




F I V E 
ESTUARIES
OFFSHORE WIND FARM

FIVE ESTUARIES
OFFSHORE WIND FARM
PRELIMINARY ENVIRONMENTAL
INFORMATION REPORT

VOLUME 5, ANNEX 10.2: NON-ROAD
MOBILE MACHINERY EMISSIONS
ASSESSMENT

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FIVE ESTUARIES OFFSHORE WIND FARM

Preliminary Environmental Information Report

**Annex 10.2 of Volume 3, Chapter 10: NRMM
Emissions Assessment**
Prepared for: Five Estuaries Wind Farm Ltd

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SLR 

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DEFINITION OF ABBREVIATIONS AND ACRONYMS

Term	Definition
AQAL	Air Quality Assessment Levels
ASNW	Ancient Semi-Natural Woodland
CoCP	Code of Construction Practice
CoSHH	Control of Substances Hazardous to Health
DCO	Development Consent Order
DPFs	Diesel Particulate Filters
ECC	Export Cable Corridor
ES	Environmental Statement
ETG	Expert Topic Group
HDD	Horizontal Directional Drilling.
HV	High Voltage
HVAC	High Voltage Alternating Current
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
LNR	Local Nature Reserve
LWS	Local Wildlife Site
NSIPs	Nationally Significant Infrastructure Projects
NRMM	Non-Road Mobile Machinery
NWP	Numerical Weather Prediction
O&M	Operation and Maintenance
OnSS	Onshore Substation
PEIR	Preliminary Environmental Impact Report
PINS	Planning Inspectorate
PM	Particulate Matter
RLB	Red Line Boundary
SSA	Substation Search Areas
SSSI	Site of Special Scientific Interest
TCC	Temporary Construction Compounds
TJB	Transition Joint Bay
VE	Five Estuaries Offshore Windfarm

1.0 NRMM Emissions Assessment

1. The scope of the assessment is to understand potential air quality impacts associated with emissions generated by Non-Road Mobile Machinery (NRMM) during the construction and Operation and Maintenance (O&M) phases of the proposed Project. This is in response to comments from Planning Inspectorate (PINS) contained within the Scoping Opinion (PINS, 2021).

1.1 Background

2. According to the Institute of Air Quality Management (IAQM) construction guidance (IAQM, 2016), experience of assessing exhaust emissions from NRMM suggests that they are unlikely to make a significant impact on local air quality. Furthermore, in accordance with Defra (Defra, 2022), providing suitable controls are applied, emissions generated from NRMM are unlikely to contribute to a significant impact upon local air quality.
3. Consistent with advice provided by the IAQM and Defra, it was initially proposed to scope out impacts associated with emissions generated from NRMM used within the construction phase on the basis that suitable controls will be applied. A series of controls were included within the Scoping Report (OWFL, 2021).
4. In the Scoping Opinion (PINS, 2021), PINS indicated that following the implementation of appropriate controls/ measures it is possible that significant effects from emissions generated by NRMM in the construction phase would be avoided. However, PINS believed there was insufficient information to fully validate this opinion. Furthermore, PINS suggested that there was insufficient information to scope out effects associated with potential emissions generated from NRMM used during the O&M phase. PINS therefore recommended to either undertake an assessment of each phase or provide evidence demonstrating agreement with the relevant consultation bodies and the absence of likely significant effect occurring.
5. Essex County Council (representing Tendring District Council), within its consultation response contained within the Scoping Opinion (PINS, 2021) agreed NRMM emissions could be scoped out following the implementation and enforcement of suitable mitigation measures – consistent with the approach adopted by Defra (Defra, 2022). Furthermore, Natural England within their consultation response contained within the Scoping Opinion raised no comment with regards to the scoping out impacts associated with emissions generated from NRMM.
6. In recognition of this, a series of construction phase control measures will be included within the Code of Construction Practice (CoCP) to minimise NRMM emissions. Implementation of the CoCP will be secured as a requirement of the Development Consent Order (DCO). These are outlined within Volume 3, Annex 10.5: Air Quality - Air Quality Mitigation Measures. Therefore, in accordance with Defra and IAQM guidance, impacts associated with construction phase generated NRMM emissions are not likely to be significant.
7. Notwithstanding the above, a qualitative assessment of NRMM emissions has been undertaken to inform the likelihood of a significant effect arising in order to be proactive and robust. Use of NRMM during the construction, operational and decommissioning phases has been considered. The qualitative approach to the NRMM assessment has been discussed during the Five Estuaries Offshore Windfarm (VE) Air Quality Expert Topic Group (ETG) process (comprising discussions with Natural England, Essex County Council and Tendring District Council). A Technical Note was issued to relevant Air Quality ETG members detailing the extent of the methodology. Natural England and Tendring District Council (on behalf of Essex County Council) both agreed to the proposed qualitative approach via email.

1.2 Assessment Methodology

8. With reference to Local Air Quality Management (LAQM). TG(22), the qualitative assessment will take into account:
 - Duration of works and associated phasing plans;
 - The type and number of NRMM to be used (including the emissions standards to which the NRMM comply);
 - Operating hours of NRMM;
 - Proximity of sensitive receptors to NRMM working areas; and
 - Existing air quality conditions in the area (local monitoring and/ or Defra background pollutant concentration maps).
9. Following a review of approaches adopted for other Nationally Significant Infrastructure Projects (NSIPs) where extensive onshore construction activities are proposed, a 50 m distance screening threshold in relation to NRMM emissions has been accepted by statutory consultees and PINS (England)¹. Following submission and with use of this distance screening threshold, the DCO for the Northampton Gateway Rail Freight Interchange was awarded by the Secretary of State in 2019². Use of 50 m for screening impacts from NRMM emissions is considered appropriate. The basis for this distance screening threshold relates to guidance provided in LAQM.TG(22), used for the purposes of establishing background monitoring stations to ensure there is no additional influence of local pollution sources:

