	1	$1.0x10^{-3}$[4]	$1.7x10^{-3}$	0.2	$1.7x10^{-3}$	0.2
Cd	Annual	5.0x10-3	$1.0x10^{-3}$[4]	$1.7x10^{-3}$	34.3	$2.7x10^{-3}$	54.3
As	Annual	6.0x10-3	$1.0x10^{-3}$[4]	$3.4x10^{-3}$	56.3	$4.4x10^{-3}$	73.0
V	Max 24-Hour	1	$1.0x10^{-2}$[4]	0.1	9.7	0.1	10.7

[1] Short term Background Contributions are double the long-term contributions, [2] Background sourced from EPA Monitoring undertaken at background locations in Zone A, in 2016, [3] Background sourced from EPA Monitoring at Ringsend (2017 & 2018), [4] Background sourced from 2006 EIAR. [5] As discussed in Sections 5 and 6, three separate scenarios have been modelled due to limitations in the ADMS modelling software: a) scenario with building data but without coastline data, b) scenario with coastline data but without building data and c) a control scenario without building data or coastline data. The maximum impacts across these three scenarios have been presented.

7.5 The results demonstrate that for the 75% flow scenario the PC is less than 10% of the applicable EAL for the majority of pollutants and averaging periods. A PC of more than 10% is predicted for some pollutants and averaging periods (including hourly mean and annual mean NO_2), although where this occurs, the PEC is well below the EAL considered for the protection of human health with little risk of an exceedance.

7.6 In comparison with the 100% flow scenario, PCs are generally lower in the 75% scenario which is to be expected given the reduction in pollutant mass emissions associated with the lower normalised volumetric flow rate.

7.7 The PC and PEC with a 75% flow rate has also been quantified based on current Waste Licence A emission limits for the site operating under normal conditions. These A limits apply to pollutants that have a short-term EAL within AG4 (NO_2, SO_2, PM_{10}, HCl and HF). The PC and PEC at the point of maximum offsite impact, over the five-year period considered and for each pollutant and averaging period, is provided in Table 7.4.

Table 7.4 PC and PECs based on 75% flow rate scenario under the maximum short-term emission limit, Point of Maximum Offsite Impact (worst case (2015 – 2017, 2020 – 2021))

Pollutant	Averaging Period	EAL (µg/m³)	Background/ Ambient Concentration (µg/m³)	Maximum Offsite Impact [5]			
				PC (µg/m³)	PC % of EAL	PEC (µg/m³)	PEC % of EAL
NO_2	1-Hour	200	45.2[(1),(2)]	53.4	26.7	98.6	49.3
SO_2	1-hr	350	8.6[(1),(3)]	52.7	15.1	61.3	17.5
	24-hr	125	8.6[(1),(3)]	34.5	27.6	43.1	34.5
PM_{10}	24-hr	50	26.2[(1),(2)]	3.1	6.1	29.3	58.5
HCl	Max 1-hr	750	0.5[(4)]	53.9	7.2	54.4	7.3
HF	Max 1-hr	160	2.0×10^{-2}[(1),(4)]	3.6	2.2	3.6	2.3
	Monthly	16	2.0×10^{-2}[(1),(4)]	0.5	2.9	0.5	3.0

[(1)] Short term Background Contributions are double the long-term contributions, [(2)] Background sourced from EPA Monitoring undertaken at background locations in Zone A, in 2016, [(3)] Background sourced from EPA Monitoring at Ringsend (2017 & 2018), [(4)] Background sourced from 2006 EIAR. [(5)] As discussed in Sections 5 and 6, three separate scenarios have been modelled due to limitations in the ADMS modelling software: a) scenario with building data but without coastline data, b) scenario with coastline data but without building data and c) a control scenario without building data or coastline data. The maximum impacts across these three scenarios have been presented.

7.8 The results in Table 7.4 demonstrate that under the maximum short-term emission limit, the PC and PEC for all pollutants are all well below their respective EAL. The PC is less than 30% of the relevant EAL for all of the pollutants and averaging periods and PEC less than 60%. Therefore, there is little risk of any exceedance of the EALs considered for the protection of human health.

7.9 The PC and PEC at the point of maximum impact at a designated nature conservation site (receptor E3 (South Dublin Bay SAC/South Dublin Bay and River Tolka Estuary SPA) of the 8 modelled ecological receptors), for each pollutant and averaging period, are provided in Table 7.5. All ecological receptor locations are presented in Table 3.6 and Figure 3.2 of Appendix A.

Table 7.5: PC and PECs based on 75% flow rate scenario, Worst Case Ecological Site Impacts (South Dublin Bay SAC/South Dublin Bay and River Tolka Estuary SPA, E3) (worst case (2015 – 2017, 2020 – 2021))

Pollutant	Averaging Period	EAL (µg/m³)	Background/ Ambient Concentration (µg/m³)	Maximum Offsite Impact[(5)]			
				PC (µg/m³)	PC % of EAL	PEC (µg/m³)	PEC % of EAL
NO_x	Annual	30	37.2[(2)]	1.8	5.9	39.0	129.9
NH_3	Annual	3[(1)]	1.7[(3)]	0.1	2.9	1.8	59.6
SO_2	Annual	20	4.8[(4)]	0.4	2.2	5.2	26.2

[1)] NH_3 EAL based on the standard set by the UK Environment Agency assumed [(2)] Background sourced from EPA Monitoring undertaken at background locations in Zone A, in 2016 – likely to provide a precautionary estimate of the background contribution on the Poolbeg peninsula, [(3)] Background sourced from EPA Research (Ambient Atmospheric Ammonia in Ireland, 2013-2014), [(4)] Background sourced from 2006 EIAR, [(5)] As discussed in Sections 5 and 6, three separate scenarios have been modelled due to limitations in the ADMS modelling software: a) scenario with building data but without coastline data, b) scenario with coastline data but without building data and c) a control scenario without building data or coastline data. The maximum impacts across these three scenarios have been presented.

7.10 The results reported in Table 7.5 demonstrate that these licenced impacts at the worst affected ecologically sensitive location less than 6%. It also shows that the PEC for annual mean NOx does exceed the relevant EAL, predominantly due to the elevated background contribution, which are already in exceedance of the EAL. The PC for both NH_3 and SO_2 are both less than 1% of their respective EAL.

8. Cumulative Assessment

8.1 A cumulative assessment has been undertaken, taking into account nearby emissions sources that are not related to the DWtE facility. The cumulative assessment focuses solely on emissions of NO_X and impacts on NO_2 concentrations. The cumulative sources are all gas combustion plant from which the primary pollutants are emissions of NO_X and CO. Due to the high EAL for CO, only impacts on NO_2 have been considered within this cumulative assessment.

8.2 Emissions data for the cumulative sources has been obtained from a recently published dispersion modelling report[3]. The cumulative stack parameters and mass emissions rate data is summarised in Table 8.1 and Table 8.2 respectively.

Table 8.1 ADMS 5 Cumulative Model Source Input Data

Source	Location (Easting, Northing) (1)	Emission Release Height (m)	Internal Diameter at Release Point (m)	Gas Exit Temperature (ºC)	Exit Velocity (m/s)	Actual Volumetric Flow Rate (m^3/s)
Poolbeg Power Station						
A1-4 Auxiliary Boiler	687337, 5913747	30	0.5	233.0	25.21	4.9
A1_5 CT14 HRSG	687306, 5913752	75	5.2	108.2	31.03	659.0
A1_7 CT14 HRSG Bypass	687304, 5913772	60	6.2	535.9	39.07	1,179
A1_6 CT15 HRSG	687328, 5913753	75	5.2	121.6	31.54	669.8
A1_7 CT15 HRSG Bypass	687327, 5913773	60	6.2	516.9	49.83	1,504
FlexGen OCGT	687385, 5913566	30	3.7	446.0	37.70	405.4
Ringsend Power Station						
A2 Gas Turbine	686069, 5913694	70	6.5	113.9	23.12	767.2
FlexGen OCGT (2)	686079, 5913601	30	3.7	446.0	37.70	405.4

(1) Coordinate system used was UTM_Zone_29N, (2) Currently planned and not in operation.

Table 8.2 ADMS 5 Cumulative Model Source NO_X Emissions Data per Stack

Source	Normalised Volumetric Flow Rate (m^3/hr)	Maximum Emission Limit (mg/m^3)	Maximum Mass Emission Rate (g/s)
Poolbeg Power Station			
A1-4 Auxiliary Boiler (1)	7,200	500	1.00
A1_5 CT14 HRSG (2)	1,555,200	45	19.4
A1_7 CT14 HRSG Bypass (2)	1,555,200	45	19.4
A1_6 CT15 HRSG (2)	1,555,200	45	19.4
A1_7 CT15 HRSG Bypass (2)	1,555,200	45	19.4
FlexGen OCGT (3)	618,347	35	6.01
Ringsend Power Station			
A2 Gas Turbine	2,610,000	65	4.13
FlexGen OCGT (4)	618,347	35	6.01

(1) Auxiliary Boiler (A1-4) is assumed to operate for four hours per day, every day of the year, running on diesel as a worst-case. (2) Emission points A1_5 and A1_7 cannot operate together, likewise A1_6 and A1-7 cannot operate together and thus there is no scenario where A1_5, A1_6, A1_7 and A1_8 would operate simultaneously. (3) FlexGen assumed to be operating at a baseload output of at ISO temperature of 15ºC and FlexGen plant is unrealistically assumed to operate for 1,000 hour per year on diesel. (4) Currently planned and not in operation.

