Wheelabrator Kemsley North (WKN) Energy from Waste Facility

Response to Duly Making Questions

EPR/SP3206ST/A001

JER1247
WKN Energy from Waste
Duly Making Response
1
2
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Quality Management					
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1 INTRODUCTION

1.1.1 This document provides the response to the request for more information issued on 24/09/2020, with further questions asked on 29/09/2020 and 01/10/2020. The notice sets out further information required by the Environment Agency (EA) to duly make an application for permit EPR/SP3206ST/A001 relating to the Wheelabrator Kemsley North (WKN) Energy from Waste (EfW) facility.

1.1.2 Section 2 of this document sets out each question followed by the response.

2 RESPONSES

Question 1: Habitats Assessment

a. Your habitats assessment excludes assessment of the Marine Conservation Zone (MCZ) on the basis that there is no requirement to assess for air quality impacts. You need to justify the exclusion based on the conservation objectives of the MCZ and the relevant impacts from the site.

b. You need to provide us with an assessment of the impact at the Village Park, Iwade local wildlife site.

c. The assessment did not include an assessment against all of the relevant environmental standards (ESs). Provide us with an assessment against the following ESs: daily oxides of nitrogen (NOx) and hydrogen fluoride (HF) weekly/daily.

d. You need to justify the use of the higher annual ESs for ammonia (NH_3) and sulphur dioxide (SO_2).

2.1.1 Please see response in Appendix 1.

Question 2: Air Quality Assessment

a. The assessment includes details of Air Quality Management Areas (AQMAs). You need to provide us with an assessment of the most impacted receptor in the AQMA.

b. We require an assessment of the impact from total organic carbon (TOC)

2.1.2 Please see response in Appendix 2.

Question 3: IED Chapter IV Compliance

a. You need to send us a summary of how the operating techniques comply with IED chapter IV requirements (Refer to the key issues section of S5.01 for the incineration of waste, items 1 to 36).

2.1.3 Table 2-1 below addresses each of the items in S5.01 and sets out where the information is found within the permit application.

Table 2-1. IED Compliance

Item	Key Issue	Cross-reference to main application document
1	Does the installation contain more than one incineration line? Identify with a brief reference (e.g. L1, L2 etc) and provide a brief description (e.g. fixed hearth, chain grate) of each line.	Paragraph 1.5.1and section 3
2	State the maximum design capacity (in tonnes/hour) for waste incineration for each line, and the maximum total incineration capacity (in tonnes/hour) of the plant.	Paragraphs,1.1.2, 1.5.1 and 2.4.8 Figure 2
3	Are any of the wastes you treat hazardous waste for WID purposes?	Paragraph 2.4.6
4	For each line, provide the following information: a. Is the operating temperature of the plant, after the last injection of combustion air, 1100°C for hazardous waste with greater than 1% halogenated hydrocarbons expressed as chlorine, or 850°C for all other wastes? b. If the operating temperature is below 1100°C for incineration of hazardous waste with greater than 1% halogenated hydrocarbons expressed as chlorine, or below 850°C for all other wastes, you must request a derogation under WID Article 6(4) with a justification that the operation will not lead to the production of more residues or residues with a higher content of organic pollutants than could be expected if operation was according to WID conditions. c. State the residence time of gas at the operating temperature given above. Is it less than 2 seconds? d. Where the residence time is less than 2 seconds, you must request a derogation under WID Article 6(4) with a justification that the operation will not lead to the production of more residues or residues with a higher content of organic pollutants than could be expected if operation was according to WID conditions. e. Describe the technique that will be used to verify the gas residence time and the minimum operating temperature given, both under normal operation and under the most unfavourable operating conditions anticipated, in accordance with WID Article 6 (4). f. Describe where the temperature in the combustion chamber will be measured with a demonstration that it is representative in accordance with WID Article 6(1).	a. Paragraph 3.4.1 b. Not applicable c. Paragraph 3.4.1 d. Not applicable e. Paragraph 3.5.2 – 3.5.4 f. Paragraph 3.4.4
5	For each line, describe the automatic system to prevent waste feed under the following circumstances: a. during start-up; b. when continuous emission monitors show that an emission limit value (ELV) is exceeded due to disturbances or failures of the abatement equipment; c. whenever the combustion chamber temperature has fallen below a set value. You must show that you comply with WID Article 6 (3) and 6 (4).	Paragraph 3.4.15
6	State the temperature set point at which waste feed is prevented. It must be at least the temperature specified in WID (1100°C for hazardous waste with greater than 1% halogenated hydrocarbons expressed as chlorine, or 850°C for all other wastes) or an alternative temperature as allowed by WID Article 6(4) in which case the applicant should demonstrate how WID Article 6(4)'s requirements are met.	Paragraph 3.4.15

7	Does the plant use oxygen enrichment in the incineration combustion gas? If it does, specify the oxygen concentration in the primary air and secondary air (% oxygen). This is required to enable us to specify standards for measurement as required in Article 11 (8)	Paragraph 3.4.8
8	Does each line of the plant have at least one auxiliary burner controlled to switch on automatically whenever the furnace temperature drops below a set value in accordance with the requirements of WID Article 6 (1)? If the set value is not at least the temperature specified in WID (1100°C for hazardous waste with greater than 1% halogenated hydrocarbons expressed as chlorine, or 850°C for all other wastes), justify how operating at this lower temperature will not lead to the production or more residues or residues with a higher organic pollutant content as required by WID Article 6 (4)?	Paragraph 3.4.6
9	Which fuel type is used during start-up/shut-down? If it is not natural gas, LPG or light fuel oil/gasoil, provide evidence that it will not give rise to higher emissions than burning one of those fuels, as specified by WID Article 6 (1)	Paragraph 3.4.6
10	Are pre-treatment methods required to ensure that the quality standard for Total Organic Carbon (TOC) content or Loss on Ignition (LOI) of the bottom ash or slag is achieved? If they are, describe them. (WID Article 6 (1))	Not applicable
11	If any line of the plant uses fluidised bed technology, do you wish to request a derogation of the CO WID ELV to a maximum of 100 mg/m3 as an hourly average, as provided for in WID Annex V (e)? If you do, you must provide a justification.	Not applicable
12	For each type of waste to be burned, provide the following information a. Waste reference (e.g. WT1, WT2 etc) b. Waste description (e.g. chemical/physical description, trade name and firing locations) c. EWC classification number d. Maximum and minimum annual disposal in tonnes e. State whether it is hazardous waste for the purposes of WID and if it is, provide the following information: 1. the hazardous waste category (H1 – 14); 2. the names and maximum concentrations in grams/tonne of the specified substances that cause it to be hazardous. This should include at least PCB, PCP, chlorine, fluorine, sulphur and heavy metals if these are present; 3. whether it is waste oil, as defined in Article 1 of Council Directive 75/439/EEC (WID Article 3 (2)); 4. The waste composition 5. Is the balance of the waste composition more than 10%? If it is, give details of the waste components and quantities likely to be present in the balance. 6. Provide calorific value (CV) and feed rate details for the waste (WID Article 4)	a. Paragraph 2.4.4 b. Paragraph 2.4.4, Table 2-2, Table 2-3 c. Table 2-2 d. Paragraph 1.1.2 e. Not applicable
Hazardous wastes incineration		
13 - 19	Various requirements specific to hazardous waste incineration	Not applicable
Emissions to surface water and sewer		
20	If the technique by which you clean the exhaust gas from the incinerator generates wastewater, you must give details of the wastewater treatment process and demonstrate that you comply with the requirements of WID Annex IV and Articles 8(4) and 8(5). In particular, if you mix waste waters from your exhaust gas treatment with other waste waters prior to treatment, monitoring or discharge, you must demonstrate how you apply the mass balance requirements referred to in Articles 8(4) and 8(5) to ensure that you derive a valid measurement of the emission in the waste water.	Not applicable –Section 4.2