“For urban background or suburban sites there should be no major sources of pollution (for example a large multi-storey car park) within 50 m. There should be no medium sized emission sources (for example, petrol stations, boiler vents, or ventilation outlets to catering establishments) within 20 m.”
10. Notwithstanding the above, the 50 m distance threshold relates to major sources of pollution. NRMM emissions generated by Project activity is not considered to be comparable to major sources of pollution (for example a large multi-storey car park). Furthermore, in consideration of likely construction activities, the extent of NRMM used throughout all stages of the Project is likely to be lower than those used to facilitate the construction of the Northampton Gateway Rail Freight Interchange. Construction activities for the Project will also occur in temporary and mobile manner (e.g. across the full spatial extent of the Onshore Export Cable Corridor (ECC)). Exposure to emission contributions will therefore be transient. Whereas for the Northampton Gateway Rail Freight Interchange, construction activities will be confined to a smaller boundary – where exposure to emissions is likely to be constant. Use of 50 m to screen impacts from NRMM is considered to be overly precautionary.
11. A 50 m distance screening threshold in relation to NRMM emissions has been applied to the Preliminary Environmental Impact Report (PEIR) onshore Red Line Boundary (RLB) initially to inform the spatial extent of affected receptors (human and ecological). Use of the PEIR onshore RLB for the purposes of informing the extent of NRMM emissions is conservative – as it relates to the maximum design parameters/ extents of any proposed construction area, however, ensures all potential scenarios and associated impacts have been assessed. In addition, it assumes that all NRMM will be operated at the

¹ The Northampton Gateway Rail Freight Interchange Order 201X. Applicants’ Response to Secretary of State’s Request for Comments. 5th September 2019. <https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR050006/TR050006-001311-Applicants%20Responses%20to%20Secretary%20of%20State%20Request%20for%20Comments.pdf>

² Statutory Instruments. 2019 No. 0000 Infrastructure Planning. The Northampton Gateway Rail Freight Interchange Order 2019. <https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR050006/TR050006-001344-191009%20Northampton%20Gateway%20Rail%20Freight%20Interchange%20Order%20-%20PINS.pdf>

extents of the RLB, which is highly unlikely to be the case, as NRMM locations will vary across the active construction area and will not typically be operated continuously at the boundary. The assessment will be repeated at ES stage, following refinement of design parameters.

1.3 Baseline Air Quality

12. This section presents the baseline environment in relation to NRMM, including NRMM emissions regulation, background air quality and local meteorological conditions.

1.3.1 NRMM Emissions Regulation

13. NRMM emissions are controlled through European Directives (e.g. Regulation EU 2016/1628) in terms of maximum operable emission limits. Emissions standards are applied to NRMM engines at the point of placing on the market and typically become stricter following the introduction and availability of cleaner technologies and fuels. The most recent stringent emission standards, Stage V, were effective from 2019 for engines below 56 kW and above 130 kW, and from 2020 for engines of 56-130 kW.

1.3.2 Background Pollutant Concentrations

14. Defra maintains a nationwide model of existing and future background air quality concentrations at a 1 km grid square resolution. The datasets include annual average concentration estimates for NO_x, NO₂, Particle Matter (PM)₁₀ and PM_{2.5} using a reference year of 2018 (the year in which comparisons between modelled and monitoring are made).

15. Consideration has been given to pollutant concentrations reported for the first year of proposed activities associated with the Project (2027 – the earliest potential year onshore construction will commence). Use of 2027 datasets to characterise baseline pollutant concentrations for the whole lifespan of the Project is conservative, in recognition of the forecast improvements to air quality (associated with the introduction of policy and cleaner emission technologies/ restrictions). Baseline concentrations anticipated throughout the whole life cycle of the Project (beyond 2027) are expected to be lower in comparison to those reported. 2027 (construction phase) also coincides with the greatest extent of potential NRMM activity (the first year of proposed activities) and is therefore worst-case with respect to potential emission contributions and background pollutant levels.

16. Pollutant concentrations for the assessment year of 2022 have also been provided as a comparison – to inform the evolution of the baseline.

17. The maximum mapped background concentrations from the 1 km grid squares covering the PEIR onshore RLB are presented in Table 1.1. The corresponding annual mean Air Quality Assessment Levels (AQALs) and/or Critical Levels (where available) are provided for comparison.

Table 1.1
Maximum Defra Mapped Background Pollutant Concentration Estimates

Pollutant		Year	Annual Mean Concentration (µg/m ³)	
			Maximum Background	AQAL or Critical Level
Nitrogen Oxides	NO _x	2022	10.2	30
		2027	8.8	
Nitrogen Dioxide	NO ₂	2022	7.9	40
		2027	6.8	
Particulate Matter	PM ₁₀	2022	16.0	40

Pollutant	Year	Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)	
		Maximum Background	AQAL or Critical Level
	2027	15.5	
PM _{2.5}	2022	9.2	25
	2027	8.8	

18. The maximum background concentrations presented in Table 1.1 are ‘well below’ the relevant respective annual mean AQALs or Critical Level across the potential construction area.

1.3.3 Roadside Pollutant Concentrations

19. Passive NO₂ diffusion tube monitoring is undertaken by Tendring District Council within their administrative areas at numerous locations. Diffusion Tube DT20 is located roadside of the A120 within the extent of the PEIR onshore RLB. The A120 is an arterial trunk road which anticipated to be the busiest road that runs through the PEIR onshore RLB. Therefore, the NO₂ annual mean concentrations at this location (presented in Table 1.2) are representative of the worst-case roadside pollutant concentrations across the extent of the PEIR onshore RLB.