[3] AWN Consulting (2020) *Assessment of Four ESB Projects (FlexGen & BESS), Poolbeg Peninsula – Air Modelling Assessment*

8.3 The impacts reported in this section are the maximum PC and PEC results from the three different model iterations described in Paragraph 3.4 and Sections 5 and 6 (with ADMS Building module, with ADMS Coastline module, and the control scenario). The PC and PEC at the point of maximum offsite impact, for each pollutant and averaging period, is provided in Table 8.3. Plots showing isopleths of the PC in the worst meteorological year, for annual mean and hourly mean NO_2, are provided in Appendix A as Figures 8.1 to 8.2.

Table 8.3 NO_2 PC and PEC for cumulative assessment, Point of Maximum Offsite Impact (worst case (2015 – 2017, 2020 – 2021))

Scenario	Averaging Period	EAL (µg/m³)	Background/ Ambient Concentration (µg/m³)	Maximum Offsite Impact [(4)]			
				PC (µg/m³)	PC % of EAL	PEC (µg/m³)	PEC % of EAL
Normal Operational of Poolbeg and Ringsend OCGT	1-Hour	200	45.2[(1),(2),(3)]	36.2	18.1	81.4	40.7
	Annual	40	22.6[(2), (3)]	13.5	33.7	36.1	90.2

[(1)] Short term Background Contributions are double the long-term contributions, [(2)] Background sourced from EPA Monitoring undertaken at background locations in Zone A, in 2016. [(3)] Monitored background contribution will already include emissions from the DWtE facility and cumulative sources – Reported PEC therefore precautionary. [(4)] As discussed in Sections 5 and 6, three separate scenarios have been modelled due to limitations in the ADMS modelling software: a) scenario with building data but without coastline data, b) scenario with coastline data but without building data and c) a control scenario without building data or coastline data. The maximum impacts across these three scenarios have been presented.

8.4 The results reported in Table 8.3 demonstrate that with the cumulative sources in place, the PC for short term NO_2 at the location of maximum offsite impact is less than 20% of the applicable EAL and the PC for long term NO_2 is less than 35% of the EAL. The short term NO_2 PEC accounts for less than 50% of the EAL and the long term NO_2 PEC around 90% of the EAL. Figures 8.1 and 8.2 of Appendix A demonstrate that the point of maximum offsite impact occurs within Dublin Bay, to the northeast of the DWtE facility, where there is no air quality sensitive exposure. The largest PC occurs with the DWtE plant and cumulative sources running under normal operation, and this scenario has been considered further with the PC and PEC reported in Table 8.4 at the worst affected human health receptor (receptor R7), the location of which is shown in Table 3.6 and Figure 3.2 of Appendix A.

Table 8.4 NO_2 PC and PEC for cumulative assessment, worst affected human health receptor – R7 (worst case (2015 – 2017, 2020 – 2021))

Scenario	Averaging Period	EAL (µg/m³)	Background/ Ambient Concentration (µg/m³)	Receptor R7 (Proposed Residential Property n South bank Road) [(3)]			
				PC (µg/m³)	PC % of EAL	PEC (µg/m³)	PEC % of EAL
Normal Operational of Poolbeg and Ringsend OCGT	1-Hour	200	45.2[(1),(2)]	31.9	16.0	77.1	38.6
	Annual	40	22.6[(2)]	2.1	5.2	24.7	61.7

[(1)] Short term Background Contributions are double the long-term contributions, [(2)] Background sourced from EPA Monitoring undertaken at background locations in Zone A, in 2016. [(3)] As discussed in Sections 5 and 6, three separate scenarios have been modelled due to limitations in the ADMS modelling software: a) scenario with building data but without coastline data, b) scenario with coastline data but without building data and c) a control scenario without building data or coastline data. The maximum impacts across these three scenarios have been presented.

8.5 Table 8.4 shows that at the worst affected human health receptor (R7), the PC for short term is for short term NO_2 is less than 20% of the applicable EAL and the PC for long term NO_2 is around 5% of the EAL. The short term NO_2 PEC accounts for less than 40% of the EAL and the long term NO_2 PEC for less than 65% of the EAL.

8.6 The PC and PEC at the point of maximum impact at a designated nature conservation site (receptor E4 (North Dublin Bay SAC / North Bull Island SPA) of the 8 ecology receptors modelled), for each pollutant and averaging period, is provided in Table 8.5.

Table 8.5 NO_x PC and PEC for cumulative assessment, Worst Case Ecological Site Impacts (North Dublin Bay SAC / North Bull Island SPA, E4) (worst case (2015 – 2017, 2020 – 2021))

Scenario	Averaging Period	EAL ($\mu g/m^3$)	Background/ Ambient Concentration ($\mu g/m^3$)	Maximum Offsite Impact (2)			
				PC ($\mu g/m^3$)	PC % of EAL	PEC ($\mu g/m^3$)	PEC % of EAL
Operational Long-term	Annual	30	37.2(1)	3.1	10.2	40.3	134.2

(1) Background sourced from EPA Monitoring undertaken at background locations in Zone A, in 2016 – likely to provide a precautionary estimate of the background contribution on the Poolbeg peninsula. (2) As discussed in Sections 5 and 6, three separate scenarios have been modelled due to limitations in the ADMS modelling software: a) scenario with building data but without coastline data, b) scenario with coastline data but without building data and c) a control scenario without building data or coastline data. The maximum impacts across these three scenarios have been presented.

8.7 The results demonstrate that the PC at the worst affected ecologically sensitive location is less than approximately 10% of the EAL. The PEC exceeds the EAL, predominantly due to the elevated background/ambient contribution to annual mean NO_X, which is already in exceedance of the EAL (124%). The background concentration utilised in the assessment is based on urban background monitoring undertaken a locations in Dublin. Background NO_X concentrations at the coastal nature conservation receptors are likely to be lower than urban background concentrations within the City.

9. Unplanned Events (Abnormal)

9.1 Unplanned events can occur when there is a temporary failure in the operating capacity of the facility. These are anticipated to be infrequent and of limited duration. EPA air guidance document AG4 states the following regarding such events:

Abnormal operations (such as the bypassing of an Air Pollution Control System (APCS)) should be considered, where realistic. In order to model an abnormal operation, the emission rate under this scenario and the frequency of occurrence should be determined.

9.2 The Dublin Waste to Energy (DWtE) facility operates with several safety plant interlocks which prevent the plant from operating during unplanned events. In such a scenario the flow is reduced to almost zero. Examples of these safety systems include:

- If a failure occurs on any part of the flue gas treatment (FGT) systems, the facility shuts down i.e. the ID fan trips, bringing the line down and reducing the flue gas flow from that stack
- Any failure in the baghouse can be isolated in the individual chamber (cell) – (12 cells in the Dublin baghouses) which allows the baghouse to continue operation.
- Semi dry reactor failure will result in a shutdown as the lime and activated carbon are no longer dosing.
- Any failure in the Wet scrubber trips the ID fan bringing the line down.

9.3 There is no by-pass at the DWtE facility. Under no scenario is raw gas emitted to atmosphere from this facility. Table 9.1 presents the highest ELV's recorded during unplanned events at the facility over the past five year (2017 to 2021).

Table 9.1: Unplanned Events Emissions Data for the Dublin Plant

Year	NO_x (mg/Nm^3)	SO_2 (mg/Nm^3)	HCl (mg/Nm^3)	Dust (mg/Nm^3)	Flow (Nm^3/hr)
ELV	200	50	10	10	-
2017 L1	204.7	282.3	1.0	5.5	23,0940
2017 L2	179.9	36.2	1.0	75.8	24,3180
2018 L1	213.5	60.8	1.0	5.2	24,3810
2018 L2	392.0	41.7	0.5	3.9	25,9920
2019 L1	272.4	118.7	2.4	4.6	24,4530
2019 L2	194.7	163.2	0.4	15.1	24,6600
2020 L1	188.8	35	0.2	1.5	24,1830
2020 L2	188.9	87.8	2.0	6.2	27,4950
2021 L1	201.7	62.2	0.7	3.6	24,2010
2021 L2	223.0	50.8	0.3	4.5	27,3510
Maximum	392.0	282.3	2.4	75.8	-

Note: Maximum duration of high ELV's would be 4 hours before the plant is shut down as per license requirements.

9.4 The monitoring data in Table 9.1 shows that during unplanned events , the ELV for NO_x, SO_2 and Dust may be exceeded, though HCl remained well below the ELV.

9.5 Condition 3.19.2(a) of the plant's Industrial Emissions (IE) licence obliges the plant to "reduce or close down operations", in the event of a breakdown, and limits operation to no more than four uninterrupted hours where emission limit values specified in Schedule B1: Emissions to Air of the licence are exceeded. Condition 3.19.2(c) also states that "under no circumstances" should total dust exceed 150 mg/Nm^3 and likewise the emission limit values specified in Schedule B1 for CO and TOC shall not be exceeded.

9.6 For licensing to be in line with Condition 3.19.2(a), unplanned events are when the plant can meet the dust limit of 150 mg/Nm^3 and also maintain the ELVs for TOC and CO but can exceed ELVs for other pollutants for a period of less than 4 continuous hours with the total number of unplanned event operating hours not to exceed 60 hours in a year.