21	Describe your storage arrangements for contaminated rainwater run-off, water contaminated through spillages and water arising from fire-fighting operations. Demonstrate that the storage capacity is adequate to ensure that such waters can be tested and, if necessary, treated before discharge. (WID Article 8 (7))	Paragraph 4.4.9
22	For each emission point, give benchmark data for the main chemical constituents of the emissions under both normal operating conditions and the effect of possible emergency conditions. In this section we require further information on how you monitor the pollutants in these emissions. You must provide information for flow rate, pH, and temperature. Article 8 of WID requires that wastewater from the cleaning of exhaust gases from incineration plant shall meet the ELVs for the metals and dioxins and furans referred to in Annex IV of WID. Where the wastewater from the cleaning of exhaust gases in mixed with other waters either on or offsite the ELVs in Annex IV must be applied to the waste water from the cleaning of exhaust gases proportion of the total flow by carrying out a mass balance. Monitoring for other pollutants is dependant on the process and the pollutants you have identified in response to the question.	• Process wastewater: not applicable– Section 4.2 • Air emissions: Table 4-1, AQ Assessment (Appendix C) and Abnormal emissions assessment (Appendix M).
23	For each parameter you must define • the emission point • the monitoring frequency • the monitoring method • whether the equipment/sampling/lab is MCERTS certified • the measurement uncertainty of the proposed methods and the resultant overall uncertainty • procedures in place to monitor drift correction • calibration intervals and methods • accreditation held by samplers or details of the people used and their training/competencies	• Water: not applicable • Air: Table 4-1, paragraphs 4.7.3 – 4.7.9 • Waste: Table 4-2
24	Describe any different monitoring that you will carry out during commissioning of new plant.	Paragraphs 4.7.18 – 4.7.21
25	Describe any different arrangements during start-up and shut-down.	Not applicable
26	Provide any additional information on monitoring and reporting of emissions to water or sewer.	Not applicable
Waste recovery/disposal		
27	How do you deal with the residue from the incineration plant? Explain how you minimise, recover, recycle and dispose of it.	Section 2.5
Continuous emission monitor performance		
28	How do you intend to manage the continuous measurement system to satisfy WID Article 11 (11)? WID Article 11 allows a valid daily average to be obtained only if no more than • 5 half-hourly averages, and • 10 daily averages per calendar year during the day are discarded due to malfunction or maintenance of the continuous measurement system. Give details of how calibration, maintenance and failure of the continuous measurement system will be managed in order to satisfy these limitations. If necessary distinguish between different incineration lines.	Section 4.7
29	Give details of how you define when start-up ends and shut-down begins. Describe any different arrangements for monitoring during start up or shut down. Note that the emission limit values specified for compliance with WID do not apply during start-up or shut-down when no waste is being burned. Explain how you will integrate these periods into the emissions monitoring	Section 3.11

	system in such a way that the reportable averages are calculated between these times, but the raw monitoring data remains available for inspection. (WID Article 11(11)). If necessary, distinguish between different incineration lines.	
30	Describe each type of unavoidable stoppage, disturbance or failure of the abatement plant or continuous emission monitoring system during which plant operation will continue. State the maximum time anticipated before shut-down is initiated for each of these types of unavoidable stoppage.	Paragraph 2.2.5 - 2.2.8 and abnormal emissions assessment (Appendix M)
31	Will the values of the 95% confidence intervals of a single measured value of the daily emission limit value, exceed the percentages of the emission limit values required by WID Article 11(11) and Annex III. point 3? (We will accept that MCERTS certified instruments satisfy these quality requirements)	Paragraph 4.7.8
32	Describe the monitoring of process variables. For emissions to air, include at least the arrangements for monitoring oxygen content, temperature, pressure and water vapour content at the points where emissions to air will be monitored (WID Article 11 (7)). For emissions of wastewater from the cleaning of exhaust gases include at least the arrangements for monitoring pH, temperature and flow rate (WID Article 8 (6)).	Table 4-3
33	Describe how the heat generated during the incineration and co-incineration process is recovered as far as practicable, for example through combined heat and power, the generating of process steam or district heating. You must assess the potential for heat recovery from each line, using the guidance in this Sector Guidance Note. You must justify any failure to recover the maximum amount of heat.	• Section 2.3 • CHP Ready Assessment (Appendix J)
34	Describe how you will minimise the amount and harmfulness of residues and describe how they will be recycled where this is appropriate.	Section 2.5
35	For each significant waste that you dispose of, provide the following information • incineration line identifier • residue type reference (e.g. RT1, RT2 etc) • source of the residue • description of the residue • details of transport and intermediate storage of dry residues in the form of dust (e.g. boiler ash or dry residues from the treatment of combustion gases from the incineration of waste). Article 9 of WID requires operators of incineration plant to prevent the dispersal in the environment in the form of dust. • details of the total soluble fraction, and soluble heavy metal fraction of the residues. Article 9 of WID requires operators of incineration plant to establish the physical and chemical characteristics and polluting potential of incineration residues. • the route by which the residue will leave the installation – e.g. recycling, recovery, disposal to landfill, other.	• Section 2.5 • Table 2-4 • Paragraphs 4.7.12 – 4.7.17
36	Article 6(1) of WID requires incinerators to be operated in order to achieve a level of incineration such that the slag and bottom ashes have a total organic carbon (TOC) content of less than 3%, or their loss on ignition (LOI) is less than 5% of the dry weight of the material. Where the incinerator includes a pyrolysis stage or other stage in which part of the organic content is converted to elemental carbon, the portion of TOC which is elemental carbon may be subtracted from the measured TOC value before comparison with the 3% maximum, as specified in the Defra Guidance on the Waste Incineration Directive. Note that WID Article 6(1) requirements are complied with if either TOC or the LOI measurement referred to below is achieved. TOC: for waste incinerators, 3% as maximum as specified by WID Article 6(1). LOI: for waste incinerators, 5% maximum as specified by WID Article 6(1). Specify whether you intend to use total organic carbon (TOC) or loss on ignition (LOI) monitoring of your bottom ash or slag.	Paragraph 3.4.7