Table 1.2
Results from Local Non-Automatic Monitoring Locations

Site ID	2019 Data Capture	Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)				
		2015	2016	2017	2018	2019
DT20	100	21.0	21.9	24.2	20.3	20.7

The annual mean NO₂ concentration at DT20 was ‘well below’ the annual mean AQS Objective for all years assessed.

1.3.4 Meteorological Data

20. Local numerical weather prediction (NWP) meteorological data, as input to the dispersion modelling exercise (further details provided in Volume 3, Annex 10.4: Air Quality - Road Traffic Dispersion Modelling) can be used to identify localised meteorological trends. The processed NWP meteorological data was provided by an accredited 3rd party vendor. A wind rose of the 2019 NWP data is presented in Figure 1.1 below.

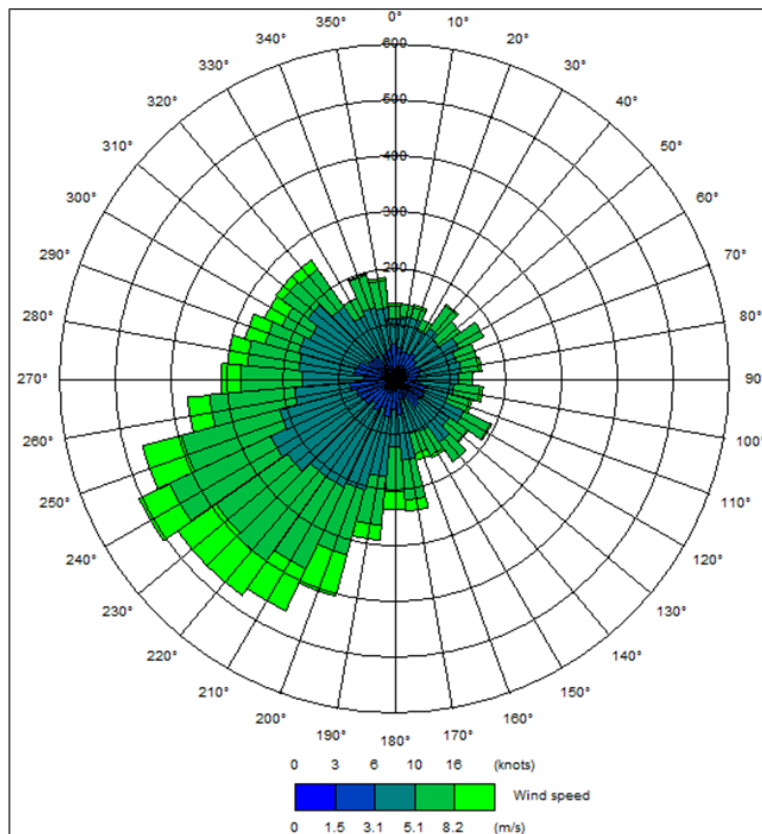


Figure 1.1
Wind Rose for NWP Meteorological Data 2019

21. Winds are predominantly from the south-west. Receptor locations to the north and east of potential NRMM activity are therefore more likely to be impacted by emissions, as they are located downwind.

1.4 Affected Receptors

22. A review of onshore sensitive (human and ecological) receptors located within 50 m of potential NRMM activity has been undertaken (i.e. areas within and proximal to the PEIR onshore RLB). Outcomes of this exercise will be used to indicate whether exposure exists, and further assessment is required. The spatial extent of areas affected by potential NRMM activity are presented in Figure 10.5.

1.4.1 Human Receptors

23. Table 1.3 details the extent of human receptors located within 50 m of potential NRMM activity generated by the Project.

Table 1.3
Details of Affected Human Receptors

Affected Area/Properties	Affected Area/Properties
Properties on Manor Way	Properties off Whitehall Lane
Properties on B1032 Clacton Road	Property off Swan Road
Properties on Little Clacton Road	Properties off B1035 Thorpe Road
Property on Mill Lane	Property off Wolves Hall Lane
Property off Pork Lane	Property off Stones Green Road
Property off B1033 Thorpe Road	Properties on B1035 Clacton Road and B1035
Property on B1033 Frinton Road	Property on Bentley Road
Property on Damant's Farm Lane	Properties on Payne's Lane
Properties on White Lodge Crescent	Properties on Lilley's Lane
Properties on B1414	Properties on Ardleigh Road
Properties on Golden Lane	Property on Hungerdown Lane

24. Human receptors are found within 50 m of potential NRMM activity generated by the Project. These receptor locations will be examined in further detail to consider the specific NRMM activities which have the potential to affect them and existing baseline conditions – to determine the likelihood of a significant effect arising.

1.4.2 Ecological Receptors

25. Table 1.4 details the spatial extent of ecological designations within 50 m from potential NRMM activity generated by the Project. These locations are illustrated in Figure 10.5.

Table 1.4
Details of Affected Ecological Receptors

Site Name	Designation	Sensitive Habitat	Spatial Extent of Affected Area (%) Within Designation
Holland Haven Marshes	SSSI	Vascular Plant Assemblage	28.3
	LNR	Vascular Plant Assemblage	94.2
Simon's Wood	ASNW	Mixed Woodland	45.3
	LoWS	Mixed Woodland	41.8
Great Holland Pits	LoWS	Not Sensitive (Open Mosaic Habitat on Previously Developed Land)	N/A
Thorpe Green	LoWS	Lowland Meadows	40.2
		Lowland Grassland	
Little Bromley Churchyard	LoWS	Lowland Grassland (Neutral)	0.6

26. Sensitive ecological receptors are found within 50 m of potential NRMM activity generated by the Project. These receptor locations will be examined in further detail to consider the specific NRMM activities which have the potential to affect them, the baseline conditions and their sensitivities to air pollution – to determine the likelihood of a significant effect arising.