9.7 Table 9.2 presents the unplanned events emission rates assumed within the assessment. In order to maintain the conservative nature of this assessment, values greater than those presented in Table 9.1 have been used for all pollutants. It should be noted that the 150 mg/Nm^3 ELV for CO and 10 mg/Nm^3 ELV for TOC are already at the maximum operating concentrations that the plant can operate at without triggering a plant shutdown. As such the plant will never operate in exceedance of these limits and so these pollutants are not considered further in the unplanned events assessment.

Table 9.2: Modelled Unplanned Event Emission Rates

Pollutant	Normal Emissions Concentration (mg/Nm^3)	Unplanned Event Emissions Concentration (mg/Nm^3)	Normal to Unplanned Event Emissions Factor	Event Duration (hours)	Total Hours per Year (hours)
NO_X	200	500	2.5	4	60
PM_{10} / $PM_{2.5}$	10	150	15	4	60
SO_2	50	500	10	4	60
HCl	10	1000	100	4	60
HF	1	100	100	4	60
Cd Tl	0.05	0.75	15	4	60
Hg	0.05	1.4	28	4	60
Group 3 metals (inc. As)	0.5	7.5	15	4	60
Dioxins Furans	0.0000001	0.00001	100	4	60

9.8 As most metals will be released in the particulate phase, or tend to be particle bound if in the vapour phase, Group 2 and Group 3 metals have been scaled by a factor of 15 times to be consistent with the increase in particle matter emissions.

9.9 The unplanned events PC and PEC have been assessed by taking the maximum hourly PC for the combined emissions from the two stacks, dividing it by two. As each line has its own independent FGT system, the likelihood of a failure in both lines at the same time is extremely remote. This is then multiplied by the resultant PC by the Normal to unplanned event Emission Factor presented in Table 9.2. Finally, this is combined with the normal operating PC from the other stack to determine the total maximum worst-case hourly PC that could occur in the very unlikely event that the FGT system on one line should fail during conditions that result in the maximum off-site impacts. This approach is considered a conservative and robust way to assess impacts.

9.10 For 24-hour impacts, a similar approach has been taken except the maximum 24-hour PC is used, as well as factoring the PC of one line by the Normal to unplanned event Emission Factor presented in Table 9.2. The PC is also adjusted to reflect the fact that unplanned events can only last 4 hours out of the 24 hours in the day.

9.11 For annual operations, the PC is adjusted in the same way as for 24-hour averages, with the concentrations adjusted to reflect that the ELV can be exceeded for 60 hours out of the year, though no event should last more than 4 hours. However, IED Article 50(4)(c), states that "*The time limit set out in the second subparagraph* [i.e. limiting annual exceedances to 60 hours] *shall apply to those furnaces which are linked to one single waste gas cleaning device.*" As such, the combined PC from both lines has been adjusted to reflect 60 hours of unplanned event operation per year to reflect the fact that the DWtE has separate FGT for each line and it is conceivable that both lines could suffer unplanned event operation at separate times throughout the year. This approach has also been taken when considering HF against the monthly EAL, though it is much less likely that both lines would suffer 60 hours of unplanned event operations within a single month.

9.12 The results of the unplanned events analysis are presented in Table 9.3 and show that even in the unlikely event that unplanned events were to coincide with the worst dispersion conditions the PC's and resultant PEC's of all pollutants modelled are predicted to be below their relevant EALs.

Dioxins and Furans

9.13 There is not an EAL for dioxins or furans against which to assess unplanned events. Elevated short-term emission of dioxins and furans are not likely to be significant as they accumulate slowly in the body over time and a short-term emission of 100 times the benchmark value for four hours would not have an acute effect by inhalation on human health.

9.14 For long-term PCs an increase of 100 times the benchmark value for 60 hours per year would increase the amount deposited over a year at any given site by a factor of [(100 x 60/8000) + (7940/8000)] = 1.743. This is not anticipated to result in a significant change in human health risk in terms of Hazard Index (HI) and would be insignificant in terms of other sources such as barbequing and emissions from bonfires.

Table 9.3 Predicted PC and PECs under unplanned event Operations, Point of Maximum Offsite Impact (worst case (2015 - 2017, 2020 – 2021))

Pollutant	Averaging Period	EAL (µg/m³)	Background/ Ambient Concentration (µg/m³)	With Building data information (5)				With Fumigation information (5)				With no building or fumigation information (5)			
				PC (µg/m³)	PC % of EAL	PEC (µg/m³)	PEC % of EAL	PC (µg/m³)	PC % of EAL	PEC (µg/m³)	PEC % of EAL	PC (µg/m³)	PC % of EAL	PEC (µg/m³)	PEC % of EAL
NO_2	1-Hour	200	45.2(1),(2)	52.5	26.2	97.7	48.8	41.1	20.5	86.3	43.1	42.4	21.2	87.6	43.8
	Annual	40	22.6(2)	7.8	19.6	30.4	76.1	2.8	7.1	25.4	63.6	2.8	7.1	25.4	63.6
SO_2	1-hr	350	8.6(1),(3)	81.7	23.3	90.3	25.8	59.9	17.1	68.5	19.6	65.0	18.6	73.6	21.0
	24-hr	125	8.6(1),(3)	17.6	14.0	26.2	20.9	6.8	5.5	15.4	12.3	6.8	5.5	15.4	12.3
PM_{10}	24-hr	50	26.2(1),(2)	2.5	5.0	28.7	57.4	0.9	1.8	27.1	54.2	0.9	1.8	27.1	54.2
	Annual	40	13.1(2)	0.4	1.1	13.5	33.8	0.2	0.4	13.3	33.1	0.2	0.4	13.3	33.1
$PM_{2.5}$	Annual	25	9.5(2)	0.4	1.7	9.9	39.7	0.2	0.6	9.7	38.6	0.2	0.6	9.7	38.6
HCl	Max 1-hr	750	0.5(4)	423.4	56.4	423.9	56.5	242.7	32.4	243.2	32.4	215.2	28.7	215.7	28.8
HF	Max 1-hr	160	$2.0x10^{-2}$(1),(4)	42.3	26.5	42.4	26.5	36.4	22.7	36.4	22.7	42.2	26.4	42.2	26.4
	Monthly	16	$2.0x10^{-2}$(1),(4)	1.2	7.6	1.2	7.7	0.7	4.6	0.8	4.7	0.5	3.2	0.5	3.4
Dioxins	Annual	N/A	$5.6x10^{-8}$(4)	$6.5x10^{-9}$	-	-	-	$2.4x10^{-9}$	-	-	-	$2.4x10^{-9}$	-	-	-
Hg	Annual	1	$1.0x10^{-3}$(4)	$2.3x10^{-3}$	0.2	$2.3x10^{-3}$	0.2	$8.3x10^{-4}$	0.1	$8.3x10^{-4}$	0.1	$8.3x10^{-4}$	0.1	$8.3x10^{-4}$	0.1
Cd	Annual	$5.0x10^{-3}$	$1.0x10^{-3}$(4)	$2.1x10^{-3}$	42.4	$3.1x10^{-3}$	62.4	$7.7x10^{-4}$	15.4	$1.8x10^{-3}$	35.4	$7.7x10^{-4}$	15.4	$1.8x10^{-3}$	35.4
As	Annual	$6.0x10^{-3}$	$1.0x10^{-3}$(4)	$4.2x10^{-3}$	69.4	$5.2x10^{-3}$	86.0	$1.5x10^{-3}$	25.6	$2.5x10^{-3}$	42.3	$1.5x10^{-3}$	25.6	$2.5x10^{-3}$	42.3
V	Max 24-Hour	1	$1.0x10^{-2}$(4)	0.2	24.2	0.3	25.2	0.1	11.2	0.1	12.2	0.1	10.0	0.1	11.0

(1) Short term Background Contributions are double the long-term contributions, (2) Background sourced from EPA Monitoring undertaken at background locations in Zone A, in 2016, (3) Background sourced from EPA Monitoring at Ringsend (2017 & 2018), (4)Background sourced from 2006 EIAR, (5) Three separate scenarios have been modelled due to limitations in the ADMS modelling software: a) scenario with building data but without coastline data, b) scenario with coastline data but without building data and c) a control scenario without building data or coastline data. This has been explained further in Paragraph 3.5 and Sections 5 and 6.

10. Conclusions

10.1 AECOM has revisited the 2019 assessment of emissions associated with the DWtE facility, following the submission of a Request for Information (RFI) Regulation 10 letter by the Environmental Protection Agency (EPA). Modelling has been updated to include 5-years of hourly sequential meteorological data (2015, 2016, 2017, 2020 and 2021) and to account for the current version of the dispersion modelling software.

10.2 Modelling has also been updated to demonstrate the influence of fumigation and building downwash on the Dublin Waste to Energy (DWtE) facility emissions and the Process Contribution (PC), i.e. the contribution of DWtE emissions to pollutant concentrations, reported at the point of maximum offsite impact. Modelling has also been undertaken to consider the cumulative impact of the facility alongside other emissions sources in its vicinity, to consider operation of the DWtE facility operating at 75% of its stack's anticipated flow rates, and the impact of unplanned event operations.