Question 4: Additional Air Quality Assessment Question

a. Confirm if NH_3 is included in the nutrient nitrogen and acid deposition process contributions (and not just NOx and SO_2). If not update the assessments accordingly.

2.1.4 NH_3 is included in the nutrient nitrogen and acid deposition process contributions reported in the submitted AQ assessment.

Question 5: Noise Assessment

a. Please provide the raw data from the noise surveys conducted (including LA90, LAeq and LAmax values).

b. Please clarify the hours of operation during which HGVs deliveries will be made to the site.

c. In paragraph 7.12.30 of the NIA it states that “Noise source data has been provided by the scheme engineers”, this requires further clarification, and justification that these sound levels are applicable.

d. Please provide workings and calculation methods used to predict internal reverberant levels.

e. Please provide drawings showing the elevations of the proposed buildings.

Response to bullet a

2.1.5 An excel spreadsheet with the baseline data was provided with the submission in Appendix D. The raw data file is large and is enclosed as a zipped file entitled ‘RawData’.zip.

Response to bullet b

2.1.6 HGV movements would be generated throughout the day and would typically be spread fairly equally in terms of hourly movements. HGV movements through the night-time period will be subject to individual fuel contract with third party fuel providers.

Response to bullet c

2.1.7 Nosie source data used in the WKN assessment is the same as was used for the K3 noise assessment completed to inform the DCO/Planning and Permitting aspects of that similar development. This data was originally provided by Umwelttechnik & Ingenieure GmbH and included the broadband internal noise levels for the areas containing the most significant noise generating plant and Sound Reduction Indices (SRIs) of the facades of the building. This data is presented in Appendix 7.4 of the Environmental Statement. Whilst no specific WKN noise data has been provided it is the professional opinion of RPS that this data is comparable to other similar development and will allow for a robust assessment to be completed.

Response to bullet d

2.1.8 As above, these data have been provided by Umwelttechnik & Ingenieure GmbH, rather than calculated. Internal reverberant noise level of 85 to 90 dBA L_p are typical of such installations and will allow for a robust assessment to be completed.

Response to bullet e

2.1.9 The building parameters included in the noise model are:

Building	Length (m)	Width (m)	Height (m)
Flue Gas Treatment Plant	45	35	30
Air Cooled Condensers	45	30	25
Substation	45	30	7
Boiler	50	36	43
Bunker	35	36	30
Tipping Hall	45	36	20
Admin Building	30	15	25
Turbine Hall	40	25	20
Stores (next to turbine)	20	10	10
Stores (adjacent to pond)	40	35	10
Stack	Diameter: 2.6		110
Raw Water Tank	Diameter: 6.4		10
Firewater Tank	Diameter: 7.2		15

2.1.10 Detailed elevations for the WKN facility are not currently available. Drawings 1 and 2 were submitted with the Development Consent Order application and establish maximum parameters, a summary table of the maximum parameters is provided in Table 2.3 of Chapter 2 of the Environmental Statement (ES) which forms Appendix K of the submitted permit application.

2.1.11 It should be noted that these maximum parameters are different to those in the model. Modelled noise levels, when revised to take into account the maximum parameters considered in the ES, are not different, from those presented in the submitted noise assessment and, as such, the conclusion of the noise assessment remain valid. Specific sound levels based on the original building heights and revised building heights are presented in the table below.

Receiver	Noise Levels for Maximum Heights (dB $L_{Aeq,Tr}$)	Noise Levels for Heights in Submitted Assessment (dB $L_{Aeq,Tr}$)	Difference (dB)
Marsh Rise	35	35	0
Off Reams Way	35	35	0
Reams Way	36	36	0
Reams Way N	35	35	0
Reams Way S	35	35	0
Recreation Way N	35	35	0
Recreation Way S	34	34	0
Walsby Drive N	33	33	0
Walsby Drive S	33	33	0
Kemsley Primary School	32	32	0

Drawings

Drawing 1 WKN North Elevation

Drawing 2 WKN West Elevation

Appendices

Appendix 1

Detailed Response to Question 1

Appendix 2

Detailed Response to Question 2

Appendix 3

Noise Models

Appendix 1 - Assessment of Ecological Impacts

This appendix has been prepared to address the following comment from the Environment Agency:

"Please provide us the information set out below:

1. ***Habitats assessment***

   a) Your habitats assessment excludes assessment of the Marine Conservation Zone (MCZ) on the basis that there is no requirement to assess for air quality impacts. You need to justify the exclusion based on the conservation objectives of the MCZ and the relevant impacts from the site.

   b) You need to provide us with an assessment of the impact at the Village Park, Iwade local wildlife site.

   c) The assessment did not include an assessment against all of the relevant environmental standards (ESs). Provide us with an assessment against the following ESs: daily oxides of nitrogen (NOx) and hydrogen fluoride (HF) weekly/daily.

   d) You need to justify the use of the higher annual ESs for ammonia (NH3) and sulphur dioxide (SO2)."

The following European designated nature conservation sites, within 10 km of the Application Site, were identified in Appendix 5.4 accompanying the original permit application:

- The Swale Special Protection Area (SPA);
- The Swale Ramsar;
- Medway Estuary and Marshes SPA;
- Medway Estuary and Marshes Ramsar;
- Thames Estuary and Marshes SPA;
- Thames Estuary and Marshes Ramsar;
- Queensdown Warren Special Area of Conservation (SAC); and
- Outer Thames Estuary SPA.

The Village Park, Iwade Local Wildlife Site has been added to the list of nationally and locally designated sites, within 2 km of the Application Site, previously identified in Appendix 5.4. The list of sites is now:

- The Swale Site of Special Scientific Interest (SSSI);
- Milton Creek Local Wildlife Site (LWS);
- Elmley National Nature Reserve (NNR); and
- Village Park, Iwade LWS.