27. The Great Holland Pits local wildlife site (LWS) is not considered sensitive to atmospheric pollution, and has therefore not been considered further.

1.5 Construction Phase Assessment

1.5.1 Working Hours

28. Construction working hours are to be agreed with the Local Authority, with necessary permit/authorisations required for the construction work to commence. Typically, construction activities will be daytime only; 07:00 to 19:00 Monday to Saturday, with no work beyond the site boundary on Sundays, Bank Holidays or in the night-time without prior agreement.
29. Certain 'time critical/ continuous activities' (major HDD works) would occur outside these hours. Any requirement to work outside of these normal hours would only occur with prior agreement from the Local Authorities.

1.5.2 Construction Operations

Overview and Duration of Construction Activities

30. The earliest potential year construction of the Project will commence is 2027. Onshore construction activities will occur in a phased manner and will vary along the spatial extent of the PEIR onshore RLB, according to specific works (e.g. construction of the OnSS). Discrete construction activities will not occur concurrently in the same location (e.g. construction, use and reinstatement of a transition joint bay (TJB)).
31. The onshore construction of the Project will comprise of three main elements of work:
- Landfall connection;
 - High Voltage Alternating Current (HVAC) export cable installation; and
 - OnSS construction.
32. Construction of the onshore cable route, including landfall and Horizontal Directional Drilling (HDD) is anticipated to last 18 months. Indicatively the HDD drillings works associated with landfall are anticipated to last 6 months. Construction of the Onshore Substation (OnSS) is anticipated to last approximately 24 months. The construction phase is therefore considered short-term.

Landfall Connection

33. The landfall construction works are required to connect offshore and onshore cable circuits.
34. Open cut techniques are specifically excluded through the sea defence wall. HDD or other suitable alternative trenchless techniques are therefore expected, which may require intertidal or subtidal excavations. Given that the location and nature of landfall operations are yet to be decided, a worst-case assessment is considered, with activities assumed intertidal, nearer to potential onshore sensitive receptors.
35. The landfall beach works shall require temporary piling activities to facilitate the drilling and cable installation activities. These activities will be required for the installation works only and may consist of localised driven beam, sheet pile wall and steel casing at the trenchless launch point and exit point. To enable the works, a TCC is proposed off Manor Way.
36. Offshore cables will be connected onshore within TJBs, located landward side of the sea defences/ beach. The TJBs will require excavation, wall and base construction, connection of cables within the bay itself and subsequent roof and backfill over the bays. Indicatively, the TJB activity will last 8 months.

HVAC Export Cable Installation

37. The Onshore ECC is the wider cable corridor within which the typically 60 m cable route will be located. The Onshore ECC is typically approximately 200 m to 250 m wide, however some areas require a wider corridor (such as where trenchless crossing may take place). The Onshore ECC will be up to 27 km from landfall to OnSS.
38. The cable corridor will be constructed using a combination of open trench and HDD at various depths. HDD crossings are required across the railway, A120, B1032 Clacton Road, Little Clacton Road and the intermediate pressure gas main.
39. To enable the works, five main TCCs and three minor TCCs will be established alongside site access points. The site will be prepared including fencing, temporary drainage, haul road construction and stripping of the topsoil.
40. Different areas/ sections of the onshore cable route will be worked on independently at the same time. The route will not be worked sequentially from one end to the other. Works on a particular area/ section will be temporary before construction progresses to a different area within the extent of the onshore ECC.
41. The specific construction processes and associated indicative timescales for the HVAC export cable installation are as follows:
 - Establishing TCC (including HDD compounds) and access (2 months);
 - Site preparation including fencing, haul road construction and stripping topsoil (5 months);
 - Trench excavation, duct installation, backfill and reinstatement (7 months);
 - Jointing bay excavation, base construction, pulling and connection of cables, backfill and reinstatement (9 months);
 - HDD Crossings (required to cross significant environmental and physical features such as main rivers, major drains, main roads and railways) (establish entry compound, HDD drilling works and ducting, removal of entry and exit compound) (8 months);
 - Haul road removal, removal of fencing and reinstatement (4 months);
 - TCC and access road removal (including HDD compounds) (2 months); and
 - Compound operations (the compounds will provide secure, fenced and potentially lit, storage locations for heavy duty plant equipment, local site management offices, welfare, local first aid points, refueling stations, and control of substances hazardous to health (CoSHH) storage as well as providing space for storage of cables, optical fibres, ducts and other supplies required to complete the installation works) (limited to daytime) (14 months).

OnSS Construction

42. At PEIR stage there are two Substation Search Areas (SSA) relating to the OnSS that have been identified (SSA West and SSA East) to create the design envelope, with one indicative OnSS substation location within each SSA.
43. Construction activities will include ground works/ formation of platform, building foundation works, access road and car parking works road works as well as building fabrication and High Voltage (HV) Plant Installation.

