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Norfolk Vanguard Offshore Wind Farm

Cumulative Impact Assessment

Traffic and Transport

Applicant: Norfolk Vanguard Limited

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Photo: Kentish Flats Offshore Wind Farm

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EXECUTIVE SUMMARY

A Cumulative Impact Assessment (CIA) has been prepared to consider the potential cumulative traffic and transport impacts of Norfolk Vanguard in combination with other projects. This is provided in response to action point 9 from Issue Specific Hearing 1 held on 5th February 2019. This CIA also includes an updated review of Hornsea Project Three collision data on shared road links in response to action point 8 from Issue Specific Hearing 1.

29 separate roads (links) are required by both Norfolk Vanguard and Hornsea Project Three and may be subject to cumulative impacts. On these 29 shared road links, Norfolk Vanguard has already committed to enhanced mitigation measures on four of these for Norfolk Vanguard alone. These enhanced mitigation measures are presented in ES Chapter 24 and include restricting delivery times, restricting delivery routes and monitoring construction traffic flows.

Potentially significant cumulative impacts related to pedestrian amenity were identified for six of the shared links. For four of these links, the cumulative impact relates to peak traffic for Norfolk Vanguard and Hornsea Project Three occurring during the same 2-3 week window. Norfolk Vanguard has committed to maintaining cumulative traffic flows below an identified threshold, which may be achieved either through coordination of the two construction programmes or by extending Norfolk Vanguard construction programme by an extra week during this 2-3 week window.

For the remaining two links (link 68 and link 34) additional mitigation is proposed as detialed below.

There has been extensive consultation between Hornsea Project Three and Norfolk County Council in regard to a highways mitigation scheme to address cumulative impacts along link 68 (The Street at Oulton). Norfolk County Council has confirmed a preferred scheme which includes passing places and a temporary speed limit. Norfolk Vanguard support the implementation of this preferred scheme, which would be sufficient to mitigate impacts for either Norfolk Vanguard alone, Hornsea Project Three alone or for both projects together.

A range of traffic management measures are proposed to manage potential cumulative impacts along link 34 (the B1145 west of Cawston), including enhanced pedestrian facilities, managed parking and road safety measures as well as managing cumulative peak HGV flows. Hornsea Project Three are currently in discussion with Norfolk County Council regarding a scheme of highway mitigation that would deliver this. Norfolk Vanguard is continuing to engage with Hornsea Project Three and Norfolk County Council to further understand the details of this highway mitigation scheme for cumulative construction traffic with a view to adopting those measures following a review by Norfolk Vanguard to confirm its appropriateness.

An updated review of collision risk data on shared road links was also undertaken. No significant cumulative impacts were identified.

An assessment of cumulative traffic related noise and vibration effects on shared links was also undertaken. In accordance with the Design Manual Roads and Bridges (DMRB) criteria construction traffic has the potential for significant cumulative noise and vibration impacts along two shared links (link 34 and 68).

The scheme of mitigation proposed by Hornsea Project Three (and agreed with Norfolk County Council) on link 68 includes re-grading the road surface and introducing a temporary speed limit, which also serves to provide noise reductions. This mitigation scheme has been reviewed by Norfolk Vanguard and will reduce traffic related noise impacts to negligible in the cumulative scenario. Norfolk Vanguard has committed to adopt this scheme of mitigation. The first project to proceed to construction would deliver the full scheme of mitigation and the second project would be responsible for removing the measures once both project's construction phases are complete. This commitment will be captured in an update to the Norfolk Vanguard Outline Traffic Management Plan.

For link 34, construction traffic noise impacts will be mitigated by maintaining cumulative peak HGV flows below 347. The traffic CIA has demonstrated that the cumulative peak HGV demand on link 34 (after further programme interrogation) will in fact not exceed 271 when combining the Norfolk Vanguard primary peak HGV demand and the Hornsea Project Three peak traffic demand. This commitment will be also captured within an update to the OTMP.

An cumulative traffic related air quality impact assessment has also been undertaken for cumulative construction traffic flows on shared links. No significant cumulative impacts have been identified.

All of the identified additional measures to mitigate cumulative construction traffic impacts on shared road links will be captured in an update to the Outline Traffic Management Plan.