For information, the Medway Estuary and Marshes SSSI is 2.9 km from the Application Site (i.e. more than 2 km away) and has been excluded from the assessment. The Swale Marine Conservation Zone (MCZ) has also

been excluded as there is no requirement to assess air quality impacts at waterbodies/MCZs. The projects ecologist advised that "*The conservation objectives for the MCZ require that each protected feature is either maintained in Favourable Conservation Status (FCS) or brought into such status, if not already there. FCS means maintenance of stable structure and function of the protected features. The MCZ is an inter- and sub-tidal designated site. As such, the structure and function of the habitats is driven overwhelmingly by the marine environment as a result of being inundated by the tide twice daily. Therefore, they are not considered sensitive to changes in air quality and are excluded from the assessment*".

The approach taken to assess the air quality impacts at the designated sites is detailed in Annex A to this Appendix.

Results

The ambient NO_x, SO_2 and NH_3 concentrations and existing deposition rates have been obtained from APIS. The highest deposition rates have been obtained, taking into account the various habitats across the sites. The lowest critical loads for nitrogen deposition and acid deposition have been also obtained from APIS [1]. APIS does not provide background concentrations for HF.

The maximum predicted concentrations/depositions at Village Park, Iwade LWS are compared with the critical level/loads in Table 1.

The maximum daily NOx, maximum daily HF and maximum weekly HF concentrations for all designated sites are compared with the critical levels in Table 2, Table 3 and Table 4.

The critical levels used for annual-mean SO_2 and NH_3 in the original assessment were 20 and 3 $\mu g.m^{-3}$ respectively. These critical levels were obtained from APIS. The critical levels for Queendown Warren should have be 10 and 1 $\mu g.m^{-3}$ due to the potential presence of lichens and bryophytes. Table 5 compares the annual-mean SO_2 and NH_3 concentrations with the lower critical levels.

Table 1 Predicted Concentrations/Depositions at Village Park, Iwade LWS

Averaging Period/Pollutant	Units	CL	Proposed K3 PC ($\mu g.m^{-3}$)	WKN PC ($\mu g.m^{-3}$)	Kemsley K4 CHP PC (EN010090 (18/501923/ ADJ))	Kemsley AD (SW/11/1291)	Reserve Power Plant PC (18/500393/FULL)	Garden of England Energy Facility (15/500348/COUNTY)	Cumulative PC	Cumulative PC as % of CL
Annual-mean NOx	$\mu g.m^{-3}$	30	0.1	0.2	No data	No data	No data	No data	0.3	1
Annual-mean SO_2	$\mu g.m^{-3}$	20	0.04	0.05	-	-	-	No data	0.08	0
Annual-mean NH_3	$\mu g.m^{-3}$	3	0.004	0.005	-	-	-	No data	0.008	0
N Deposition	$kgN.ha^{-1}.yr^{-1}$	10	0.04	0.05	No data	No data	No data	No data	0.09	1
Acid Deposition	$keq.ha^{-1}.yr^{-1}$	Min N – 0.357 Max N – 2.227 Max S – 1.87	N – 0.003 S- 0.004	N – 0.004 S – 0.006	No data	No data	No data	No data	N – 0.007 S - 0.010	1
Maximum Daily NOx	$\mu g.m^{-3}$	75	3.39	5.33	No data	No data	No data	No data	8.7	12
Maximum Daily HF	$\mu g.m^{-3}$	5	0.02	0.03	-	-	-	No data	0.04	9
Maximum Weekly HF	$\mu g.m^{-3}$	0.5	<0.005	0.01	-	-	-	No data	0.01	2

Table 2 Predicted Maximum Daily NOx Concentrations at Designated Sites

Designated Site	CL (µg.m^{-3})	AC (µg.m^{-3})*	Proposed K3 PC (µg.m^{-3})	WKN PC (µg.m^{-3})	Kemsley K4 CHP PC (EN010090 (18/501923/ADJ))*	Kemsley AD (SW/11/1291)*	Reserve Power Plant PC (18/500393/FULL)*	Garden of England Energy Facility (15/500348/COUNTY)*	Cumulative PC	Cumulative PC as % of CL	Cumulative PEC (µg.m^{-3})	Cumulative PEC/CL (%)
The Swale SPA/Ramsar/SSSI	75	24.6	21.8	21.4	1.6	2.8	4.5	2.7	54.7	73	79.3	106
Medway Estuary and Marshes SPA/Ramsar		-	3.1	3.8	0.2	0.1	0.0	0.2	7.4	10	-	-
Thames Estuary and Marshes SPA/Ramsar		-	0.8	0.9	0.2	0.0	0.0	0.0	1.9	3	-	-
Queendown Warren SAC		-	0.9	1.0	0.1	0.0	0.0	0.0	2.1	3	-	-
Elmley NNR		-	21.8	21.4	1.6	2.8	4.5	2.7	54.7	73	-	-
Milton Creek LWS		-	22.8	17.7	1.6	2.8	4.5	2.7	52.0	69	-	-
Village Park, Iwade LWS		-	3.4	5.3	No data	No data	No data	No data	8.7	12	-	-

Notes:
*The daily-mean AC and PC from cumulative developments is assumed to be 2 x the annual-mean concentration.
The Swale SPA, Medway Estuary and Marshes SPA and Thames Estuary and Marshes SPA all cover the same geographical areas as the corresponding Ramsar and SSSI designations. Therefore, the values set out in Tables 2 to 4 represent the pollutant concentrations at all of these sites. Elmley NNR is within The Swale SPA/Ramsar/SSSI. APIS does not provide data for NNRs so the ambient concentrations and critical levels/loads have been assumed to be the same as The Swale SPA. Milton Creek LWS is an extension of the Swale SPA and the project's ecologist has advised that the same habitats, ambient concentrations and critical levels/loads apply.
Consistent with the Institute of Air Quality Management's *"A guide to the assessment of air quality impacts on designated nature conservation sites"* [2], the PC as a % of the CL has been rounded to the nearest integer.