1.5.3 The Number and Type of Plant to be Used

44. Table 1.5 to Table 1.10 details the maximum number of plant proposed to be operable at any point during the different construction activities. Construction activities have been grouped to represent the full lifecycle of a specific activity (e.g. TJB: grouping of excavation, wall and base construction, connection of cables within the TJB, roof and backfill).
45. For all activities presented (with the exception of OnSS construction) temporary lighting is the only type of NRMM where more than three (indicative) pieces of equipment will be operational at any one time. Temporary lighting itself is not expected to generate emissions, rather the mobile generators which are required for power. Emission generating NRMM activity associated with all areas (with the exception of OnSS construction) are not considered extensive.
46. Conversely, the OnSS construction comprises the greatest number of NRMM proposed to be operational at any point; including eight No. dump truck, six no. excavator and five no. grinders. The OnSS construction therefore represents the worst-case emission generating construction activities.
47. The maximum estimated percentage of operation (%) for each type of plant during the activity lifecycle has also been presented. Some types of plant will potentially be operated continuously throughout the full duration of proposed activities activity (i.e. 100%) whereas other items are only required for up to 5 %, 10 % or 25 % of the time.
48. Whilst specific NRMM equipment may be operated continuously (up to 100 %), construction activities will be temporary/ mobile, and plant will not be fixed for the full duration of works. By way of example, construction activities along the onshore ECC construction area will spatially vary as construction progresses. Exposure to NRMM emissions (in the majority of cases) will be transient.

Landfall Connection

Table 1.5
NRMM: Landfall Beach Operations and Sheet Piled Intertidal Exit Pit

Vehicle/ Equipment	Maximum Indicative Number (No.) at any Point	Maximum Estimated Percentage of Operation During All Activities
21T excavator	1	10
Cable winch	1	10
Percussive piling rig (if cofferdam approach used)	1	70
Pump	2	25
Temporary lighting	4	50

Table 1.6
NRMM: TJB

Vehicle/ Equipment	Maximum Indicative Number (No.) at any Point	Maximum Estimated Percentage of Operation During All Activities
D6 dozer	1	100
30T excavator	1	100
20T dumper	2	100

Vehicle/ Equipment	Maximum Indicative Number (No.) at any Point	Maximum Estimated Percentage of Operation During All Activities
Smooth drum vibro roller	1	10
21T excavator	1	50
5T forward tipping dumper	1	50
Tractor & fuel bowser (or self-propelled)	1	10
Tractor & water bowser (for dust suppression)	1	25
Mobile self-contained welfare unit	1	25
Mobile generator	2	25
Temporary lighting	4	25
Pump	2	100
Tractor & trailer	1	50
Mobile concrete pump/ concrete mixer truck	1	50
Telehandler	1	50
Mobile crane	1	25
Cable laying tracked crane	1	25
Crawler crane	1	25
Loading shovel	1	100
Trench roller	1	75
Cement mixer	1	25
Pre-cast concrete truck	1	5

HVAC Export Cable Installation

Table 1.7
NRM: Establish Access, Establish TCC and Site Preparation. Removal of Access, TCC's and General Reinstatement

Vehicle/ Equipment	Maximum Indicative Number (No.) at any Point	Maximum Estimated Percentage of Operation During All Activities
D6 dozer	2	100
30T excavator	2	100
20T dumper	3	100
Smooth drum vibro road roller	1	100
21T excavator	1	100
5T forward tipping dumper	1	100
Loading shovel	2	100
Tractor & fencing kit	1	100

Vehicle/ Equipment	Maximum Indicative Number (No.) at any Point	Maximum Estimated Percentage of Operation During All Activities
Tractor & trailer	1	70
Tractor & fuel bowser (or self-propelled)	1	10
Tractor & water bowser (for dust suppression)	1	25
Grader	1	100
Telehandler	1	70
Mobile self-contained welfare unit	2	25
Mobile generator	2	25
Temporary lighting	12	25
Road surface paver & roller (not required for HDD compounds)	1	25
Tractor & soil tiller, roller, seeder	1	25

Table 1.8
NRMM: Trench Bays, Jointing Bays, and Unlicensed Works

Vehicle/ Equipment	Maximum Indicative Number (No.) at any Point	Maximum Estimated Percentage of Operation During All Activities
D6 dozer	2	100
30T excavator	2	100
20T dumper	2	100
Smooth drum vibro roller	1	100
21T excavator	2	100
5T forward tipping dumper	2	100
Tractor & fuel bowser (or self-propelled)	1	10
Tractor & water bowser (for dust suppression)	1	25
Mobile self-contained welfare unit	1	25
Mobile generator	2	25
Temporary lighting	8	25
Pump	2	100
Tractor & trailer	1	50
Mobile concrete pump/ concrete mixer truck	1	50
Telehandler	1	50
Mobile crane	1	50
Crawler crane	1	10
Loading shovel	2	100

Vehicle/ Equipment	Maximum Indicative Number (No.) at any Point	Maximum Estimated Percentage of Operation During All Activities
Trench roller	2	75
Tractor & cable drum trailer	1	50
Cable winch	1	50

Table 1.9
NRMM: TCC and Compound Operations

Vehicle/ Equipment	Maximum Indicative Number (No.) at any Point	Maximum Estimated Percentage of Operation During All Activities
Generator	2	100
Wheel wash	0	10
Telehandler	2	75
Road sweeper	1	10
Vibratory piling rig	1	10
Directional drill generator	1	100
Mounting supports for directional drill (hydraulic hammer)	1	25
Mud pump	1	100
Mixing tank	1	100
Cuttings/ Recycling tank	1	100

OnSS Construction

Table 1.10
NRMM: OnSS Construction

Vehicle/ Equipment	Maximum Indicative Number (No.) at any Point	Maximum Estimated Percentage of Operation During All Activities
Excavator (earthworks)	6	100
Excavator (hydraulic breaker)	4	100
Dozer	4	75
Air compressor	4	100
Dump truck	8	70
Generator	2	100
Crusher	2	80
Large rotary bored piling rig	1	100
Tracked drilling rig with hydraulic drifter	1	100
Crane mounted auger	1	100

