Immingham Green Energy Terminal

Preliminary Environmental Information Report

Appendix 7.A – Operational Noise Model Information

Associated British Ports

December 2022

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1 Operational Sound Information

1.1 Noise model Settings

1.1.1 The Project Site has been constructed in CadnaA (version 2021 MR2) acoustic modelling software. This software implements the sound propagation calculation methodology set out in ISO 9613-2:1996: Attenuation of Sound during Propagation Outdoors.

Data Sources

1.1.2 The data sources presented in Table 1 have been used to construct the noise model:

Table 1: Modelling Input Data

Model element	Data package	Format	Source file	Received from	Received Data
Digital Terrain Map	Light Detection and Ranging (LIDAR)	.tiff	LIDAR-DTM-2m-2020-TA11ne LIDAR-DTM-2m-2020-TA11se LIDAR-DTM-2m-2020-TA21nw LIDAR-DTM-2m-2020-TA21sw	Downloaded from Open Survey Data (www.environment.data.gov.uk/DefraDataDownload)	27 September 2022
Topography; Building Height Attribute; Ground Absorption	OS Master Map Topography Layer	.shp	OSMM.shp	Internal Project Team	25 May 2022
Site Layout	Overall scheme designs and plot layouts	.pdf .dwg	Neom Downstream Master East Plot ACOM aligned Merged 220922 Neom Downstream Master West Plot ACOM aligned Merged 220922 Neom Downstream - Overall Site Plan - Permitting - 27 May 22 30011348-230-PP501-001 PLOT PLAN 10 30011348-231-PP501-001 PLOT PLAN 7 30011348-271-PP501-001 PLOT PLAN 4 30011348-607-PP501-001 PLOT PLAN 9 Immingham NH3 Terminal Overall Plot Plan 1 to 1000 - Main Plot - Preliminary 1 Aug 2022	Internal Project Team Daniel Charleston/ Clive Horrell (Air Products PLC)	22 September 2022 to 18 October 2022

Model element	Data package	Format	Source file	Received from	Received Data
			Immingham NH3 Terminal Overall Plot Plan 1 to 1000 - Storage Area - Preliminary 1 Aug 2022.pdf Various mark-up drawings provided by Clive Horrell (Air Products PLC).		
Proposed Development Building Information and Heights	Building Information	.xlsx	Buildings and Infratsructure.xlsx	Internal Project Team Daniel Charleston (Air Products)	28 September 2022
Sound source data	Air products Ammonia Terminal – Data for Noise Study	.xlsx	30011350-600GL1-00001 Noise Source List Rev0	Stephen Bradley (Air Products PLC)	29 September 2022

Modelling Assumptions

1.1.3 The model was configurated with the following specifications:

- maximum number of reflections: 2;
- maximum source to receiver distance: 3km;
- areas of ground absorption determined from the OS Topography Layer. 'Natural' areas that are not water were assumed to be acoustically soft while all other areas were assumed to be acoustically hard;
- the Project Site area is considered to be acoustically hard;
- all buildings have an absorption coefficient of 0.21;
- existing residential buildings have been assumed to be 4m for 1 storey, 6m for 2 storeys and plus 2.5m for every storey thereafter.
- receivers have been positioned at 1.5m for 1 storey buildings and 4m from ground for 2 storey buildings.
- maximum building dimensions within the Project Site have been provided by Air Products Plc.
- sound emission data for key sound emitting plant/ buildings across all areas of the site have been provided by Air Products Plc. Where sources are proposed to be internal, an external level has been calculated assuming walls and roof are made of a lightweight composite panel;
- where the information on the location of on-site sound sources is not available at this stage, the worst case scenario has been assumed in which the on-site sound sources are located as close as practically possible to residential receptors (within their designated plot boundaries), as reviewed and agreed by Air Products Plc.

Table 2: Sound Power Levels

Source	Linear sound power levels each frequency band (dB)									Number in model	L_{WA} (dB)
	31	63	125	250	500	1k	2k	4k	8k		
West Site Utilities – Low Noise Cooling Tower											
Cooling Tower Air Inlet Face (Side A & Side B)	104	106	106	103	100	97	95	95	93	2	104
Cooling Tower Closed Face (Side A & Side B)	104	106	106	103	100	97	95	95	93	2	104
Cooling Tower Fan Air Outlet	100	102	102	98	95	93	88	85	82	6	98
West Site Utilities – Nitrogen Generator (24 HPN)											
Compressor with On-Skid Close-Fit Enclosure	96	97	95	90	91	93	86	85	79	1	96
Compressor Inlet filter	86	87	90	89	97	99	90	88	81	1	101
U004 Process Container	97	96	98	92	89	91	92	93	89	1	99
U004 Vent	84	91	3	85	81	55	94	100	98	1	103
Tepsa Skid C182A/B	92	92	90	85	85	88	89	91	87	1	96
Expanders	80	78	75	71	73	75	84	81	82	1	88
Vacuum Can S218	90	92	85	81	87	86	89	92	89	1	96