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Glossary

AADT	Annual Average Daily Traffic
CIA	Cumulative Impact Assessment
DCO	Development Consent Order
EIA	Environmental Impact Assessment
ES	Environmental Statement
GEART	Guidelines for the Environmental Assessment of Road Traffic
HDD	Horizontal Directional Drilling
HGV	Heavy Goods Vehicle
MA	Mobilisation Area
NCC	Norfolk County Council
NNDR	Norwich Northern Distributor Road
NV	Norfolk Vanguard
PEIR	Preliminary Environmental Information Report
RIS	Road Investment Strategy
TC	Trenchless Crossing
TMP	Traffic Management Plan

Terminology

Control Point	A location that provides the checks and controls for the movement of HGVs and employees.
Delivery	A delivery is the process of transporting goods from a source location to a predefined destination. A delivery will generate two vehicle movements (an arrival and departure).
Jointing pit	Underground structures constructed at regular intervals along the cable route to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	Where the offshore cables come ashore at Happisburgh South.
Landfall compound	Compound at landfall within which HDD drilling would take place.
Link boxes	Underground chambers or above ground cabinets next to the cable trench housing low voltage electrical earthing links.
Mobilisation area	Areas approximately 100 x 100m used as access points to the running track for duct installation. Required to store equipment and provide welfare facilities. Located adjacent to the onshore cable route, accessible from local highways network and suitable for the delivery of heavy and oversized materials and equipment.
National Grid new / replacement overhead line tower	New overhead line towers to be installed at the Necton National Grid substation.
National Grid overhead line modifications	The works to be undertaken to complete the necessary modification to the existing 400kV overhead lines.
National Grid substation extension	The permanent footprint of the National Grid substation extension.

National Grid temporary works area	Land adjacent to the Necton National Grid substation which would be temporarily required during construction of the National Grid substation extension.
Necton National Grid substation	The existing 400kV substation at Necton, which will be the grid connection location for Norfolk Vanguard
Onshore 400kV cable route	Buried high-voltage cables linking the onshore project substation to the Necton National Grid substation
Onshore cable route	The 45m easement which will contain the buried export cables as well as the temporary running track, topsoil storage and excavated material during construction.
Onshore cables	The cables which take the electricity from landfall to the onshore project substation.
Onshore infrastructure	The combined name for all onshore infrastructure associated with the project from landfall to grid connection.
Onshore project area	All onshore electrical infrastructure (landfall; onshore cable route, accesses, trenchless crossing technique (e.g. Horizontal Directional Drilling (HDD)) zones and mobilisation areas; onshore project substation and extension to the Necton National Grid substation and overhead line modification)
Onshore project substation	A compound containing electrical equipment to enable connection to the National Grid. The substation will convert the exported power from HVDC to HVAC, to 400kV (grid voltage). This also contains equipment to help maintain stable grid voltage.
Running track	The track along the onshore cable route which the construction traffic would use to access workfronts.
The Applicant	Norfolk Vanguard Limited
The project	Norfolk Vanguard Offshore Wind Farm, including the onshore and offshore infrastructure.
Transition pit	Underground structures that house the joints between the offshore export cables and the onshore cables.
Trenchless crossing zone (e.g. HDD)	Temporary areas required for trenchless crossing works.
Vehicle movement	A single trip (i.e. either an arrival to, or departure from site) for the transfer of employees or goods.
Workfront	The 150m length of onshore cable route within which duct installation would occur

1 TRAFFIC AND TRANSPORT CUMULATIVE IMPACT ASSESSMENT

1.1 Introduction

1. This Cumulative Impact Assessment (CIA) has been prepared to consider the potential cumulative traffic and transport impacts of Norfolk Vanguard in combination with other projects. This is provided in response to action point 9 from Issue Specific Hearing 1 held on 5th February 2019. This CIA also includes an updated review of collision data on shared road links in response to action point 8 from Issue Specific Hearing 1.

2. A CIA was included in Chapter 24 Traffic and Transport of the Environmental Statement (ES). Table 24.42 of Chapter 24 summarises those projects which were scoped into the CIA due to their temporal or spatial overlap with the potential effects arising from the project. The projects and the nature of the cumulative impacts that were scoped into the CIA are repeated below.

1.1.1 Hornsea Project Three Offshore Wind Farm

3. Ørsted is proposing to develop an offshore wind farm located in the southern North Sea, with a total generating capacity of up to 2,400MW (Hornsea Project Three). The outline Export Cable Route (ECR) of Hornsea Project Three will make landfall at a location between Sheringham and Cley next the Sea. From the landfall location, the ECR heads approximately 55km south to connect to the Norwich Main National Grid Substation. A high level construction programme indicates that onshore construction is currently planned to commence in 2021 and last for a period of six years. Hornsea Project Three construction will likely coincide with Norfolk Vanguard's duct installation and onshore project substation construction works period.

4. The Hornsea Project Three application for development consent was submitted in May 2018 and the data necessary for Norfolk Vanguard Ltd to undertake a CIA taking into account Hornsea Project Three construction traffic was not publicly available at the time the Norfolk Vanguard application was submitted.

1.1.2 Norfolk Boreas Offshore Wind Farm

5. Norfolk Boreas (the sister project to Norfolk Vanguard) will use the same onshore cable route as Norfolk Vanguard with the addition of a spur to the Norfolk Boreas onshore project substation and there could be an overlap between the construction of the Norfolk Boreas project substation and the Norfolk Vanguard cable pull, joint and commissioning phase.