Vehicle/ Equipment	Maximum Indicative Number (No.) at any Point	Maximum Estimated Percentage of Operation During All Activities
Mini piling rig	2	100
Compressor for mini piling	1	100
Truck mixer with pump	2	10
Grinder	5	50
Asphalt spreader with support lorry	1	100
Vibratory roller	2	70
Grader	1	100
Mobile crane	1	50
Lorry	3	25
MEWP	2	75
Forklift truck	2	50
Pneumatic chipper/drill	3	50
Scaffolding	1	25

1.5.4 NRMM Activity in Relation to Sensitive Receptors

49. Whilst an initial overview of affected receptors (in relation to the PEIR onshore RLB) has been reviewed in Section 1.4, further investigation regarding the extent of sensitive receptors in proximity to specific construction activities (and associated plant) has been undertaken below.
50. Where there is uncertainty and/ or optionality regarding the extent of specific construction activities within 50 m of a receptor, all possible construction activities have been considered for completeness. This is considered worst-case, as it is possible that the full extent of construction activities and NRMM identified may not occur within 50 m of the receptor. However, this approach ensures all potential scenarios and associated impacts have been assessed for completeness.

Human Receptors

51. Potential construction activities (that have the potential to occur within 50 m of sensitive human receptor locations) comprise:
- Access road for landfall beach operations;
 - Cable construction works;
 - Site preparation/ reinstatement; and
 - Construction compounds and accesses (TCC and HDD).
52. These activities have been grouped based on their proximity to sensitive receptor locations (Table 1.11).

Table 1.11
NRMM Activity Relative to Human Receptors

Affected Area/Properties	Construction Activities within 50 m	Extent of NRMM	Location Relative to Activity
Properties on Manor Way	Access road for landfall beach operations	Table 1.7	Downwind and upwind
Properties on B1032 Clacton Road	Cable construction works, site preparation/ reinstatement, construction compounds	Table 1.7, Table 1.8 and Table 1.9	Downwind and upwind (Upwind of construction compound)
Properties on Little Clacton Road	Cable construction works, site preparation/ reinstatement	Table 1.7 and Table 1.8	Downwind and upwind
Property on Mill Lane	Cable construction works, site preparation/ reinstatement	Table 1.7 and Table 1.8	Upwind
Property off Pork Lane	Cable construction works, site preparation/ reinstatement	Table 1.7 and Table 1.8	Downwind
Property off B1033 Thorpe Road	Cable construction works, site preparation/ reinstatement	Table 1.7 and Table 1.8	Downwind
Property on B1033 Frinton Road	Cable construction works, site preparation/ reinstatement, construction compound	Table 1.7, Table 1.8 and Table 1.9	Upwind
Property on Damant's Farm Lane	Cable construction works, site preparation/ reinstatement	Table 1.7 and Table 1.8	Upwind
Properties on White Lodge Crescent	Cable construction works, site preparation/ reinstatement	Table 1.7 and Table 1.8	Upwind
Properties on B1414 Landermere Road	Cable construction works, site preparation/ reinstatement	Table 1.7 and Table 1.8	Downwind and upwind
Properties on Golden Lane	Cable construction works, site preparation/ reinstatement	Table 1.7 and Table 1.8	Downwind and upwind
Properties on B1035 Tendring Road	Cable construction works, site preparation/ reinstatement, construction compound	Table 1.7, Table 1.8 and Table 1.9	Upwind
Properties off Whitehall Lane	Cable construction works, site preparation/ reinstatement	Table 1.7 and Table 1.8	Upwind
Property off Swan Road	Cable construction works, site preparation/ reinstatement	Table 1.7 and Table 1.8	Downwind
Properties off B1035 Thorpe Road	Cable construction works, site preparation/ reinstatement	Table 1.7 and Table 1.8	Downwind and upwind
Property off Wolves Hall Lane	Cable construction works, site preparation/ reinstatement	Table 1.7 and Table 1.8	Downwind
Property off Stones Green Road	Cable construction works, site preparation/ reinstatement	Table 1.7 and Table 1.8	Downwind
Properties on B1035 Clacton Road and B1035	Cable construction works, site preparation/ reinstatement, construction compound	Table 1.7, Table 1.8 and Table 1.9	Downwind and upwind

Affected Area/Properties	Construction Activities within 50 m	Extent of NRMM	Location Relative to Activity
Property on Bentley Road	Cable construction works, site preparation/ reinstatement, construction compound	Table 1.7, Table 1.8 and Table 1.9	Upwind
Properties on Payne's Lane	Cable construction works, site preparation/ reinstatement, construction compound	Table 1.7, Table 1.8 and Table 1.9	Downwind and upwind (Upwind of construction compound)
Properties on Lilley's Lane	Cable construction works, site preparation/ reinstatement	Table 1.7 and Table 1.8	Upwind
Properties on Ardleigh Road	Cable construction works, site preparation/ reinstatement	Table 1.7 and Table 1.8	Downwind
Property on Hungerdown Lane	Cable construction works, site preparation/ reinstatement	Table 1.7 and Table 1.8	Upwind

53. There are no sensitive human receptors within 50 m of the two SSA zones. As such, further consideration of NRMM activities associated with the OnSS construction is not required and impacts on human receptors are considered to be not significant. Based upon the extent of information considered, OnSS construction activities are likely to represent highest emission magnitude potential, given the fixed location of work, extent of NRMM activity (Table 1.10) and extended length of construction (approximately 24 months).
54. There are no sensitive human receptors within 50 m of any potential landfall beach activity, TJB activity or the landfall TCC. However, there are properties along Manor Way which will be used as an access road for these works. This location may therefore require limited NRMM activity to establish/ develop the access. Once operational, NRMM impacts along the access road are likely to be transient.
55. In relation to the onshore ECC, construction activities will be temporary/ mobile - indicatively lasting up to 18 months (as discussed). Exposure to NRMM emissions will be transient. There are no human receptors located within 50 m of the proposed major HDD works.
56. In relation to the construction compounds (TCC and HDD), NRMM will be operational within a fixed area and exposure pathways to surrounding receptors are likely to be constant. Possible construction activities within construction compounds may last up to 18 months. However, the extent of NRMM equipment proposed to be used within the construction compounds is considered small in comparison to other activities (Table 1.9). Furthermore, sensitive human receptor locations are mainly located to the west and south of the proposed compound areas i.e. upwind, with the exception of a property off B1035 Clacton Road which is located east of a potential minor TCC option. Exposure pathways to potential NRMM activity for the majority of sensitive receptors are likely to be ineffective.