10.3 This dispersion modelling assessment has demonstrated that the DWtE facility will not contribute to an exceedance of an Environmental Assessment Limit (EAL) set for the protection of human health, nor will it put any such EAL at risk of an exceedance at the point of maximum offsite impact. The Predicted Environmental Concentration (PEC), i.e. the total environment concentration with both background and contribution from DWtE accounted for, does exceed the EAL for the protection of sensitive habitat at the worst affected nature conservation site (E3 (South Dublin Bay SAC/South Dublin Bay and River Tolka Estuary SPA)), although this is predominantly due to the elevated background contribution (37.2µg/m^3), which already accounts for 124% of the EAL. By comparison the PC predicted at this location (2.0µg/m^3) accounts for 6.6% of the EAL. This is consistent with the findings of the 2019 assessment and background concentrations at the coastal nature conservation sites is likely to be lower than the monitored background concentrations within the City.

10.4 The cumulative modelling has identified a long term NO_2 PEC that is around 90% of the EAL at the point of maximum offsite impact, which occurs at a location in Dublin Bay, to the northeast of the DWtE facility. The elevated PEC is predominantly due to the NO_2 background concentration, which already comprises approximately 57% of the EAL. Due to limited human health sensitive exposure close to the DWtE facility, modelling was also undertaken at a number of human health sensitive receptors, i.e. residential properties. This demonstrated that at the worst affected human health sensitive receptor, where there is relevant sensitive exposure, the PC and PEC predicted is much lower and does not suggest any risk of exceedance of the EAL.

10.5 Overall, it is considered that the findings of this report have no material differences in conclusions to those presented in the 2019 assessment.

Appendix A - Figures

Figure 3.1 Windrose plots for the five years of meteorological data used to inform this assessment

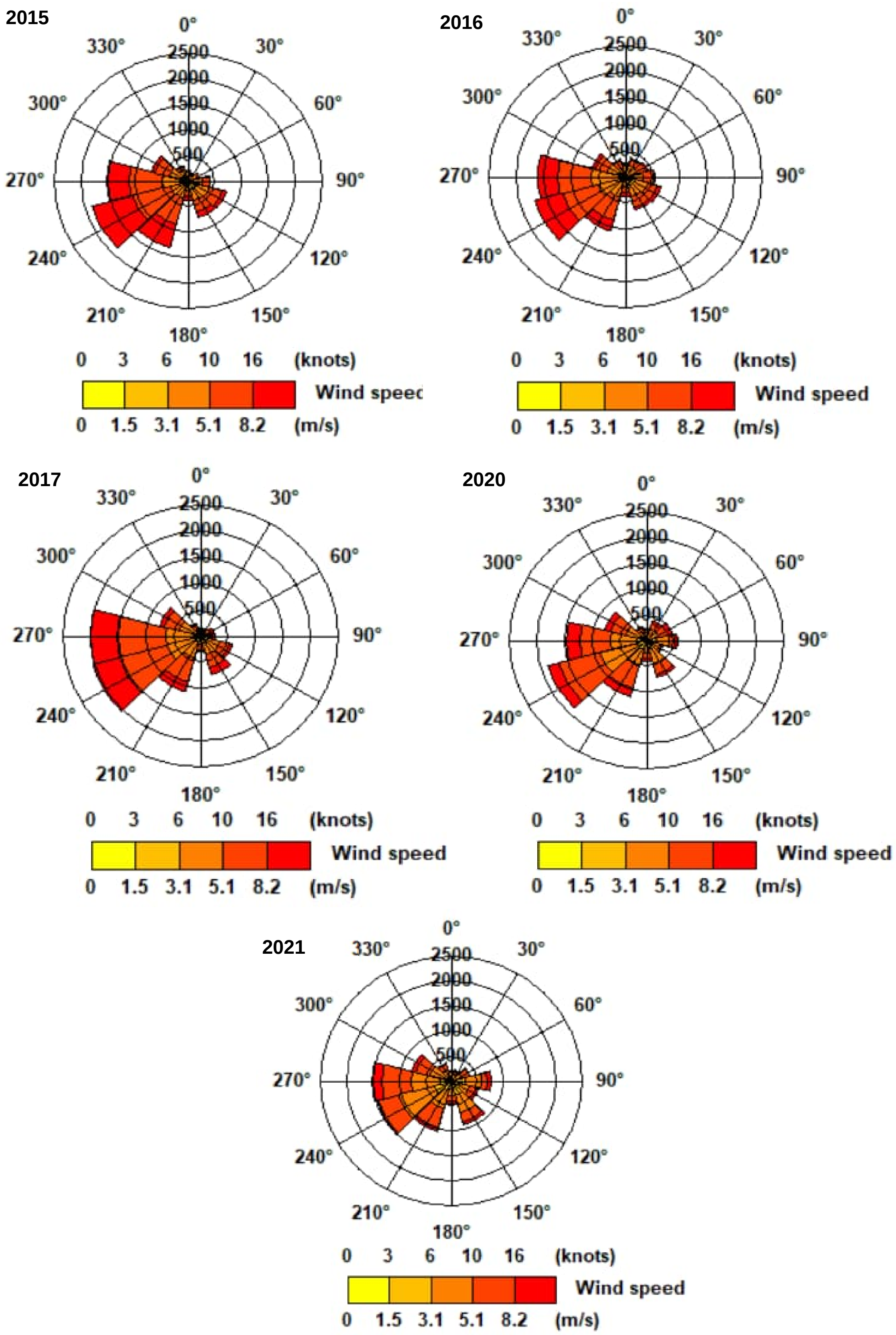


Table 3.6 Modelled Residential and Ecologically Sensitive Receptors

Receptor ID	Receptor Type	Easting [(1)]	Northing [(1)]	Height (m)
R1	Residential Property	685428	5913800	1.5
R2	Residential Property	685496	5913947	1.5
R3	Residential Property	685408	5913915	1.5
R4	Residential Property	685325	5913982	1.5
R5	Proposed Residential Property	685612	5913758	1.5
R6	Proposed Residential Property	685665	5913695	1.5
R7	Proposed Residential Property	685840	5913560	1.5
R8	Proposed Residential Property	685717	5913422	1.5
R9	Residential Property	685761	5912774	1.5
R10	Residential Property	685347	5913207	1.5
R11	Residential Property	684843	5913418	1.5
R12	Residential Property	684748	5913659	1.5
R13	Residential Property	684680	5913818	1.5
R14	Residential Property	684978	5914068	1.5
R15	Residential Property	684700	5914126	1.5
R16	Residential Property	684540	5914624	1.5
R17	Residential Property	684347	5914618	1.5
R18	Residential Property	684504	5915110	1.5
R19	Residential Property	685396	5916072	1.5
R20	Residential Property	686700	5915809	1.5
E1	South Dublin Bay and River Tolka Estuary SPA, South Dublin Bay SAC, Irish Town Nature Reserve	686450	5913490	0
E2	South Dublin Bay and River Tolka Estuary SPA, South Dublin Bay SAC, Irish Town Nature Reserve	686882	5913469	0
E3	South Dublin Bay and River Tolka Estuary SPA, South Dublin Bay SAC, Irish Town Nature Reserve	687239	5913498	0
E4	North Bull Island SPA, North Dublin Bay SAC	688175	5915613	0
E5	North Bull Island SPA, North Dublin Bay SAC	688511	5917403	0
E6	Baldoyle Bay SPA and SAC	691863	5919687	0
E7	North Bull Island SPA, North Dublin Bay SAC	693278	5917242	0
E8	South Dublin Bay and River Tolka Estuary SPA, South Dublin Bay SAC	686594	5910617	0

[(1)] Coordinate system used was UTM_Zone_29N,

Figure 3.2 Location of Modelled Air Quality Sensitive Receptors

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 4.1 Annual Mean NO_2 Process Contribution (with buildings scenario) 2015

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 4.2 1hr Mean NO_2 Process Contribution (with buildings scenario) 2021 for both emission limit and the maximum short term emission limit