6. However, as noted from Table 24.12 of Chapter 24, the worst case assessment for Norfolk Vanguard includes the overlap of onshore project substation and duct installation activities along the onshore cable route. This scenario generates greater traffic demand and associated impact than that of a Norfolk Boreas onshore project substation and Norfolk Vanguard cable pull, joint and commissioning cumulative activities. It is therefore concluded that any potential cumulative impacts associated with Norfolk Boreas have been adequately assessed within the Norfolk Vanguard (worst case) impact assessment and is not covered further in this report.

7. Table 1.1 details the source of construction traffic data and vehicle derivation that has informed this CIA.

Table 1.1 CIA Projects Construction Traffic

Project	Source	Date	Notes
Norfolk Vanguard	Norfolk Vanguard ES Chapter 24: Section 24.7	July 2018	Construction traffic vehicle derivation remains unchanged from that submitted in the original Environmental Statement (ES).
Hornsea Project Three	Hornsea Project Three Deadline 4 - Appendix 7: The HGV Haul Road Reduction Report (REP-028)	February 2019	Revised HGV numbers due to a decrease in Haul Road depth*.
			Confirmation that for CIA purposes a normal (100%) HGV distribution was to be used rather than the sensitivity (200%) flows as presented in the Hornsea Three ES*.

*The updated Hornsea Project Three construction traffic numbers, and their use of the normal (100%) distributions for the CIA, have been agreed by Hornsea Project Three, Norfolk County Council (NCC) and Highways England as part of the Statements of Common Ground between Hornsea Project Three and NCC (REP4-019) and Highways England (REP4-017).

1.1.1. Temporal and Geographical Project Overlap

1.1.1.1. Temporal Overlap

8. **Table 1.2** shows the simplified onshore construction programmes for Norfolk Vanguard and Hornsea Project Three taken from the sources identified in **Table 1.1**.

Table 1.2 Cumulative Project Onshore Construction Programmes

Activity	2020	2021	2022	2023	2024	2025	2026	2027
Norfolk Vanguard								
Landfall								
Duct Installation								
Cable Pull, Joint and Commission					Phase 1	Phase 2		
Onshore Cable Route								
Preconstruction works								
Duct installation works								
Cable pull, joint and commission					Phase 1	Phase 2		
Onshore Project Substation								
Preconstruction works								
Primary works								
Electrical plant installation and commission					Phase 1	Phase 2		
Hornsea Project Three								
Onshore substations								
Onshore Export Cables								
Landfall								
Key								
	Project activity							
	Peak project activity							

[1] Norfolk Boreas Scenario 2 (Duct installation and cable pull) only occurs if Norfolk Vanguard is not implemented and therefore does not present a cumulative impact to the Norfolk Vanguard project
[2] Two potential options for Norfolk Boreas landfall duct installation: Option A install ducts prior to cable pulling; and Option B install ducts at the same time as Norfolk Vanguard.

9. **Table 1.2** indicates that Hornsea Project Three peak construction activity will likely coincide with Norfolk Vanguard's peak construction activities during the landfall, duct installation and onshore project substation works. These activities are predicted to occur during 2022 and 2023, thus this period has been adopted for the cumulative impact assessment.

1.2. Cumulative Assessment Methodology

10. The traffic and transport CIA methodology follows the method set out in the Norfolk Vanguard ES Chapter 24: Traffic and Transport (Document reference 6.1). This is repeated here for clarity. This approach was discussed and agreed during Expert Topic Group (ETG) meetings with relevant stakeholders, including Norfolk County Council as Local Highway Authority and Highways England.

11. Utilising The Guidelines for the Environmental Assessment of Road Traffic (GEART) (Institute of Environmental Assessment, 1993) the following staged process has been followed:

    a. Identify sensitive receptors;

    b. Define the scale of the assessment;

    c. Identify relevant traffic effects;

    d. Determine magnitude of effect; and

    e. Assess Impact Significance.

1.2.1. Highway Traffic Sensitive Receptors

12. The sensitivity of a road (link) can be defined by the type of user groups who may use it. A sensitive area may for example be a village environment or where pedestrian or cyclist activity may be high, for example in the vicinity of a school. **Table 1.3** provides broad definitions of the different sensitivity levels which have been applied to the assessment.

Table 1.3 Example definitions of the different sensitivity levels for a highway link

Sensitivity	Definition
Negligible	Routes of no importance to the assessment not included in the traffic and transport study area.
Low	Few sensitive receptors and / or highway environment can accommodate changes in volumes of traffic
Medium	A low concentration of sensitive receptors (e.g. residential dwellings, pedestrian desire lines, etc.) and limited separation from traffic provided by the highway environment
High *	High concentrations of sensitive receptors (e.g. hospitals, schools, areas with high tourist footfall etc.) and limited separation provided by the highway environment

*High sensitivity links are considered to be 'specifically sensitive areas' for the purposes of GEART Rule 2

1.2.2. Scale of Assessment

13. GEART suggests application of the following rules to define the extent and scale of the assessment required:

    a. Rule 1: Include highway links where traffic flows are predicted to increase by more than 30% (or where the number of Heavy Goods Vehicles (HGVs) is predicted to increase by more than 30%); and

    b. Rule 2: Include any other specifically sensitive areas where traffic flows (or HGV component) are predicted to increase by 10% or more.