Ecological Receptors

57. The ecological receptors located in proximity to the potential onshore construction activities (i.e. within 50 m) are presented in Table 1.12. For reference, the spatial extent of the affected area (i.e. proportion of the site within 50 m of potential NRMM activity) is also presented – however does not represent the extent of the site that will be exposed to continuous emissions.
58. Potential construction activities (that have the potential to occur within 50 m of sensitive ecological receptor locations) comprise:
- landfall beach operations;
 - cable connection at the TJB;

- cable construction works;
- site preparation/ reinstatement; and
- construction compounds and accesses (TCC and HDD).

Table 1.12
NRMM Activity Relative to Ecological Receptors

Site Name	Designation	Construction Activities within 50 m	Extent of NRMM	Spatial Extent of Affected Area (%)
Holland Haven Marshes	SSSI	Landfall beach operations, cable connection at TJB, site preparation/ reinstatement and cable construction works	Table 1.5, Table 1.6, Table 1.7 and Table 1.8	28.3
	LNR			94.2
Simon's Wood	ASNW	Cable construction works, site preparation/ reinstatement and construction compounds	Table 1.7, Table 1.8 and Table 1.9	45.3
	LoWS			41.8
Thorpe Green	LoWS	Construction compound access	Table 1.7	40.2
Little Bromley Churchyard	LoWS	Cable construction works and site preparation/ reinstatement	Table 1.7 and Table 1.8	0.6

59. There are no sensitive ecological receptors within 50 m of the identified OnSS zones. As such, further consideration of NRMM activities associated with the OnSS construction is not required, and impacts on ecological receptors are considered to be not significant. Based upon the extent of information considered, OnSS construction activities are likely to represent worst case emission magnitude potential, given the fixed location of work, extent of NRMM activity (Table 1.10) and extended length of construction (approximately 24 months).
60. In relation to landfall beach operations and TJBs, the Holland Haven Marshes Site of Special Scientific Interest (SSSI) and Local Nature Reserve (LNR) have the potential to interact with associated NRMM activity (Table 1.5 and Table 1.6). These activities are temporary - only predicted to last up to 6 months. As such, exposure to NRMM emissions will be temporary and indiscernible. Furthermore, a large proportion of the landfall construction activities are expected to be below ground level i.e. associated with trenchless techniques. This is likely to minimise any impacts from NRMM emissions.
61. In relation to the onshore ECC and associated preparation/ reinstatement works the Holland Haven Marshes SSSI and LNR, Simon's Wood Ancient Semi-natural Woodland (ASNW) and LWS and Little Bromley Churchyard LWS have the potential to interact with associated NRMM activity. As discussed, construction activities will be temporary/ mobile - indicatively lasting up to 18 months and as such, exposure to NRMM emissions will be transient.
62. In relation to the construction compound works, Simon's Wood ASNW and LWS have the potential to interact with associated NRMM activity. NRMM will be operational within a fixed area and exposure pathways to surrounding receptors are likely to be constant. Possible construction activities within construction compounds may last up to 18 months. However, the extent of NRMM equipment proposed to be used within the construction compounds is considered small in comparison to other activities (Table 1.9). Furthermore, the designations are located to the south of the proposed compound areas i.e. upwind. Exposure pathways to potential NRMM activity are likely to be ineffective.

63. Thorpe Green LoWS is located upwind of a proposed access road to a potential TCC location. Potential NRMM activity will be limited, used to establish the access road. This will comprise two months at the beginning and end of construction, so exposure is considered short term and temporary. Once operational, NRMM impacts along the access road are likely to be transient/ minimal.
64. Less than 50 % of the spatial extent of all the ecological designations have the potential to interact with the NRMM activities, with the exception of Holland Haven Marshes LNR (94.2 %). However, the spatial extent of the affected areas considers the maximum design parameters/ extent of any proposed construction area (i.e. the entire PEIR onshore RLB). This includes consideration of two landfall options therefore increasing the spatial extent of the affected area across the Holland Haven Marshes LNR. As such, these values are indicative until a preferred option is selected. The assessment will be repeated at ES stage, following the refinement of design parameters. Furthermore, it assumes that all NRMM will be operated at the extents of the RLB, which is highly unlikely to be the case, as NRMM locations will vary across the active construction area and will not typically be operated continuously at the boundary. This approach is likely to facilitate a conservative assessment, and therefore increases the opportunity for interactions with sensitive receptors (and the spatial extent of affected areas).
65. Furthermore, exposure to the NRMM activities will be transient/ mobile as previously discussed. Landfall construction activities are also expected to be below ground level minimising any impacts from NRMM emissions.
66. It is unlikely that independent construction activities will overlap at the same location – therefore cumulative effects are considered not likely.