Source	Linear sound power levels each frequency band (dB)									Number in model	L_{WA} (dB)
	31	63	125	250	500	1k	2k	4k	8k		
600 West Site Utilities – Other											
Instrument Air Compressor	92	87	87	86	89	92	92	90	87	2	97
Cooling Water Pump	89	90	91	93	93	96	93	89	83	6	100
Cooling Water Pump Motor	85	87	89	90	90	93	93	85	78	6	98
Firewater Pump	89	90	91	93	93	96	93	89	83	2	99
Diesel Drive Exhaust – Exhaust Silencer		107	118	110	92	91	97	98	98	1	107
Diesel Driver – Noise Enclosure		108	104	102	95	90	88	86	92	1	99
Firewater Pump Motor	87	89	91	91	91	91	91	88	81	1	97
Firewater Jockey Pump	78	79	80	82	82	85	82	78	72	2	89
Firewater Jockey Pump Motor	41	56	68	76	81	84	86	82	73	2	90
Diesel Generator Set Exhaust – Exhaust Silencer		111	122	114	96	95	101	102	102	1	111
Diesel Generator Set – Noise Enclosure		112	108	106	99	94	92	90	96	1	103
741 East Site Utilities – Other											
Instrument Air Compressor	93	88	88	87	90	93	93	91	88	2	99

Source	Linear sound power levels each frequency band (dB)									Number in model	L_{WA} (dB)
	31	63	125	250	500	1k	2k	4k	8k		
Firewater Pump	89	90	91	93	93	96	93	89	83	2	99
Diesel Driver Exhaust – Exhaust Silencer		107	118	110	92	91	97	98	98	1	107
Diesel Driver – Noise Enclosure		108	104	102	95	90	88	86	92	1	99
Firewater Pump Motor	87	89	91	91	91	91	91	88	81	1	97
Firewater Jockey Pump	78	79	80	82	82	85	82	78	72	2	89
Firewater Jockey Pump Motor	41	56	68	76	81	84	86	82	73	2	90
741 East Site – Storage Area											
Flare	124	125	123	127	131	133	130	126	120	1	137
NH3 Transfer Pump	82	84	86	86	86	86	86	83	76	3	92
Boil Off Gas Compressor Package (@ 50%) - Enclosure	101	104	108	117	109	93	77	68	62	2	110
231 – LHY1 (Liquifier Areas)											
H2 Recycle Compressor + Lube Oil system		112	113	111	109	107	106	101	96	4 buildings containing all 4 items of equipment	113
H2 Recycle Compressor Motor		89	96	97	101	108	108	98	91		112
N2 Recycle Compressor + Lube Oil System		124	128	129	123	127	128	126	115		133

Source	Linear sound power levels each frequency band (dB)									Number in model	L_{WA} (dB)
	31	63	125	250	500	1k	2k	4k	8k		
N2 Recycle Compressor Motor		103	108	100	100	97	105	85	76		107
Two N2 Companders + Lube Oil System	105	107	108	98	108	105	107	116	112	4 buildings containing this item of equipment	119
Diesel Generator Set Exhaust – Exhaust Silencer		111	122	114	96	95	101	102	102	4	111
Diesel Generator Set – Noise Enclosure		112	108	106	99	94	92	90	96	4	103
271 – NH3 Dissoc (Dissociator Area)											
H2 PSA	63	78	81	89	102	106	107	109	104	6	113
Flue Stack (ID Fan)	108	100	97	105	92	77	69	62	48	6	97
ID Fan	90	91	87	87	90	94	97	83	72	6	100
ID Fan Motor	86	88	90	90	90	90	90	87	80	6	96
Air Inlet (FD Fan)	96	93	92	96	96	86	87	76	67	6	95
FD Fan	96	93	92	96	96	86	87	76	67	6	95
FD Fan Motor	80	82	84	84	84	84	84	81	74	6	90
Tail Gas Compressor		104	105	103	101	99	98	93	88		105

Source	Linear sound power levels each frequency band (dB)									Number in model	L_{WA} (dB)
	31	63	125	250	500	1k	2k	4k	8k		
Tail Gas Compressor Motor	56	71	83	91	96	99	101	97	88	6 buildings containing these items of equipment	105
NH3 Dissociator – North Wall	81	88	95	93	88	77	67	52	37	6 buildings radiating these noise sources	89
NH3 Dissociator – South Wall	81	88	95	93	88	77	67	52	37		89
NH3 Dissociator – East Wall	80	87	95	92	87	76	66	52	36		88
NH3 Dissociator – West Wall	80	87	95	92	87	76	66	52	36		88
NH3 Dissociator – Ventilation Gril – North	89	86	90	84	82	81	80	75	71	6	87
NH3 Dissociator – Ventilation Gril – South	89	86	90	84	82	81	80	75	71	6	87
NH3 Dissociator – Ventilation Gril – East	89	86	90	84	82	81	80	75	71	6	87
NH3 Dissociator – Ventilation Gril – West	89	86	90	84	82	81	80	75	71	6	87
NH3 Dissociator – Burner Pipes – East	92	92	98	90	90	87	87	83	83	6	94
NH3 Dissociator – Burner Pipes – West	92	92	98	90	90	87	87	83	83	6	94

Uncertainty

1.1.4 It should be noted than any predictions of sound levels have an associated degree of uncertainty. Modelling and measurement processes have been carried out in such a way to reduce the uncertainty. In particular, the following sources of uncertainty have been noted:

- Sound emission data for key sound emitting plant/ buildings within the Project Site have been based on data provided by Air Products Plc. These data are assumed to be representative of the proposed plant, although the precise methodology by which these data were gathered by third parties, and hence the uncertainty associated with these, is not known; and
- predictions of sound pressure levels according to ISO 9613 are based on an assumption of moderate downwind propagation, and hence could be considered as a worst-case calculation. However, the standard also indicates an estimated accuracy of ±3 dB(A) in predicted levels.