14. In justifying these rules GEART examines the science of traffic forecasting and states:

    - "It is generally accepted that accuracies greater than 10% are not achievable. It should also be noted that the day to day variation of traffic on a road is frequently at least some + or -10%. At a basic level, it should therefore be assumed that projected changes in traffic of less than 10% create no discernible environmental impact.
    - …a 30% change in traffic flow represents a reasonable threshold for including a highway link within the assessment."

15. Changes in traffic flows below the GEART rules (thresholds) are assumed to result in no discernible or negligible environmental effects and have therefore not been assessed further as part of this study.

1.2.2.1. Relevant Traffic Effects

1.2.2.2. Severance

16. Severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery. The term is used to describe a complex series of factors that separate people from both places and other people. Severance may result from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself. It can also relate to relatively minor traffic flows if they impede pedestrian access to essential facilities. Severance effects could equally be applied to residents, motorists, cyclists or pedestrians.

17. GEART suggests that changes in total traffic flow of 30%, 60% and 90% are considered to be 'slight', 'moderate' and 'substantial' respectively.

1.2.2.3. Pedestrian amenity

18. Pedestrian amenity is broadly defined as the relative pleasantness of a journey and is considered to be affected by traffic flow, traffic composition and pavement width and separation from traffic. The definition of amenity also takes into consideration pedestrian fear and intimidation, consideration of the exposure to noise and air pollution, and the overall relationship between pedestrians and traffic.

19. GEART suggests that a threshold of a doubling of total traffic flow or the HGV component may lead to a negative impact upon pedestrian amenity.

1.2.2.4. Road safety

20. The salient GEART guidance on road safety is as follows:

> "Where a development is expected to produce a change in the character of traffic (e.g. HGV movements on rural roads), then data on existing accidents levels may not be sufficient. Professional judgement will be needed to assess the implications of local circumstances, or factors which may elevate or lessen the risk of accidents, e.g. junction conflicts."

1.2.2.5. Driver delay

21. The Norfolk Vanguard impact assessment identified, in consultation with stakeholders, four critical junctions that could potentially be subject to driver delay effects:

- A12 Gapton Hall Roundabout;
- A47 Vauxhall Roundabout;
- A149 Fuller's Hill Roundabout; and
- Junction of the A47 and the A1064.

22. These critical junctions are not located along any shared road links between Norfolk Vanguard and Hornsea Project Three, and therefore are scoped out from further assessment in this CIA.

1.2.2.6. Other impacts

62. Traffic-borne noise and vibration effects and air quality effects will be informed by the traffic data outlined in this study. These impacts are assessed in Appendix G and H to this report.

1.2.3. Magnitude

23. GEART sets out consideration and, in some cases, thresholds in respect of changes in the volume and composition of traffic to facilitate a subjective judgement of traffic impact and significance.

24. Table 1.4 details the assessment framework for magnitude thresholds adapted from GEART. These thresholds are guidance only and provide a starting point by which transport data will inform a local analysis of the impact magnitude.

Table 1.4 Traffic and transport assessment framework

Effect	Magnitude of effect			
	Very low	Low	Medium	High
Severance	Changes in total traffic flows of less than 30%	Changes in total traffic flows of 30 to 60%	Changes in total traffic flows of 60 to 90%	Changes in total traffic flows of over 90%
Pedestrian amenity	Change in traffic flows (or HGV component) less than 100%	Greater than 100% increase in traffic (or HGV component) and a review based upon the quantum of vehicles, vehicle speed and pedestrian footfall		
Highway safety	Informed by a review of existing collisions patterns and trends based upon the existing personal injury collision records and the forecast increase in traffic			

1.2.3.1. Impact significance

25. **Table 1.5** sets out the significance matrix which combines the magnitude of effect derived from the framework presented in **Table 1.4** with the receptor sensitivity value for the purpose of determining the impact significance.

Table 1.5 Impact Significance Matrix

		Negative Magnitude				Beneficial Magnitude			
		High	Medium	Low	Negligible	Negligible	Low	Medium	High
Sensitivity	High	*Major*	*Major*	*Moderate*	*Minor*	*Minor*	*Moderate*	*Major*	*Major*
	Medium	*Major*	*Moderate*	*Minor*	*Minor*	*Minor*	*Minor*	*Moderate*	*Major*
	Low	*Moderate*	*Minor*	*Minor*	*Negligible*	*Negligible*	*Minor*	*Minor*	*Moderate*
	Negligible	*Minor*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Negligible*	*Minor*

*Beneficial magnitude matrix has been included for completeness, although it is not anticipated for traffic and transport impacts.