1.5.5 Controls and Mitigation

67. In line with the emission standards discussed in Section 1.3.1 and the earliest potential year construction will commence (2027), it is expected that all NRMM utilised will comply with Stage V emission standards as a minimum. Stricter emission standards may be introduced in the interim period.
68. Furthermore, a series of construction phase control measures are included within the CoCP to minimise NRMM emissions. Implementation of the CoCP will be secured as a requirement of the DCO. These are outlined within Volume 3, Annex 10.5 and replicated here:
- Plan site layout so that machinery are located away from receptors, as far as is possible;
 - Ensure all vehicles switch off engines when stationary - no idling vehicles;
 - Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable;
 - Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate);
 - Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials;
 - Ensure all equipment complies with the latest (Stage V) emission standards; and
 - Where feasible, ensure further abatement plant is installed on NRMM equipment, e.g. Diesel Particulate Filters (DPFs).
69. As per Defra's LAQM.TG(22), following application of the above controls, impacts associated with NRMM emissions on sensitive receptors are unlikely to be significant.

1.5.6 Assessment of Significance of Effect

70. This section summarises the information presented to determine the likelihood of a significant effect arising from construction NRMM emissions. The following points are considered:
- The construction period is considered short-term and temporary (i.e. up to 18 months at locations of exposure), and working hours within this are further limited (normal hours are 07:00 to 19:00 Monday to Saturday);
 - Discrete construction activities are unlikely to occur concurrently in the same location;
 - For the purposes of defining the extent of NRMM activities the maximum design parameters/ extents of any proposed construction area have been used (i.e. PEIR onshore RLB). The assessment will be repeated at Environmental Statement (ES) stage whereby design parameters may be more refined. In addition, it assumes that all NRMM will be operated at the extents of the RLB, which is highly unlikely to be the case, as NRMM locations will vary across the active construction area and will not typically be operated continuously at the boundary. This approach is likely to facilitate a conservative assessment, and therefore increases the opportunity for interactions with sensitive receptors;
 - There are no sensitive human or ecological receptors within 50 m of potential OnSS construction – the construction activity with the highest emission magnitude potential, given the fixed location of work, extent of NRMM activity (Table 1.10) and extended length of construction (approximately 24 months);
 - Construction activities will be temporary/ mobile, and plant will not be fixed for the full duration of works. By way of example, construction activities along the onshore ECC construction area will spatially vary as construction progresses. Exposure to NRMM emissions (in the majority of cases) will be transient;
 - Where NRMM equipment will be operational within a fixed area (e.g. compounds) and exposure pathways to surrounding receptors are considered to be constant, the extent of NRMM equipment proposed is considered small in comparison to other activities (Table 1.9). Furthermore, exposure pathways to nearby receptors are largely considered to be ineffective (i.e. receptors located upwind);
 - A series of construction phase control measures to minimise potential NRMM impacts will be included within the CoCP and are outlined within Volume 3, Annex 10.5. This includes the requirement for all NRMM to comply with Stage V emission standards, as a minimum. According to Defra guidance, following implementation of these controls, effects are considered not significant; and
 - The maximum annual mean background concentrations across all potential construction areas are ‘well below’ the relevant AQALs or Critical Level (Table 1.1). Concentrations across the full extent of the RLB are expected to vary and be lower relative to the maximum reported. The likelihood of NRMM causing an exceedance (whilst considering the above points e.g. transient nature, type, quantum and emission standards) is therefore low.
71. Given the above, it is considered unlikely that significant effects on onshore sensitive human and ecological receptors will arise due to NRMM emissions generated during the construction phase of the Project. Potential impacts from NRMM emissions would therefore be considered negligible, direct and short-term/temporary, with the resultant effects **not significant** in terms of the EIA regulations.

1.6 Operational Phase Assessment

72. Onshore operational activities limited to maintenance are expected to be intermittent/ infrequent in comparison to the assessed construction activities. To give an indication of the extent of operational activities, planned maintenance to the OnSS would comprise one visit per week, which may increase to daily for a two week period per year during annual maintenance. In relation to the onshore cable route, planned maintenance may involve one visit to each cable joint pit per year. NRMM may not be required during these maintenance activities.
73. The extent of NRMM proposed to be used during the operational phase is not expected to be greater in comparison to the construction phase. For these reasons, operational activities are not anticipated to exceed the construction phase worst-case criteria assessed, and impacts are likely to be lesser in comparison and resultant effects can be concluded as not significant.

1.7 Decommissioning Phase Assessment

74. Details surrounding the decommissioning phase are yet to be fully clarified. In addition, it is also recognised that policy, legislation, and local sensitivities evolve, which will limit the relevance of undertaking an assessment at this stage.
75. Decommissioning activities are expected to occur for up to three years. Decommissioning activities are not anticipated to exceed the construction phase worst case criteria assessed, and impacts are likely to be lesser in comparison, given the following:
- Landfall infrastructure is expected to be left in situ where appropriate, to abate potential future impacts and minimise the extent of decommissioning activities and NRMM;
 - NRMM emission restrictions are expected to tighten in future years and in the interim before decommissioning activities occur (>25 years). This forecast is based on the introduction and availability of cleaner technologies and fuels, alongside enforcement by legislation. Therefore, emission contributions from NRMM emissions generated during the decommissioning phase are expected to be lower in comparison; and/or
 - Air quality is expected to improve in future years (a trend highlighted in Table 1.1), and in the interim before decommissioning activities occur (>25 years). This forecast is based on the introduction of policy and legislation, and the availability of cleaner technologies. The likelihood of a significant effect arising during the decommissioning phase is therefore low.
76. These elements (alone and/ or in combination) would result in a reduction in the level of significance in comparison to the assessment of construction effects. The outcomes of the construction phase assessment indicate effects from NRMM emissions on human and ecological receptors are not significant. Further assessment in relation to the decommissioning phase is therefore not required.
77. Nonetheless, the decommissioning methodology would be finalised nearer to the end of the lifetime of VE, to be in line with current guidance, policy and legislation. Any such methodology would be agreed with the relevant authorities and statutory consultees.

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