Table 3 Predicted Maximum Daily HF Concentrations at Designated Sites

Designated Site	CL (µg.m^{-3})	Proposed K3 PC (µg.m^{-3})	WKN PC (µg.m^{-3})	Garden of England Energy Facility (15/500348/COUNTY)	Cumulative PC	Cumulative PC as % of CL
The Swale SPA/Ramsar/SSSI	5	0.11	0.11	No data	0.218	4
Medway Estuary and Marshes SPA/Ramsar		0.02	0.02	No data	0.035	1
Thames Estuary and Marshes SPA/Ramsar		0.00	0.00	No data	0.008	0
Queendown Warren SAC		0.00	0.01	No data	0.010	0

Elmley NNR		0.11	0.11	No data	0.218	4
Milton Creek LWS		0.11	0.09	No data	0.204	4
Village Park, Iwade LWS		0.02	0.03	No data	0.044	1

Notes:
The Swale SPA, Medway Estuary and Marshes SPA and Thames Estuary and Marshes SPA all cover the same geographical areas as the corresponding Ramsar and SSSI designations. Therefore, the values set out in Tables 2 to 4 represent the pollutant concentrations at all of these sites. Elmley NNR is within The Swale SPA/Ramsar/SSSI. APIS does not provide data for NNRs so the ambient concentrations and critical levels/loads have been assumed to be the same as The Swale SPA. Milton Creek LWS is an extension of the Swale SPA and the project's ecologist has advised that the same habitats, ambient concentrations and critical levels/loads apply.
Consistent with the Institute of Air Quality Management's *"A guide to the assessment of air quality impacts on designated nature conservation sites"* [2], the PC as a % of the CL has been rounded to the nearest integer.
Kemsley K4 CHP, Kemsley AD and Reserve Power Plant do not emit HF.

Table 4 Predicted Maximum Weekly HF Concentrations at Designated Sites

Designated Site	CL ($\mu g.m^{-3}$)	Proposed K3 PC ($\mu g.m^{-3}$)	WKN PC ($\mu g.m^{-3}$)	Garden of England Energy Facility (15/500348/COUNTY)	Cumulative PC	Cumulative PC as % of CL
The Swale SPA/Ramsar/SSSI	0.5	0.044	0.051	No data	0.095	19
Medway Estuary and Marshes SPA/Ramsar		0.004	0.005	No data	0.009	2
Thames Estuary and Marshes SPA/Ramsar		0.001	0.002	No data	0.003	1
Queendown Warren SAC		0.003	0.003	No data	0.006	1
Elmley NNR		0.044	0.051	No data	0.095	19
Milton Creek LWS		0.034	0.024	No data	0.058	12
Village Park, Iwade LWS		0.005	0.006	No data	0.011	2

Notes:
The Swale SPA, Medway Estuary and Marshes SPA and Thames Estuary and Marshes SPA all cover the same geographical areas as the corresponding Ramsar and SSSI designations. Therefore, the values set out in Tables 2 to 4 represent the pollutant concentrations at all of these sites. Elmley NNR is within The Swale SPA/Ramsar/SSSI. APIS does not provide data for NNRs so the ambient concentrations and critical levels/loads have been assumed to be the same as The Swale SPA. Milton Creek LWS is an extension of the Swale SPA and the project's ecologist has advised that the same habitats, ambient concentrations and critical levels/loads apply.
Consistent with the Institute of Air Quality Management's *"A guide to the assessment of air quality impacts on designated nature conservation sites"* [2], the PC as a % of the CL has been rounded to the nearest integer.
Kemsley K4 CHP, Kemsley AD and Reserve Power Plant do not emit HF.

Table 5 Predicted Annual-Mean SO_2 and NH_3 Concentrations at Queendown Warren

Pollutant	CL ($\mu g.m^{-3}$)	Proposed K3 PC ($\mu g.m^{-3}$)	WKN PC ($\mu g.m^{-3}$)	Garden of England Energy Facility (15/500348/COUNTY)	Cumulative PC	Cumulative PC as % of CL
Annual-mean SO_2	10	0.02	0.02	0.001	0.04	0
Annual-mean NH_3	1	0.002	0.005	0.005	0.011	0

Notes:
Kemsley K4 CHP, Kemsley AD and Reserve Power Plant do not emit SO_2 or NH_3.

Village Park, Iwade LWS

At the Village Park, Iwade LWS, the cumulative PCs for all pollutants are less than 100% of the CL and the impacts can be screened out as insignificant.

Daily-mean NOx

For the maximum daily-mean NO_X, the cumulative PCs are less than 10% of the CL (or 100% for LWSs) or the PECs are below the CL of 75 µg.m^{-3} for all sites except The Swale; the effects can be screened out as insignificant at the other sites. At the Swale SPA/SSSI/Ramsar, the PEC is 106% of the critical level of 75 µg.m^{-3}. The Institute of Air Quality Management's "A *guide to the assessment of air quality impacts on designated nature conservation sites*" [2], states that *"The critical level is generally considered to be 75 µg.m3; but this only applies where there are high concentrations of SO_2 and ozone, which is not generally the current situation in the UK*". The cumulative PEC is only 40% of the higher CL of 200 µg.m^{-3} and based on that CL the impacts would be insignificant.

On that basis, the effects are considered to be insignificant.

Daily-mean HF

The maximum daily-mean HF cumulative PCs are less than 10% of the critical level (or 100% for LWSs) at all sites and the effects can be screened out as insignificant. at the other sites.