26. Note that for the purposes of this CIA, major and moderate impacts are deemed to be 'significant'.

1.3. Scope

1.3.1. Cumulative Impact Assessment Study Area

27. The Norfolk Vanguard and Hornsea Project Three traffic study areas have been reviewed to identify the highway links[1] that are shared by both projects.

28. **Figure 1** shows the Norfolk Vanguard and Hornsea Project Three onshore cable routes including respective onshore substation locations.

29. **Figure 2** includes the common links jointly used by Hornsea Project Three and Norfolk Vanguard. The resultant CIA traffic and transport study area is divided into 29 separate links that are required by both projects and may be subject to cumulative impacts.

30. **Table 1.6** details the links that make up the CIA traffic and transport study area.

Table 1.6 Common Highway Links

Norfolk Vanguard Link No.	Hornsea Three Link No.	Description
1a	210	A47
1b	210	A47
2	129	A47
3	157	A47
4	144	A47
5	137	A47
8	141	A146
11	197	A1065
12	195	A1065
13a	198	A148
13b	34	A148
14	36	A148
18	81	A1067
19	31	A148
24	109	A1067
29	110	A1067
30	111	A1067
32	59	B1149 – Norwich Road
33	76	B1149 – Holt Road

[1] Highway links - defined as sections of road with similar characteristics and traffic flows.

Norfolk Vanguard Link No.	Hornsea Three Link No.	Description
34	89	B1145 – Cawston
36	114	B1149 – Holt Road
37	78	B1145 – Cawston Road
39	118	A140 – Hevingham
40b	49	A140 – Alysham
41	190	B1436 – Felbrigg
58	204	NDR – Link a
59	202	NDR – Link b
60	201	NDR – Link c
68	208	The Street / Heydon Road

1.4. Existing Environment

1.4.1. Traffic Flow Data

31. The baseline traffic flow data has been taken from Table 24.8 of ES Chapter 24 and forecast flows for the 2022 assessment year are presented in **Table 1.8**.

1.4.2. Road Safety

32. **Table 1.7** provides a summary of all identified collision clusters within the CIA traffic and transport study area; these are also shown graphically in **Figure 3**. These cluster sites are considered potentially sensitive to changes in traffic flow and are therefore assessed further in **Section 1.5.2.3**.

Table 1.7 Crashmap Collision Cluster Information

ink ID	Collision ref no.	Description	No. of collisions			
			Total	Fatal	Serious	Slight
2	1	A47 at the junction of Woodlane and Berrys Lane	**5**	0	0	5
3	14	A146 (Loddon Road) junction with slip road off A47	**6**	0	0	6
5	12	A47 Junction with the B1140 (Acle Road)	**5**	0	2	3
8	13	A146 (Loddon Road) junction with slip road onto A47	**5**	0	0	5
8	15	A146 (Beccles Road) at the junction of B1136 (Yarmouth Road)	**6**	0	0	6
12	17	A1065 junction with Gogg's Mill Road	**5**	0	1	4

ink ID	Collision ref no.	Description	No. of collisions			
			Total	Fatal	Serious	Slight
38/38/39	18	A140 (Holt Road) roundabout with B1149	**5**	0	1	4

1.5. Potential Impacts

1.5.1. Traffic Impact Screening

33. With reference to the GEART (Rule 1 and Rule 2)[2], a screening process has been undertaken for the CIA traffic and transport study area to identify routes that are likely to have an increase in traffic flows that would require further impact assessment.

34. **Table 1.8** summarises the total daily peak vehicle movements (i.e. arrivals and departures) for both Norfolk Vanguard and Hornsea Project Three.

35. **Table 1.9** provides a comparison of the peak daily construction flows with the forecast background daily traffic flows in 2022 (assumed realistic worst case for start of construction) for both Norfolk Vanguard and Hornsea Project Three separately and cumulatively.

[2] Rule 1: Include highway links where traffic flows are predicted to increase by more than 30% (or where the number of HGVs is predicted to increase by more than 30%); and Rule 2: Include any other specifically sensitive areas where traffic flows (or HGV component) are predicted to increase by 10% or more.