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

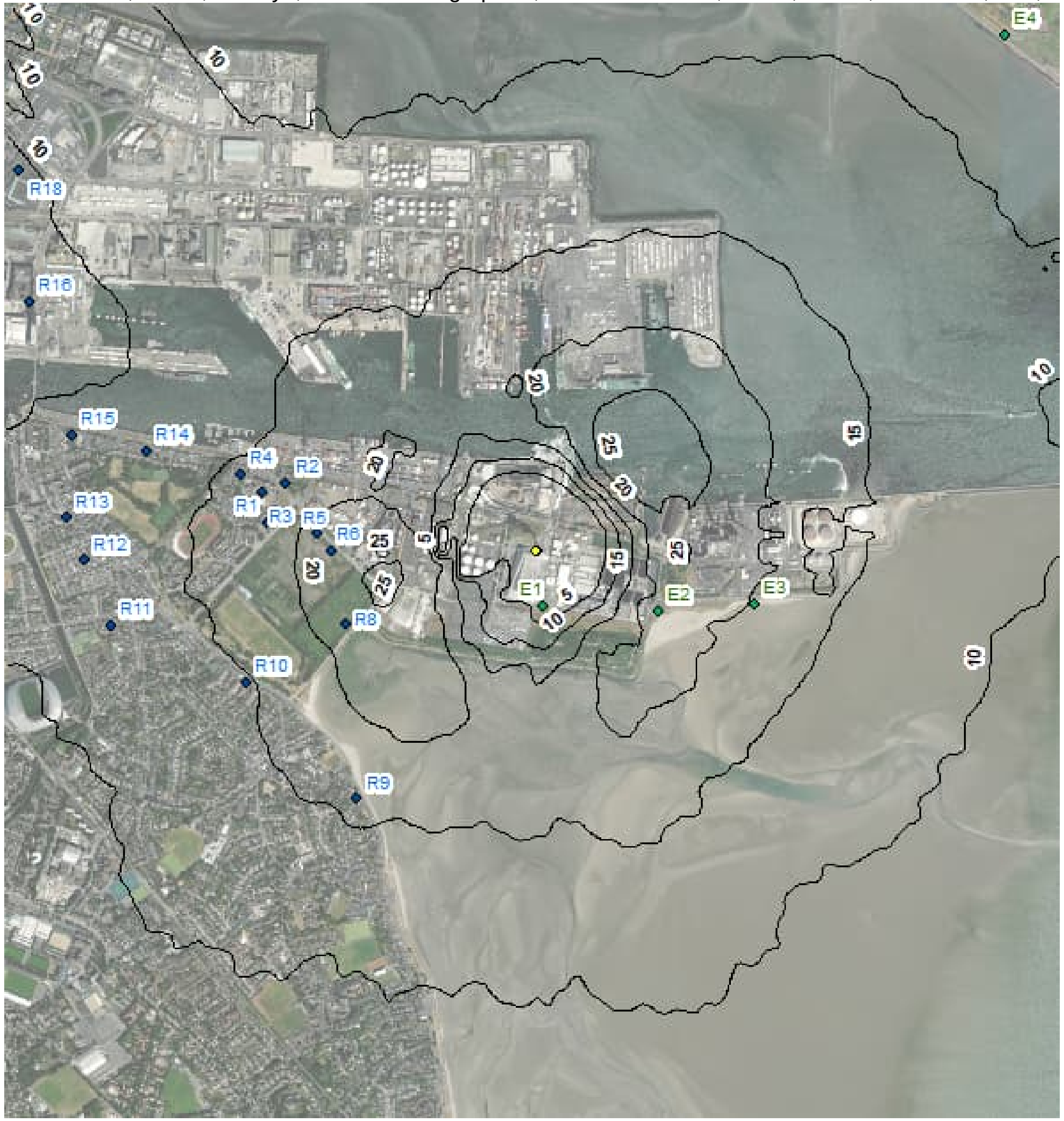


Figure 4.3 Annual Mean NO_2 Process Contribution (with coastline scenario) 2017

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 4.4 1hr Mean NO_2 Process Contribution (with coastline scenario) 2021 for both emission limit and the maximum short term emission limit

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 4.5 Annual Mean NO_2 Process Contribution (with no coastline or building information) 2017

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 4.6 1hr Mean NO_2 Process Contribution (with no coastline or building information) 2021 for both emission limit and the maximum short term emission limit

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 4.7 Annual Mean Cd Process Contribution (with buildings scenario) 2015

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 4.8 Annual Mean As Process Contribution (with buildings scenario) 2015

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 4.9 Annual Mean V Process Contribution (with buildings scenario) 2015

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 4.10 Annual Mean PM_{10} Process Contribution (with buildings scenario) 2015

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 4.11 24-hour Mean PM_{10} Process Contribution (with buildings scenario) 2015

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 6.3 ADMS 5 Model Buildings Locations

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 6.4 ADMS 5 Model Buildings Data – 3D Representation

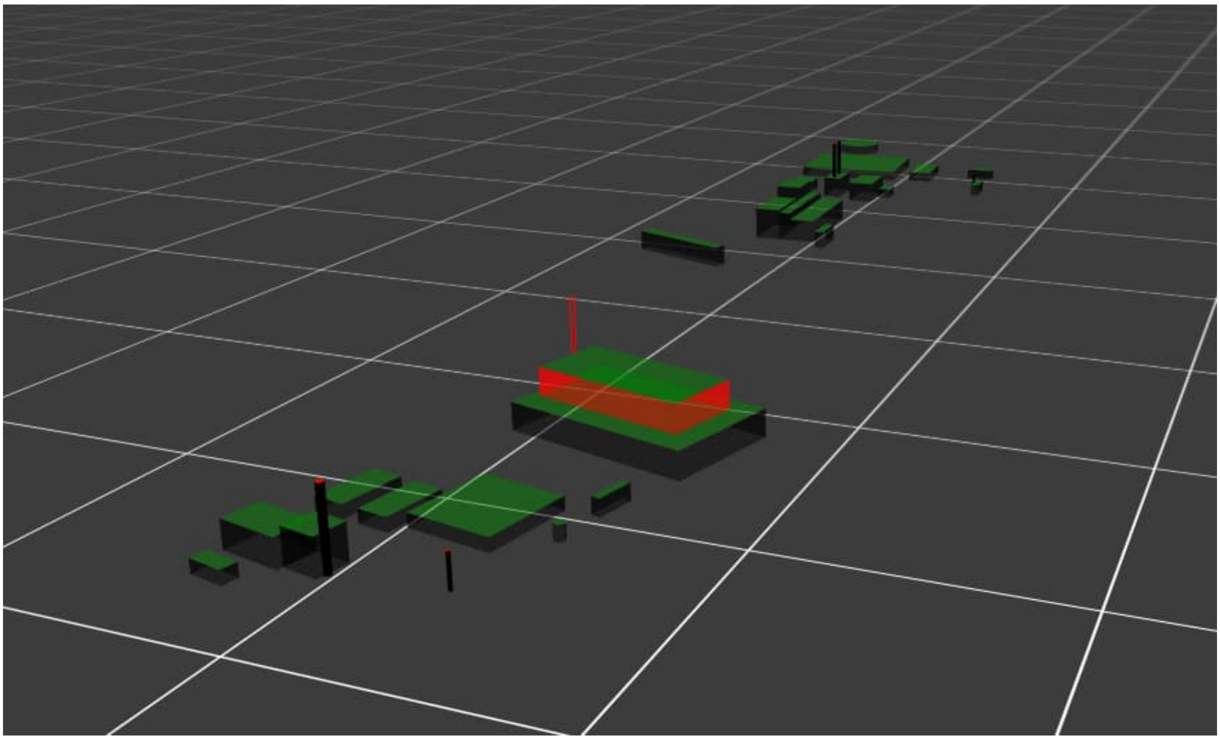


Figure 7.1 Annual Mean NO_2 Process Contribution 75% flow (maximum impact scenario) 2015

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 7.2 1-hour Mean NO_2 Process Contribution 75% flow (maximum impact scenario) 2021 for both emission limit and the maximum short term emission limit

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

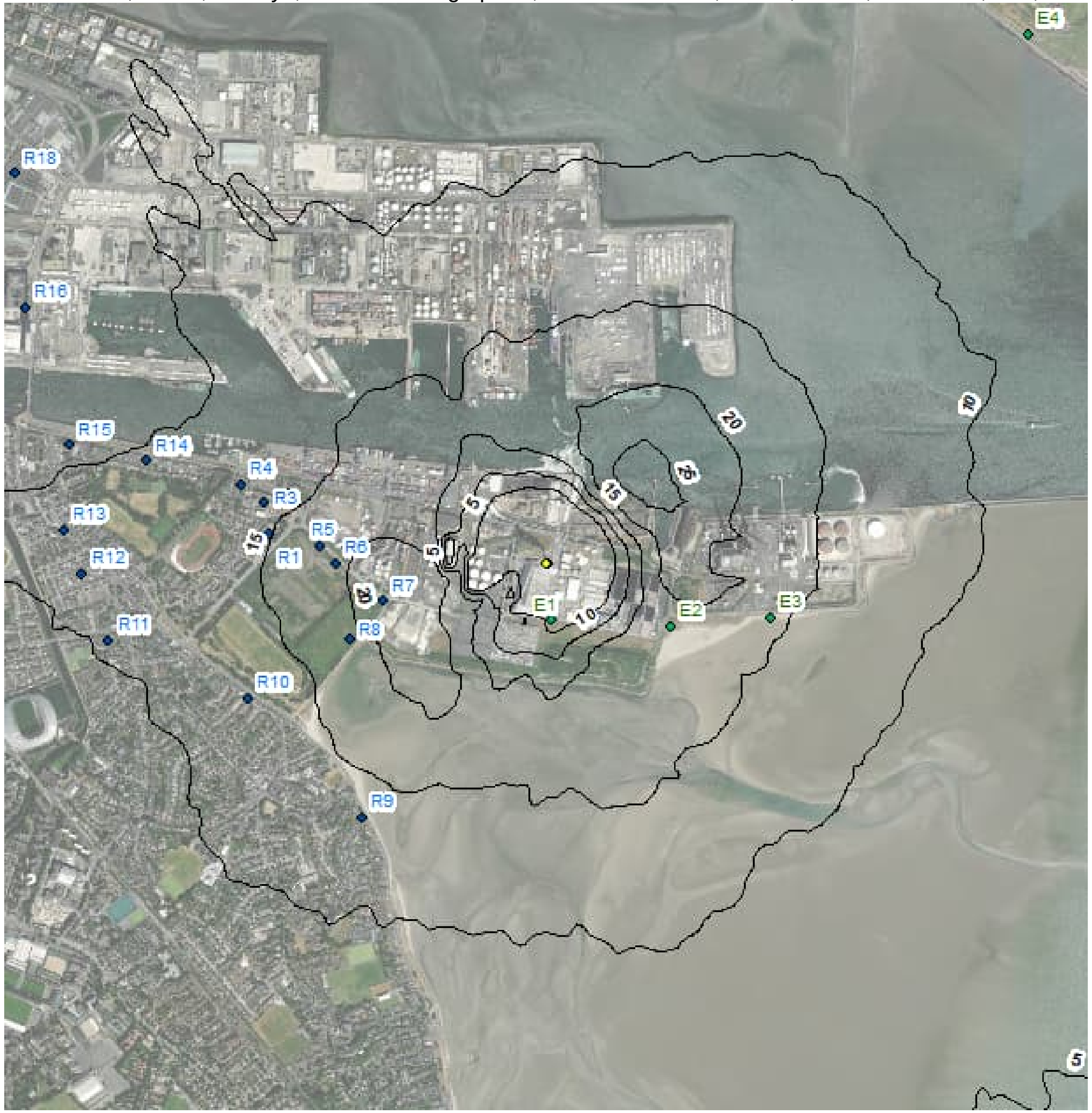


Figure 8.1 1-hour Mean NO_2 Process Contribution Operational OCGT Normal Operation (maximum impact scenario) 2017