Weekly-mean HF

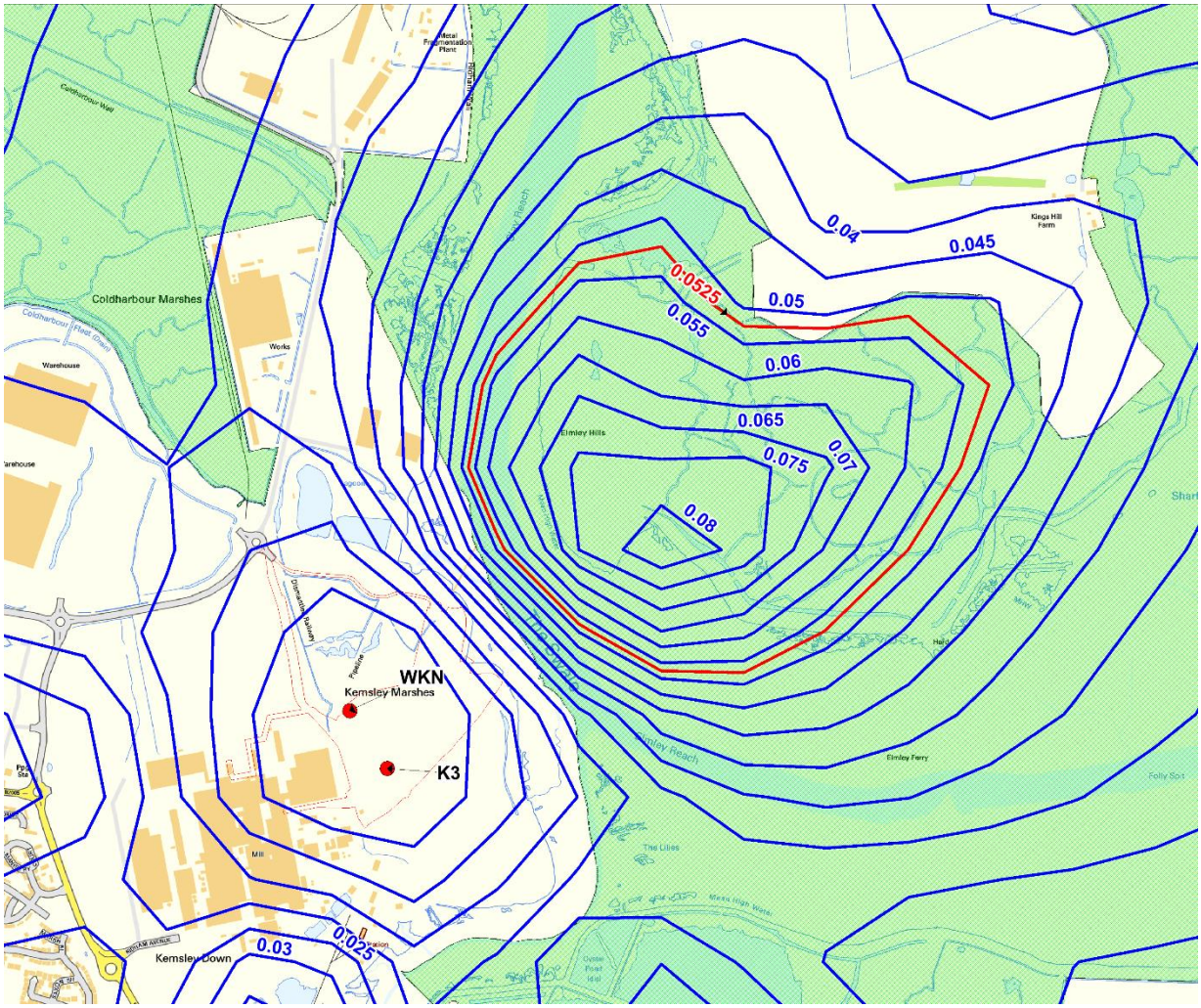
The maximum weekly-mean HF cumulative PCs only exceeds 10% of the critical level (or 100% for LWSs) at the Swale SPA/SSSI/Ramsar and the effects can be screened out as insignificant at the other sites. At the Swale SPA/SSSI/Ramsar, the cumulative PC is 19% of the critical level and based on the PCs alone the impacts are potentially significant.

Figure 1 shows the weekly HF WKN + Proposed K3 PC. Areas where the PC is less than 0.0525 µg.m^{-3} can be scoped out as insignificant on the basis that the PC does not exceed 10% of the critical level. The projects ecologist advised that "*Figure 1 shows that the majority of both the Elmley NNR and Swale SPA/SSSI/Ramsar are subject to HF concentrations <10% of the critical level for this gas (0.5 ug.m^{-3}). Further, much of the habitats within the area predicted to experience >10% of the critical level are intertidal and therefore inundated twice daily by the tide. As such, they are considered to be insensitive to the effects of HF (this includes most of the area predicted to receive the highest HF concentration).*

Further, although HF is extremely phytotoxic, the environmental conditions within these sites is such that damage due to HF toxicity is not occurring (it is not cited as a potential issue within condition reports for the area despite being relatively easy to identify). Therefore, the small increase in concentration over a small area of the sites predicted here is unlikely to result in significant harm.

Therefore, no significant effects due to HF exposure are predicted".

Figure 1 Weekly HF WKN + Proposed K3 PC (µg.m^{-3})



Annual-mean SO_2 and NH_3 at Queendown Warren

At Queendown Warren, the cumulative PCs for SO_2 and NH_3 are less than 100% of the lower CL and the impacts can be screened out as insignificant.

Annex A – Approach to Assessment of Air Quality Effects on Ecology

This approach to this assessment considers the IAQM '*A guide to the assessment of air quality impacts on designated nature conservation sites'.* Concentrations of NOx, HF, SO_2 and ammonia have been predicted using the same model as used in the assessment of impacts at human-health receptors. Modelling has been undertaken for a grid of receptor points, with a grid spacing of 200 m, across each identified nature conservation site. The receptor grid points have been modelled at ground level. To ensure that the assessment is conservative, the maximum PC for WKN and K3 (0 – 75MW) Proposed Development at each site and for all the meteorological datasets has been identified and is presented in this report.

Critical Levels

Critical level are the concentrations of an air pollutant above which adverse effects on ecosystems may occur based on present knowledge. They are specified within relevant European air quality directives and corresponding UK air quality regulations. PCs and, where appropriate, PECs of NOx, HF, SO_2 and NH_3 have been calculated for comparison with the relevant critical level. Background concentrations at each designated site have been derived from the UK Air Pollution Information System (APIS) database [iii].

Critical Loads

Critical loads refer to the quantity of pollutant deposited, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. Nutrient nitrogen deposition and acid deposition are considered in this Appendix.

Critical Loads – Nutrient N Deposition

Percentage contributions to nutrient nitrogen deposition have been derived from the modelled NOx concentrations. Deposition rates have been calculated using empirical methods recommended by the Environment Agency, as follows:

1. The dry deposition flux ($\mu g.m^{-2}.s^{-1}$) has been calculated by multiplying the ground level NO_2 and NH_3 concentrations ($\mu g.m^{-3}$) by their deposition velocities. For NO_2 the deposition velocities of 0.003 $m.s^{-1}$ for forests/tall habitats and 0.0015 $m.s^{-1}$ for grassland/short habitats were used. For NH_3, the deposition velocities of 0.03 $m.s^{-1}$ for forests/tall habitats and 0.02 $m.s^{-1}$ for grassland/short habitats were used.

2. Units of $\mu g.m^{-2}.s^{-1}$ have been converted to units of $kg.ha^{-1}.year^{-1}$ by multiplying the dry deposition flux by the standard conversion factor of 96 for NO_2 and 259.9 for NH_3.. The total N deposition flux has then been calculated as the sum of the contribution from both pollutants.

3. Predicted contributions to nitrogen deposition have been calculated and compared with the relevant critical load range for the habitat types associated with the designated site. These have been derived from the APIS database.