Table 1.8 Existing and Proposed Norfolk Vanguard and Hornsea Three Daily Traffic Flows

Link	Description	Link sensitivity*	Background 2022 flows (24hr AADT**)		2022 Norfolk Vanguard daily construction vehicle movements		2022 Hornsea Project 3 daily construction vehicle movements		2022 total cumulative daily construction vehicle movements	
			All vehicles	HGVs	All vehicles	HGVs	All vehicles	HGVs	All vehicles	HGVs
1a	A47	Low	17,379	1,747	571	445	336	176	907	621
1b	A47	Low	17,379	1,747	737	377	336	176	1,073	553
2	A47	Low	23,363	2,303	693	312	336	176	1,029	488
3	A47	Low	41,742	3,109	527	312	351	176	878	488
4	A47	Low	48,083	3,295	394	312	570	159	964	471
5	A47	Low	45,233	2,273	704	639	438	37	1,142	676
8	A146	Medium	13,500	729	340	312	114	20	454	332
11	A1065	Low	7,632	606	69	0	218	124	287	124
12	A1065	Medium	5,499	523	38	0	218	124	256	124
13a	A148	Low	14,561	828	747	671	456	242	1203	913
13b	A148	High	10,506	620	569	520	295	156	864	676
14	A148	Medium	12,286	567	491	420	205	122	696	542
18	A1067	High	8,699	623	401	335	157	85	558	420
19	A148	Medium	12,887	1,105	756	721	102	40	858	761
24	A1067	Low	10,328	521	579	431	158	86	737	517
29	A1067	Medium	13,065	884	450	335	270	92	720	427
30	A1067	Low	11,447	723	447	335	379	104	826	439
32	B1149 - Edgefield	Medium	4,436	82	275	235	291	153	566	388
33	B1149 - Holly road	Low	5,787	178	390	235	394	162	784	397
34	B1145 - west of Cawston	Medium	2,905	29	394	240	370	127	764	367
36	B1149 - Horsford	High	8,287	159	347	235	635	187	982	422
37	B1145 - Cawston road	Low	4,187	54	180	96	82	0	262	96
39	A140 - Hevingham	Medium	14,967	498	364	134	431	149	795	283
40b	A140 - Roughton	Low	13,249	594	374	192	471	149	845	341
41	B1436 - Felbrigg	Low	6,991	158	542	478	471	149	1,013	627
58	NDR - Link a	Low	37,050	1,570	536	503	655	190	1,191	693

Link	Description	Link sensitivity*	Background 2022 flows (24hr AADT**)		2022 Norfolk Vanguard daily construction vehicle movements		2022 Hornsea Project 3 daily construction vehicle movements		2022 total cumulative daily construction vehicle movements	
			All vehicles	HGVs	All vehicles	HGVs	All vehicles	HGVs	All vehicles	HGVs
59	NDR - Link b	Low	25,656	1,087	521	503	655	190	1,176	693
60	NDR - Link c	Low	19,142	811	402	335	678	187	1,080	522
68	The Street / Heydon Road	Low	1097	44	176	96	248	118	424	214
*	Link sensitivity previously defined within Section 24.6.3 of the Norfolk Vanguard ES Chapter 24 (document reference 6.1)									
**	AADT – Annual Average Daily Traffic									

Table 1.9 Summary of Percentage Increases Over 2022 Baseline

Link	Description	2022 Norfolk Vanguard Percentage Increase		2022 Hornsea Project 3 Percentage Increase		2022 Total Cumulative Percentage Increase	
		All vehicles	HGVs	All vehicles	HGVs	All vehicles	HGVs
1a	A47	3.3%	25.5%	1.9%	10.1%	5.2%	35.6%
1b	A47	4.2%	21.6%	1.9%	10.1%	6.2%	31.7%
2	A47	3.0%	13.5%	1.4%	7.6%	4.4%	21.2%
3	A47	1.3%	10.0%	0.8%	5.7%	2.1%	15.7%
4	A47	0.8%	9.5%	1.2%	4.8%	2.0%	14.3%
5	A47	1.6%	28.1%	1.0%	1.6%	2.5%	29.7%
8	A146	2.5%	42.8%	0.8%	2.7%	3.4%	45.5%
11	A1065	0.9%	0.0%	2.9%	20.5%	3.8%	20.5%
12	A1065	0.7%	0.0%	4.0%	23.7%	4.7%	23.7%
13a	A148	5.1%	81.0%	3.1%	29.2%	8.3%	110.2%
13b	A148	5.4%	83.9%	2.8%	25.1%	8.2%	109.0%
14	A148	4.0%	74.0%	1.7%	21.5%	5.7%	95.5%
18	A1067	4.6%	53.9%	1.8%	13.7%	6.4%	67.5%
19	A148	5.9%	65.3%	0.8%	3.6%	6.7%	68.9%
24	A1067	5.6%	82.8%	1.5%	16.5%	7.1%	99.3%