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

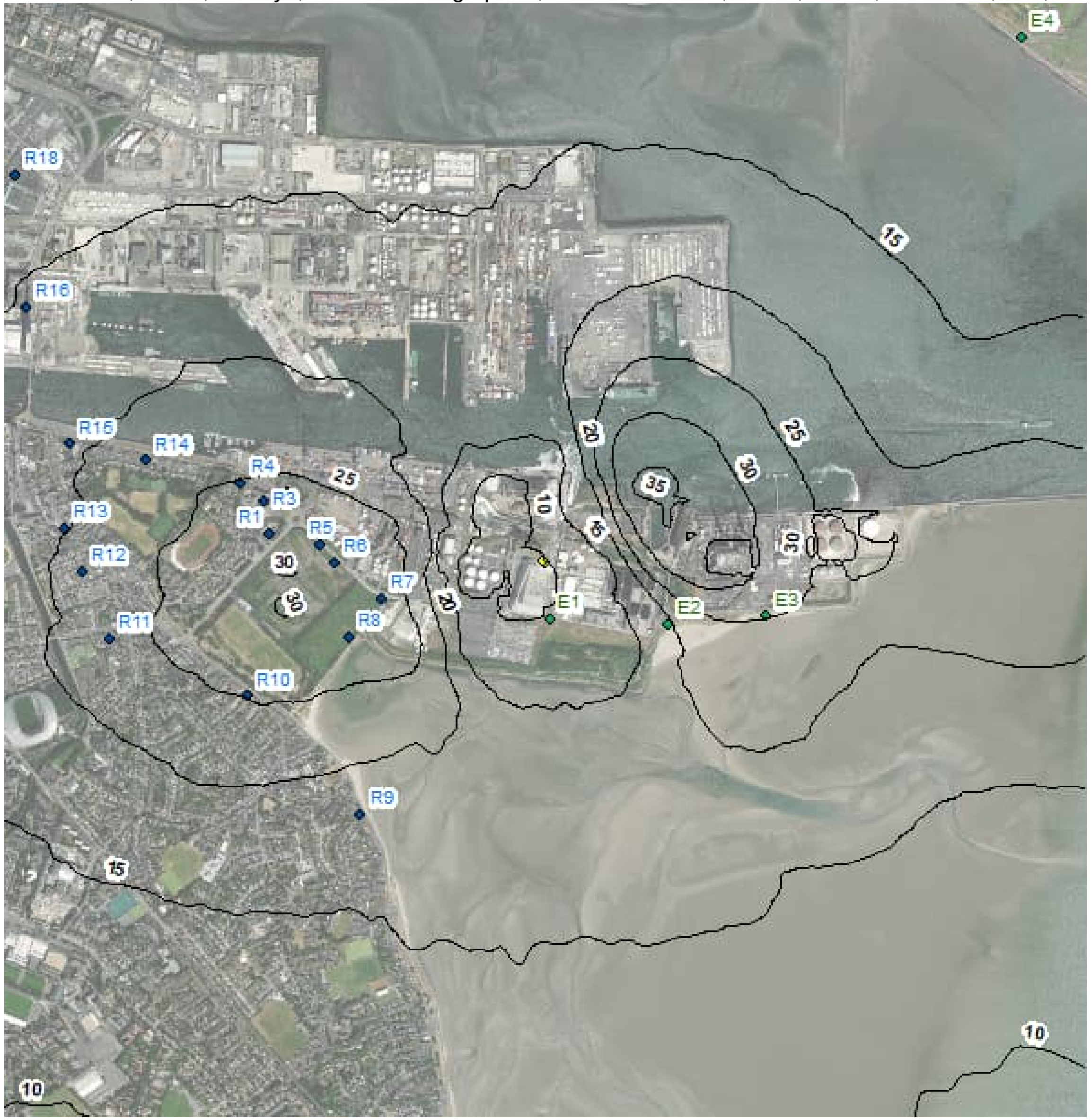


Figure 8.2 Annual Mean NO_2 Process Contribution Operational Long-term (maximum impact scenario) 2015

Source: Esri, Maxar, GeoEye, Earthstar geographics, CNES/Airbus DS, USDA, AeroGRID, IGN, and the GIS User Community

Appendix G : Correspondence Oct. 10, 2016 on Weather Station Location including Site Plan

FAO: **Simon Buckley,**
Office of Environmental Enforcement,
Environment Protection Agency,
Richview,
McCumisky House,
Clonskeagh
Dublin14

October 10, 2016

Ref: W0232-01: Weather Station Location

Dear Mr. Buckley,

Condition 3.2.1.1 of Industrial Emissions Licence registration number W0232-01 requires Dublin Waste to Energy Ltd to submit the location for the proposed weather station on site.

Please find enclosed a site map showing proposed location for the weather station (AA-1).

I would be grateful for the Agency's agreement for this location.

If you require anything further please do not hesitate to contact the undersigned.

Yours Sincerely

____
Mark Heffernan,
Environmental Manager

NATIONAL GRID CO-ORDINATES

POINT	EASTING (X)	NORTHING (Y)	ID
A2-1	319963.183	233626.573	EMISSION POINT AIR
A2-2	319968.577	233625.496	EMISSION POINT AIR
A2-3	319876.135	233559.900	EMISSION POINT AIR (DIESEL)
M-A2-1	319951.773	233611.481	MONITORING POINT AIR
M-A2-2	319965.791	233611.800	MONITORING POINT AIR
M-A2-3	319876.135	233559.900	MONITORING POINTAIR (DIESEL)
AA-1	319899.489	233691.299	MONITORING POINT WEATHER STATION
SW-1	320045.158	233780.530	EMISSION POINT COOLING WATER OUTLET
M-SW-1	320042.175	233745.515	MONITORING POINT COOLING WATER OUTLET
M-SW-1A	320055.284	233853.935	MONITORING POINT COOLING WATER INLET
M-SE-1	319971.871	233656.290	MONITORING POINT EXCESS STORM WATER
SE-1	319977.014	233444.985	EMISSION POINT EXCESS STORM WATER AND SEWAGE

NOTES

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEER'S DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE DRAWING , USE FIGURED DIMENSIONS ONLY.
3. ANY DISCREPANCIES TO BE REPORTED TO THE ARCHITECT.
4. ALL DIMENSIONS ARE IN MILLIMETERS.
5. ALL LEVELS ARE IN METERS AND RELATE TO O.S. DATUM.
6. CONTRACTOR TO VERIFY EXISTING ON–SITE DIMENSIONS PRIOR TO CONSTRUCTION.

FORMAL ISSUE
20160602.135701 – KELLEDE

ISSUE	DESCRIPTION	DRN	ORIG	AUTH CHK	APP	DATE
C	REVISED FOR INFORMATION	EK	EK	PH	KE	02/06/16
B	REVISED FOR INFORMATION	EK	EK	PH	AF	17/12/15
A	FOR INFORMATION	EK	EK	PH	AF	14/12/15

PM GROUP

CLIENT: COVANTA EUROPE ENGINEERING LTD

COVANTA
Powering Today. Protecting Tomorrow.

PROJECT: DUBLIN WASTE TO ENERGY FACILITY

TITLE: GATEHOUSE SITE LOCATION AND SITE LAYOUT FOR EPA

CLIENT REF.		DRG No.	IE0311183-48-DR-0009
PROJECT No.	IE0311183	CLIENT DRG No.	PMG-ARC-DCA-0000-0009
A0 SCALE	AS SHOWN		

THIS DRAWING WAS CREATED USING: AutoCAD

IE0311183_48_DR_0009

LS Approval - Notice - Generic Approval

Licence: W0232-01 - DUBLIN WASTE TO ENERGY LIMITED

Submitted On: 14/11/2016

Licensee Submission LR025185 **Title** Weather Station location for Agreement (Revised Location)

Notification

Dear Mr Heffernan,

The Agency has reviewed your submission LR025185, regarding the proposed location of the weather monitoring station.

The approval is sought under condition 2.3.2.1 of the industrial emission licence register number (IEL Reg. No.) W0232-01.

I am to advise you that on the basis of the information provided, the Agency approves your proposed location subject to meeting the requirements of the "World Metrological Organisation Standards and Recommendations" for the parameters outlined in schedule C.5 of the licence.