Critical Loads – Acidification

The acid deposition rate, in equivalents keq.ha^{-1}.year^{-1}, has been calculated by multiplying the dry deposition flux (kg.ha^{-1}.year^{-1}) by a conversion factor of 0.071428 for N. This takes into account the degree to which a chemical species is acidifying, calculated as the proportion of N within the molecule.

Wet deposition in the near field is not significant compared with dry deposition for N [iv] and therefore for the purposes of this assessment, wet deposition has not been considered.

Predicted contributions to acid deposition have been calculated and compared with the minimum critical load function for the habitat types associated with the designated site as derived from the APIS database.

Significance Criteria

Maximum PCs and PECs of NO_x, HF, SO_2, NH_3 and N/acid deposition have been compared against the relevant critical levels/loads for the relevant habitat type/interest feature. The Environment Agency on-line risk guidance [v] provides a step-wise approach to assessing the significance of effects at nature conservation sites. It states that:

"If emissions that affect SPAs, SACs, Ramsar sites or SSSIs meet both of the following criteria, they're insignificant - you don't need to assess them any further:

- *the short-term PC is less than 10% of the short-term environmental standard for protected conservation areas*
- *the long-term PC is less than 1% of the long-term environmental standard for protected conservation areas*

If you don't meet these requirements you need to calculate the PEC and check the PEC against the standard for protected conservation areas.

You don't need to calculate PEC for short-term targets.

If your short-term PC exceeds the screening criteria, you need to do detailed modelling.

If your long-term PC is greater than 1% and your PEC is less than 70% of the long-term environmental standard, the emissions are insignificant – you don't need to assess them any further.

If your PEC is greater than 70% of the long-term environmental standard, you need to do detailed modelling."

The IAQM's '*A guide to the assessment of air quality impacts on designated nature conservation sites'* states that *"The Environment Agency risk assessment guidance states that if the PEC is less than 70% of the long-term criterion it can be deemed to be insignificant, regardless of the PC. For some pollutants (nitrogen deposition, in particular) background values are high over much of the UK and it is unlikely*

there will be many occasions where the PEC is less than 70%. Also, this was intended to be a trigger for detailed dispersion modelling. It is not intended to be a damage threshold."

The Environment Agency on-line risk guidance continues by stating that:

"At the detailed modelling stage there are no criteria to determine whether:

- *PCs are significant*
- *PECs are insignificant or significant*

You must explain how you judged significance and base this on the site specific circumstances"

This Appendix presents the results of detailed modelling at each of the sites. In this case, the emission is considered not significant if the PC does not exceed 1% of relevant critical level/load (or 100% at local designations). With reference to the definition of critical levels and critical loads above, the emission is considered not significant if the PEC does not exceed 100% of the relevant critical level/load. Otherwise, the impact is considered *potentially* significant. Where *potentially* significant impacts have been identified, the impacts have been passed to the project's ecologist to allow the significance of the likely effect to be determined.

Cumulative Impacts

Section 5.13 of Chapter 5: Air Quality sets outs the cumulative developments considered for this assessment. There are four developments where there was sufficient detail to allow a PC to be added to give a cumulative PEC for ecological receptors:

- Kemsley K4 CHP PC (EN010090 (18/501923/ADJ))
- Kemsley AD (SW/11/1291)
- Reserve Power Plant PC (18/500393/FULL)
- Garden of England Energy Facility (15/500348/COUNTY)

The PCs for each of these four developments has been added to the maximum Proposed K3 PC and the WKN PC to give a Cumulative PC.

1 Data downloaded from APIS December 2017

2 IAQM *A guide to the assessment of air quality impacts on designated nature conservation sites*

iii Air Pollution Information Systems, www.apis.ac.uk

iv Approaches to modelling local nitrogen deposition and concentrations in the context of Natura 2000 - Topic 4

v Air emissions risk assessment for your environmental permit

Appendix 2 – Air Quality Impact Assessment

This appendix has been prepared to address the following comments from the Environment Agency:

"Please provide us the information set out below:

2. Air quality impact assessment

a) The assessment includes details of Air Quality Management Areas (AQMAs). You need to provide us with an assessment of the most impacted receptor in the AQMA.

b) We require an assessment of the impact from total organic carbon (TOC)…"

The approach taken to assess the air quality impacts at the AQMAs is the same approach taken as described in the Air Quality Chapter submitted with the permit application. The models were run assuming that the WKN plant is run all year (8,760 hours).

In relation to (a), this appendix presents the maximum predicted Process Contributions (PCs) at the following existing and proposed AQMAs:

- Rainham AQMA;
- Newington AQMA;
- AQMA No 4 – St Pauls Street, Sittingbourne;
- AQMA No 3 – East Street, Sittingbourne Kent;
- Teynham AQMA No5;
- AQMA No 2/6 Ospringe extended; and
- Keycol Hill (proposed).

Swale Borough Council (SBC) is currently consulting Defra in relation to the St Pauls Street AQMA. The St Pauls Street AQMA is currently designated due to high levels of NO_2 but in the future, this is likely to be designated for both NO_2 and PM_{10}.

SBC is also currently consulting Defra with a view to designating the area from the A249 to Rook Lane on Keycol Hill as an AQMA. Keycol Hill has therefore also been included in the assessment for this appendix.

The assessment of receptors in AQMAs focusses on NO_2 at all sites and both NO_2 and PM_{10} in the St Pauls Street AQMA.

Table 1 shows the maximum annual-mean and 99.79th percentile hourly-mean NO_2 PC at each AQMA and compares it with the relevant Environmental Assessment Levels (EALs).

Table 1 Predicted Annual-mean and Hourly-mean NO_2 Concentrations at AQMAs

AQMA	Annual Mean NO_2 WKN PC ($\mu g.m^{-3}$)	WKN PC as % of EAL	99.79th Percentile Hourly Mean NO_2 WKN PC ($\mu g.m^{-3}$)	WKN PC as % of EAL
Rainham AQMA	0.09	0	1.39	1
Newington AQMA	0.10	0	2.04	1
AQMA No 4 – St Pauls Street, Sittingbourne	0.21	1	3.18	2
AQMA No 3 – East Street, Sittingbourne Kent	0.10	0	2.70	1
Teynham AQMA No5	0.09	0	2.18	1
AQMA No 2/6 Ospringe extended	0.05	0	1.17	1
Keycol Hill AQMA	0.11	0	2.10	1

Table 2 Predicted Annual-mean and Daily-mean PM_{10} Concentrations at AQMAs

AQMA	Annual Mean PM_{10} WKN PC ($\mu g.m^{-3}$)	WKN PC as % of EAL	90.41st Percentile Daily Mean PM_{10} WKN PC ($\mu g.m^{-3}$)	WKN PC as % of EAL
AQMA No 4 – St Pauls Street, Sittingbourne	0.01	0	0.05	0

Table 1 shows that the annual-mean NO_2 WKN PC does not exceed 1% of the EAL of 40 $\mu g.m^{-3}$ and the impacts can be scoped out as insignificant.