Link	Description	2022 Norfolk Vanguard Percentage Increase		2022 Hornsea Project 3 Percentage Increase		2022 Total Cumulative Percentage Increase	
		All vehicles	HGVs	All vehicles	HGVs	All vehicles	HGVs
29	A1067	3.4%	37.9%	2.1%	10.4%	5.5%	48.4%
30	A1067	3.9%	46.4%	3.3%	14.4%	7.2%	60.7%
32	B1149 - Edgefield	6.2%	285.2%	6.6%	185.9%	12.8%	471.2%
33	B1149 - Holly road	6.7%	132.1%	6.8%	91.1%	13.6%	223.2%
34	B1145 - west of Cawston	13.5%	839.6%	12.7%	445.2%	26.3%	1284.8%
36	B1149 - Horsford	4.2%	147.5%	7.7%	117.5%	11.8%	265.1%
37	B1145 - Cawston road	4.3%	178.2%	2.0%	0.0%	6.3%	178.2%
39	A140 - Hevingham	2.4%	26.9%	2.9%	29.9%	5.3%	56.8%
40b	A140 - Roughton	2.8%	32.2%	3.6%	25.1%	6.4%	57.3%
41	B1436 - Felbrigg	7.7%	302.7%	6.7%	94.3%	14.5%	397.0%
58	NDR - Link a	1.4%	32.0%	1.8%	12.1%	3.2%	44.1%
59	NDR - Link b	2.0%	46.3%	2.6%	17.5%	4.66%	63.7%
60	NDR - Link c	2.1%	41.3%	3.5%	23.1%	5.6%	64.4%
68	The Street / Heydon Road	16.0%	218.3%	22.6%	268.9%	38.6%	487.2%
%	Exceeded GEART screening thresholds for Norfolk Vanguard alone as identified in ES Chapter 24						
%	Exceeds GEART screening thresholds for Cumulative Impact Assessment.						

36. In accordance with GEART, only those sensitive links that show greater than 10% increase in total traffic flows (or HGV component) or, for all other links, a greater than 30% increase in total traffic or the HGV component are considered when assessing the traffic effect of severance and pedestrian amenity upon receptors.

37. It is noted from **Table 1.8** and **Table 1.9** that cumulatively, 24 of the 29 links are above the GEART screening thresholds. **Table 1.10** provides a summary of those links that will be taken forward for further assessment and those that are screened out.

Table 1.10 Link Screening Summary

	Further assessment	No further assessment
Link	1a, 1b, 5, 8, 13a, 13b, 14, 18, 19, 24, 29, 30, 32, 33, 34, 36, 37, 39, 40b, 41, 58, 59, 60, 68.	2, 3, 4, 11 and 12.

38. **Table 1.11** sets out the mitigation strategy adopted for the Norfolk Vanguard project in isolation on these shared links (reference *Norfolk Vanguard Offshore Wind Farm Environmental Statement*). This strategy will serve as a 'base case' for the subsequent CIA to determine the adequacy of these measures to mitigate cumulative traffic flows and if further mitigation is required.

Table 1.11 Norfolk Vanguard Mitigation

Link	Link description	Initial impact assessment	Mitigation measures (additional to Outline TMP)	Residual impact assessment
Pedestrian Severance				
All shared links			n/a	Negligible to Minor adverse
Pedestrian Amenity				
Links 1a, 1b, 5, 8, 13a, 13b, 14, 18, 19, 24, 29, 30, 39, 40b, 58, 59, 60			Below GEART screening threshold for Norfolk Vanguard alone	
32	B1149 - Edgefield	Minor adverse	n/a	Minor adverse
33	B1149 -Holt Road	Minor adverse	n/a	Minor adverse
34	B1145 – west of Cawston	Moderate adverse	Enhanced TMP measures.	Minor adverse
36	B1149 – Holt Road	Moderate adverse	Enhanced TMP measures.	Minor adverse

Link	Link description	Initial impact assessment	Mitigation measures (additional to Outline TMP)	Residual impact assessment
37	B1145 - Cawston Road	Minor adverse	n/a	Minor adverse
41	B1436 - Felbrigg	Moderate adverse	Enhanced TMP measures.	Minor adverse
68	The Street / Heydon Road	Minor adverse	n/a	Minor adverse
Road Safety				
Link (cluster) - 2(1), 3(14), 8(13), 8(15), 12(17), 36/38/39(18)		Minor adverse	n/a	Minor adverse
Links (cluster) – 5(12),		Moderate adverse	Enhanced TMP measures.	Minor adverse

39.

40. **Table** 1.12 provides further detail of Enhanced Traffic Management Plan (TMP) measures referred to in **Table 1.11** that have been committed to for these shared links for Norfolk Vanguard alone. These are a suite of measures additional to those contained in a 'typical' Outline TMP and were identified for Norfolk Vanguard alone to minimise impacts and enable construction vehicle drivers to understand the policies, procedures and regulations proposed for the safe and efficient movement of plant, materials and employees.

The 'enhanced' measures will help to mitigate the effects of pedestrian severance and amenity (and associated fear and intimidation factors) and are expected to reduce the potential for road safety impacts associated with the increase of HGV movements within the area. These measures are already captured within the OTMP.