You are reminded of the requirement to comply with the conditions of IEL Reg. No. W0232-01 at all times.

The Agency may at any time, if it considers necessary, revisit and/or revoke this approval.

If you have any other queries in relation to this matter please contact the undersigned at 01-2680100.

Yours sincerely,

Simon Buckley

Inspector

Office of Environmental Enforcement, Dublin.

Appendix H : Revised Attachment 8-1-Wastes Generated

EPA Application Form

8.1 - Waste Generated and Animal By-Products Generated - Attachment

Organisation Name: * | Dublin Waste to Energy Limited

Application I.D.: * | LA003577

Amendments to this Application Form Attachment

Version No.	Date	Amendment since previous version	Reason
V.1.0	July 2017	N/A	Online application form attachment
As above	Mar 2018	Identification of required fields	Assist correct completion of attachment

Waste Generated (See Note i at the end of this attachment)

Attach evidence that demonstrates, in accordance with Articles 11(3) and 12(1)(h) of the Industrial Emissions Directive (for IE licence applications) and Article 4(1) of the Waste Framework Directive (for all applications), how the waste hierarchy (see Note ii at the end of this attachment) has been taken into account in the prevention and management of waste generated at the installation/facility (select Document Type: 'Waste Hierarchy').

Waste Hierarchy evidence filename: * | Attachment 8-2-1 Waste Hierarchy

Complete the table below in relation to waste generated at the installation or facility

Describe, by completing the table below, the arrangements for the recovery or disposal of solid and liquid wastes generated. Use one row (at least) for each waste generated *(the following are examples: e.g., production waste, office waste, canteen waste, vehicle servicing waste, workshop waste, landfill leachate, liquid waste, yard sweepings, ash).* Where appropriate, attach analysis of the waste (include test methods and Q.C.) and period or periods of generation of the waste.

Note: This table is for waste generated as a result of the licensable and associated activities.
This table is not for waste accepted at the installation or facility (these details are required to be included elsewhere (in the Waste Activities Tab (4.3)).

Dublin Waste to Energy Limited (DWtE) has compiled this table based on their 2018 EPR data. Incinerator Bottom Ash (IBA) is exported abroad under TFS notification for metal recovery and materials recovery with any remaining bottom ash material used as aggregate in road building or landfill cover material. Although DWtE has classified IBA as non-hazardous, it is as present being treated as hazardous waste as per the Precautionary Principle. Air Pollution Control Residues (APCR) are also exported abroad under TFS notification for recovery to a lime quarry in Norway and a salt mine in Germany for backfilling. Waste analysis is undertaken as outlined in schedule C.4.1 of W0232-01.

List of Waste (LoW) Code entry *	Applicant's description of waste generated at the facility or installation *	Estimate or, for a licence review, actual tonnes generated per annum *	Is the waste recovered or disposed on-site or is it dispatched off-site to a waste facility? [1]*	Describe the disposal or recovery treatment technique *	Disposal / Recovery Code *
19 01 12	Bottom Ash and Slag Containing Dangerous substances/Bottom Ash	134,500	Recovered Off-site	Recycling/reclamation of metals and metal compounds and re-use of ash	R4

[1] Options: '**On-site**' or '**Off-site**'

List of Waste (LoW) Code entry *	Applicant's description of waste generated at the facility or installation *	Estimate or, for a licence review, actual tonnes generated per annum *	Is the waste recovered or disposed on-site or is it dispatched off-site to a waste facility? [1]*	Describe the disposal or recovery treatment technique *	Disposal / Recovery Code *
	and Slag other than those mentioned in 19 01 11*				
19 01 07*	Solid Waste from Gas Treatment	32,750	Recovered Off-site	Recycling/reclamation of other inorganic materials	R5
19 01 15*	Boiler Dust Containing Dangerous Substances	1,000	Recovered Off-site	Recycling/reclamation of other	R5
13 05 08*	Mixtures of wastes from grit chambers and oil/water separators	150	Recovered Off-site	Used oil re-refining or other uses of previously used oil	R9

*add rows to the table as necessary

The following should be provided where appropriate:

1. Analysis of the waste (include test methods and Q.C.)
2. Its location of storage and the manner by which the integrity/impermeability of storage areas is maintained
3. Period or periods of generation of the waste.

Animal By-Products

Complete this table for any *animal by-products generated whether classified as waste or not.*

Description of material	Estimate or for licence reviews, actual tonnes generated per annum	Is the animal by-product used on-site or is it dispatched off-site to another facility? [2]	Describe the disposal or recovery treatment technique	Disposal / Recovery Code	Describe off-site uses (where applicable)
n/a					

*add rows to the table as necessary

[2] Options: 'On-site' or 'Off-site' or 'not classified as waste'.

Note i

Waste Generated

This part of the form collects data and information on the management of waste generated at the facility or installation. (Do not repeat information already provided in Tab 4 on Waste Activities, where applicable).

Waste must be managed without endangering human health and harming the environment, and in particular without risk to water, air, soil, plants or animals, without causing a nuisance through noise or odours, and without adversely affecting the countryside or places of special interest. Measures must be taken to ensure that waste generation is avoided in accordance with the waste hierarchy in Council Directive 98/2008/EC on waste and section 21A of the Waste Management Act 1996, as amended. Where waste is generated, it must be prepared for re-use, recycled or recovered or, where that is technically and economically impossible, it can be disposed of while avoiding or reducing any impact on the environment (applicants should provide this information in the context of the Waste Management Act 1996 as amended).

Note ii

Waste Hierarchy

Describe what measures will be taken to prevent the generation of waste to the extent possible. State whether the operator of the installation or facility has participated in any projects under the National Waste Prevention Programme.

Where waste is generated at the installation or facility, describe how it will be, in order of priority in accordance with section 21A of the Waste Management Act 1996, as amended, prepared for re-use, recycling, recovery or where that is not technically or economically possible, disposed of in a manner which will prevent or minimise any impact on the environment.

Section 29(2A) of the Waste Management Act 1996, as amended states that it shall be the duty of waste producers and holders to ensure that waste undergoes recovery operations in accordance with sections 21A and 32(1) of the Acts.

For waste whose generation cannot be prevented, describe what measures will be in place to ensure that waste is collected separately (if technically, environmentally and economically practicable) and will not be mixed with other waste or other material with different properties.

Appendix I : Summary of Materials Storage Capacity

Significant Materials Storage Summary

Material Description	Storage Arrangements	Storage Capacity	Units
Waste Feed	Waste Bunker	15,000	tonnes
Activated Carbon	Silos	44	tonnes
Hydrated Lime (95%)	Silos	180	tonnes
Ammonia Solution (24.9%)	Bulk Storage tank	60	m^3
Sodium Hydroxide (50%)	Bulk Storage tank	50	m^3
Calcium Oxide	Silo	16	tonne
Diesel	Storage Tank	120	m^3
Process Water	Storage tank	120	m^3
Hydraulic Oils	Drums	1,000	litres
Lubricating Oils - Turbine	Storage tank	9,000	litres
Lubricating Oils – Compressors	Drums	400	litres
Steering (Control) Oil - Turbine	Drums	500	litres
Vacuum Pump Oils	Drums	200	litres
Trisodium Phosphate	Drums	50	Kg
RoClean Acid	Drums	50	kg
RoClean Agent	Drums	100	kg
Ethylene Glycol	IBC	1,000	litres
Sodium Hypochlorite	Storage Tank	50	m^3
Sodium Chloride	Bags	1,000	kg
Sic-RK-85-ET (RK-70-ET, PK-85-ET)	Typically IBC or small drums.	4	tonnes
Reagent 781096	Typically IBC or small drums.	1	tonne
Nitrogen Gases	Cylinders	124	no.
Bottom Ash	Reinforced Water- proof Concrete Bunker	10,000	tonnes
Boiler Ash	Hopper	200	tonnes

Material Description	Storage Arrangements	Storage Capacity	Units
Flue Gas Treatment Residue	2 no. Silos	700	m^3
Waste Oils	Waste Oil tank	3000	litres

Source: DWtE

Appendix J : Revised Attachment 7-7-1- Storm Water Emissions

EPA Application Form

7.7 - Discharges to Storm Water - Attachment

Organisation Name: *	Dublin Waste to Energy Limited
Application I.D.: *	LA003577

Amendments to this Application Form Attachment

Version No.	Date	Amendment since previous version	Reason
V.1.0	July 2017	N/A	Online application form attachment
As above	Mar 2018	Identification of required fields	Assist correct completion of attachment

Storm Water Discharge Points

Storm water is rain water run-off from roof and non-process areas

Complete the table below for all storm water discharge points – (one row per discharge point).

Note: This section is NOT for rain water run-off from areas used for the outdoor storage of waste OR run-off from process areas likely to be contaminated.
(Process effluent discharges and emissions should be described in the 7.2 Emissions to Water tab of the application form).