The 99.79th percentile hourly mean NO_2 WKN PC does not exceed 10% of the EAL of 200 $\mu g.m^{-3}$ and the impacts can be scoped out as insignificant.

Table 2 shows that the annual-mean PM_{10} WKN PC does not exceed 1% of the EAL of 40 $\mu g.m^{-3}$ and the impacts can be scoped out as insignificant.

The 90.41st percentile daily mean PM_{10} WKN PC does not exceed 10% of the EAL of 50 $\mu g.m^{-3}$ and the impacts can be scoped out as insignificant.

On that basis, the impact of WKN on the AQMAs is considered to be not significant.

In relation to (b), Table 3 shows the emission rate used and the maximum predicted PC for TOC using the Industrial Emissions Directive short-term emission limit of 20 $\mu g.m^{-3}$ and long-term emission limit of 10 $\mu g.m^{-3}$. There is no EAL for TOC, therefore the EAL for benzene has been used instead. This is highly conservative as benzene has a stringent EAL and the TOC has been taken to be entirely benzene.

Table 3 Predicted Maximum Process Contributions - TOC

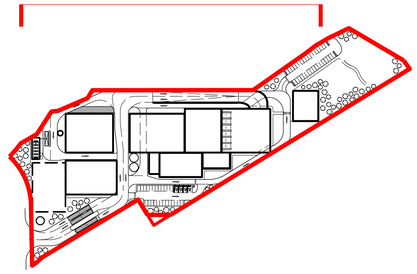
Parameter (unit)	Long-term Emission Limit Value Annual-mean	Short-term Emission Limit Value 1 Hour Maximum
IED Emission Limit Value (µg.m^{-3})	10	20
Emission rate (g/s)	1.37	2.75
TOC PC (µg.m^{-3})	2.07	4.14
Benzene EAL (µg.m^{-3})	5	195
TOC PC as % of benzene EAL	41	2
Benzene AC (µg.m^{-3})	1.36*	-
TOC PEC (µg.m^{-3})	3.43	-

**Maximum annual mean concentration at London Marylebone Road monitor between 2015 and 2019.*

Table 3 shows that the annual-mean TOC WKN PC exceeds 1% of the benzene EAL of 5 µg.m^{-3} and the impacts are potentially significant. If the TOC WKN PC is added to the benzene AC of 1.36 µg.m^{-3}, the predicted environmental concentration (PEC) is less than the benzene EAL and the impacts can be scoped out as insignificant.

The maximum hourly mean TOC WKN PC does not exceed 10% of the benzene EAL of 195 µg.m^{-3} and the impacts can be scoped out as insignificant.

On that basis, the impact of TOC is considered to be not significant.



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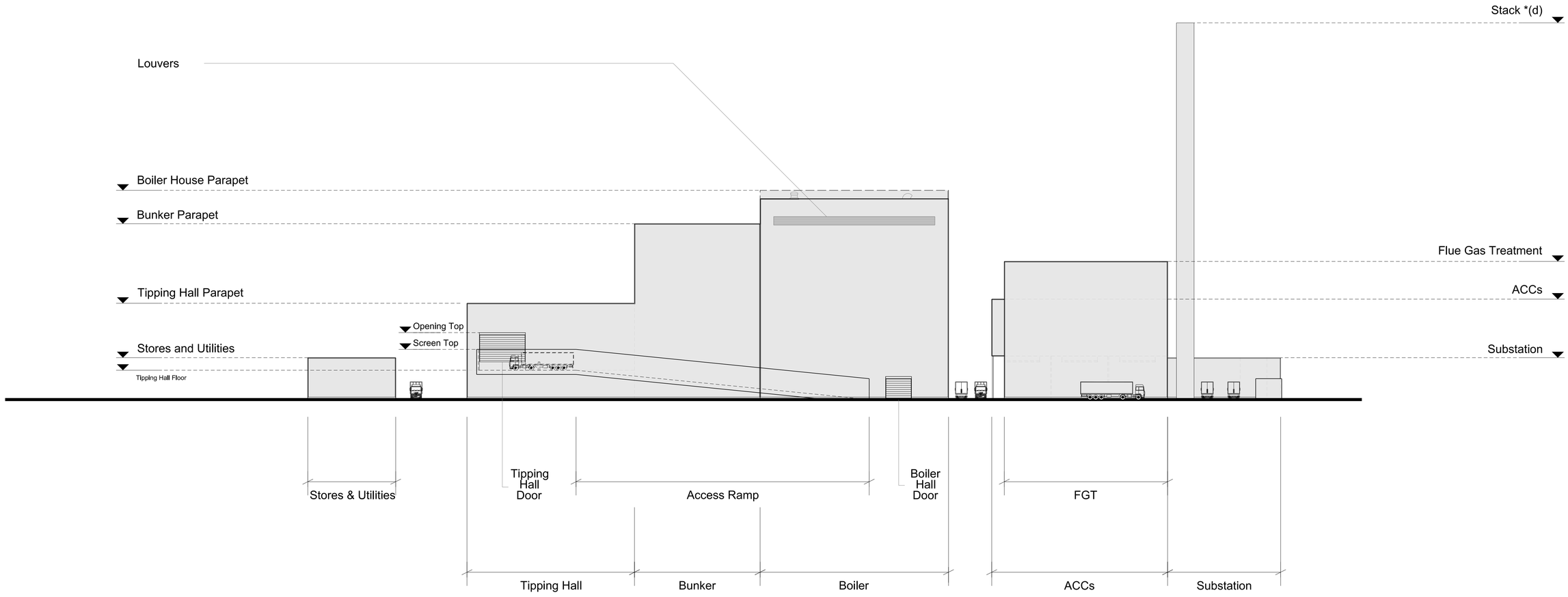

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North Elevation

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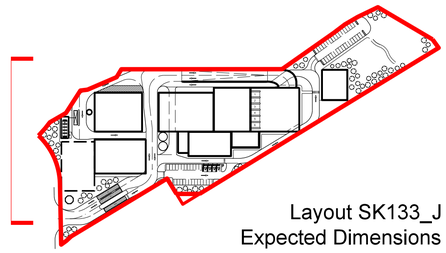

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