Discharge Point Code *	Easting * [1]	Northing * [2]	Discharges to? (enter relevant option) * [3]	Description of Discharge Point and Controls *	Name of receiving water (where applicable) *	Receiving Water Code (where applicable) *
SE-1	319977	233445	Ringsend Municipal Wastewater Treatment Plant (MWwTP)	Surface water runoff from building roofs, roads, parking areas etc. is stored in an attenuation tank for re-use in the process. Overflow from the attenuation tank discharges to the neighbouring Ringsend MWwTP.	n/a	n/a

*add rows to the table as necessary

1 Six Digit GPS Irish National Grid Reference
2 Six Digit GPS Irish National Grid Reference
3 Options: ‘River’, ‘Ditch’, ‘Estuary’, ‘Lake’, ‘Land Drain’, ‘Foul Sewer’, ‘Percolation Area’, ‘Groundwater’, ‘Storm Sewer’ or ‘Other’ (where ‘Other’ is selected please enter a description)

Storm Water Discharge Monitoring Points

Enter the Discharge Point Code, the associated Monitoring Point Code and the grid reference details for each Monitoring Point location.

Discharge Point Code*	Monitoring Point Code*	Easting * [4]	Northing * [5]
SE-1	M-SE-1	319972	233656

*add rows to the table as necessary

4 Six Digit GPS Irish National Grid Reference

5 Six Digit GPS Irish National Grid Reference

Storm Water Trigger Levels and Monitoring

Complete the table below with details of the trigger levels and proposed monitoring regime for each parameter.

Select parameters that are a good indicator of loss of containment on-site. Consult the EPA guidance in the setting of trigger values for storm water discharges to off-site surface wastes at EPA licensed facilities (2012).

(If different parameters or monitoring arrangements apply at different storm water discharge points include information on this within the table).
At present DWtE continuously monitor surface water over flow from the attenuation tank. This is considered excessive as the discharge is directly into the Ringsend WWTP and not to a sewer. Furthermore, the sampling pump is running 24 hours a day 365 days a year to maintain the TOC analyser in good condition. This is not energy efficient. DWtE are requesting that this monitoring change to obtaining a grab sample for analysis prior to discharge of the over-flow to Ringsend Municipal Waste Water Treatment Plant (MWwTP). There is both a manual and automatic pumping function between the DWtE attenuation tank and Ringsend MwWTP. In order to pump from the attenuation tank to the MWwTP the pump can be physically activated in the control room or when the level in the tank reaches 90% the pumps automatically activate. It is proposed that a grab sample be taken on activation of the pumps and sampled for pH and TOC and records be available for inspection on site.

Parameter*	Trigger Level *	How was the trigger level determined? *	Proposed Monitoring Frequency * [6]	Sampling / Monitoring	
				Sample Method * [7]	Analysis Method and Technique * [8]
M-SE-1					
pH	Not relevant as stormwater overflow from attenuation tank is to Irish Water sewer into Ringsend MWwTP and not direct to receiving waters.		Prior to discharge to Ringsend MWwTP.	Grab	pH meter (Laboratory)
TOC	Not relevant as stormwater overflow from attenuation tank is to Irish Water sewer into Ringsend MWwTP and not direct to receiving waters.		Prior to discharge to Ringsend MWwTP.	Grab	TOC analyser (Laboratory)

*add rows to the table as necessary

[6] Option list: 'Continuous', 'Hourly', 'Daily', 'Weekly', 'Monthly', 'Quarterly', 'Biannually' OR 'Annually'.
[7] Option list: 'Continuous', '24-hour Flow Proportional Composite', '24-hour Time Proportional Composite' OR 'Grab'.
[8] Option list: 'Gravimetric', 'Online Calibrated Suspended Solids', 'Online Flow Meter with Recorder', 'Online pH electrode/probe Meter and Recorder', 'Online Temperature Probe with Recorder', 'Standard Method', 'Visual', OR 'To be agreed by the Agency'.

If not provided for in the table above, upload a document that includes details of how storm water is proposed to be monitored (select Document Type: 'Storm Water Monitoring' in the application form).

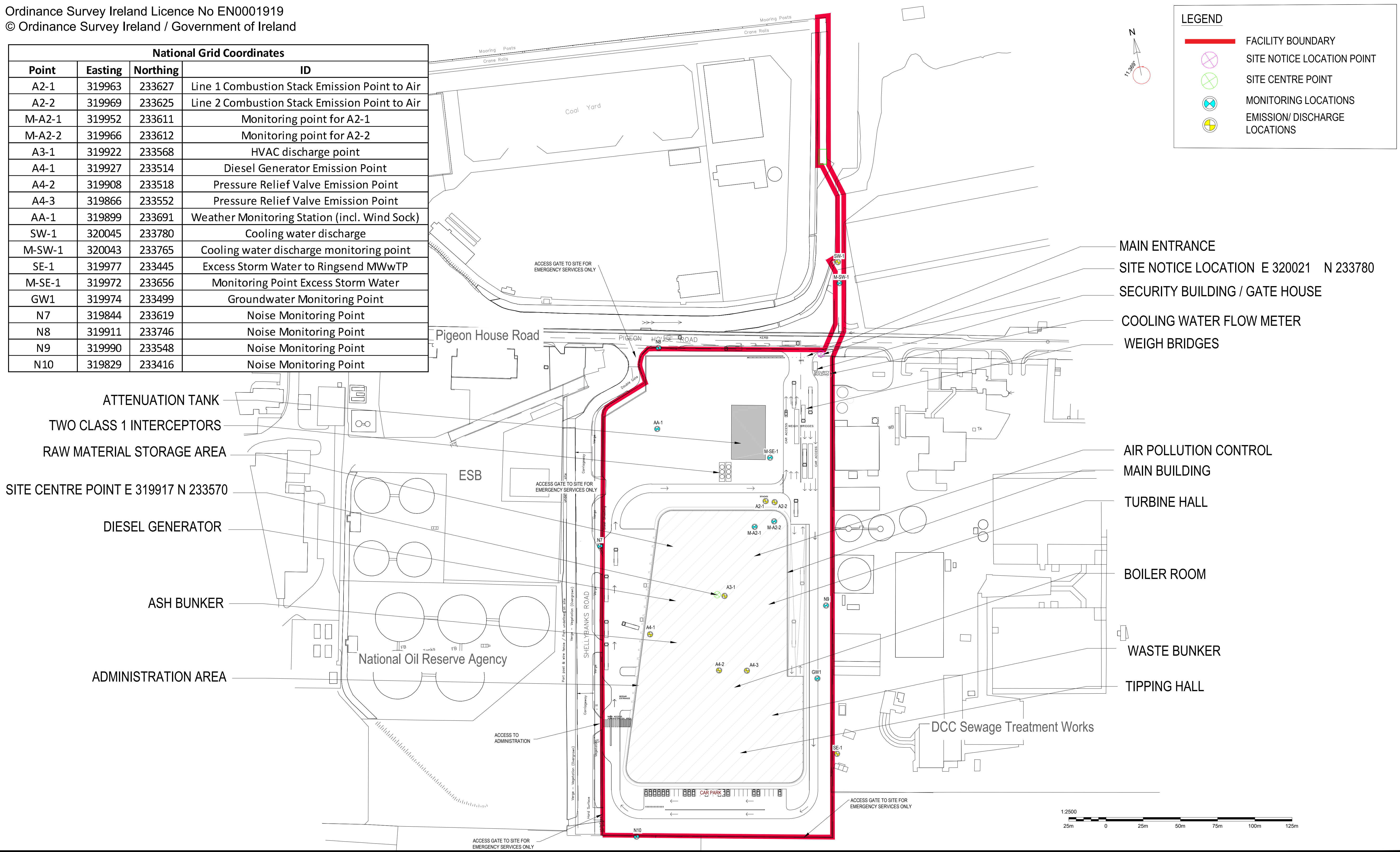
Storm Water Monitoring document file name: n/a

Appendix K : Revised Site Layout

Ordinance Survey Ireland Licence No EN0001919

National Grid Coordinates

Point	Easting	Northing	ID
A2-1	319963	233627	Line 1 Combustion Stack Emission Point to Air
A2-2	319969	233625	Line 2 Combustion Stack Emission Point to Air
M-A2-1	319952	233611	Monitoring point for A2-1
M-A2-2	319966	233612	Monitoring point for A2-2
A3-1	319922	233568	HVAC discharge point
A4-1	319927	233514	Diesel Generator Emission Point
A4-2	319908	233518	Pressure Relief Valve Emission Point
A4-3	319866	233552	Pressure Relief Valve Emission Point
AA-1	319899	233691	Weather Monitoring Station (incl. Wind Sock)
SW-1	320045	233780	Cooling water discharge
M-SW-1	320043	233765	Cooling water discharge monitoring point
SE-1	319977	233445	Excess Storm Water to Ringsend MWwTP
M-SE-1	319972	233656	Monitoring Point Excess Storm Water
GW1	319974	233499	Groundwater Monitoring Point
N7	319844	233619	Noise Monitoring Point
N8	319911	233746	Noise Monitoring Point
N9	319990	233548	Noise Monitoring Point
N10	319829	233416	Noise Monitoring Point



Project Title: W0232-01 IE LICENCE REVIEW APPLICATION Application ID LA003577	Drawing Title: SITE LAYOUT PLAN	Purpose of issue: FOR INFORMATION ONLY		
Client: Dublin Waste to Energy LTD		Designed: RPW	Drawn: NO	Checked: PH
		Approved: PH/DUB	Date: 02.09.2022	
		AECOM Internal Project No.: PR-351653	Suitability: FOR INFORMATION	
		Scale @ A3: 1:2500	Zone / Mileage: DUBLIN	
		Drawing Number: 002	Rev: C	

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