Table 1.12 Enhanced TMP measures

Enhanced TMP Measures
Driver training and toolbox talks
Driver information packs to include: • **Delivery timing constraints;** • **HGV delivery routes;** • **Diversion routes; and** • **Identify safe areas to pull over to reduce the effect of slow moving platoons of vehicles.**
Safety Awareness – Educate drivers to report 'near misses'
Engagement structure – to provide clear governance and reporting (stakeholders) structure
Monitoring and Reporting – To monitor traffic flows at mobilisation areas and the onshore project substation
Contact information at all roadwork sites and robust complaint response standards (7 days)

1.5.2. Potential Cumulative Impacts during Construction

41. An assessment of link sensitivity and magnitude of effect on those links screened in was then undertaken to establish impact significance. As can be seen in **Table 1.13**, without mitigation, six links are predicted to experience significant adverse cumulative impacts related to pedestrian amenity. Of these six links, four are predicted to experience moderate adverse impacts and two will experience major adverse impacts.

42. The remaining shared links are assessed to experience negligible or minor adverse impacts related to pedestrian severance, pedestrian amenity and road safety.

43. Where potentially significant cumulative impacts have been identified these are discussed further within this section.

Table 1.13 Impacts Summary

Link	Pedestrian Severance	Pedestrian Amenity	Road Safety
1a			
1b			
2			
3			
5			
8			
12			
13a			
13b			
14			
18			
19			
24			
29			
30			
32			
33			

Link	Pedestrian Severance	Pedestrian Amenity	Road Safety
34			
36			
37			
39			
40b			
41			
58			
59			
60			
68			
Key			
	No impacts / screened out of assessment		
	Negligible Impacts		
	Minor Adverse Impacts		
	Moderate Adverse Impacts		
	Major Adverse Impacts		

1.5.2.1. Impact 1: Pedestrian severance

44. Impacts on pedestrian severance are influenced by increases in total traffic flow. **Table 1.13** indicates that no significant cumulative traffic impacts have been identified using the agreed criteria presented in **Table 1.3** and **Table 1.4**. On this basis, pedestrian severance is not considered further within this report.

1.5.2.2. Impact 2: Pedestrian amenity

45. It can be noted from **Table 1.9** that the peak daily change in total flows or HGV component for links 13a, 13b, 32, 33, 34, 36, 37, 41, and 68 are greater than the 100% GEART impact threshold whereby GEART suggests negative impacts may be experienced (Paragraph 19). In addition, link 24 experiences an increase close to the 100% threshold. All of these links have been taken forward for further consideration.

46. Whilst link 37 is a shared link, the only HGV movements are those generated by Norfolk Vanguard alone. Therefore, the original assessment presented in the Norfolk Vanguard ES remains valid for the CIA scenario, namely a low magnitude of effect on a low sensitive link representing a cumulative impact of **minor adverse** significance. On this basis link 37 is not considered further in this CIA.

47. The remaining links all experience cumulative traffic flows significantly below the 100% HGV thresholds and the magnitude of effect is assessed as very low on low to high sensitivity links representing a cumulative impact on all these links of **negligible** to **minor adverse** significance. On this basis these links are not considered further.

48. Shared road links with potential cumulative impacts of moderate and major adverse significance have been screened in for further assessment, which is shown in **Table 1.14**. To establish the context for the impact assessment reference is made to Norfolk County Council's Highway Route Hierarchy Plan (also presented in **Table 1.14**).

Table 1.14 Pedestrian Amenity Assessment

Link	Link description	NCC route hierarchy	2022 HGV flows (movements)		HGV flow increase	Assessment	Magnitude of effect	Link sensitivity	Impact significance
			Base	Base + Cumul' Constr' flows					
13a	A148	Primary Route – 2B	828	1741	110.2%	Receptors would experience a peak flow of 175 HGVs per hour during the defined hours of construction. Classified as a 'Primary Route' route within NCC Route Hierarchy plan and is designed for high vehicle capacity.	Low	Low	**Minor Adverse**
13b	A148	Primary Route – 2B	620	1297	109.7%	Receptors would experience a peak flow of 130 HGVs per hour during the defined hours of construction. Classified as a 'Primary Route' route within NCC Route Hierarchy plan and is designed for high vehicle capacity. Link 13b routes through the village of Letheringset and into the town of Holt where at least one footway is provided adjacent to the road. A speed limit of 30mph is in force throughout both settlements.	Low	High	**Moderate Adverse**
24	A1067	Principal - 2C	521	1038	99.3%	Receptors would experience a peak flow of 104 HGVs per hour during the defined hours of construction. Classified as a 'Principal Route' route within NCC	Low	Low	**Minor Adverse**

Link	Link description	NCC route hierarchy	2022 HGV flows (movements)		HGV flow increase	Assessment	Magnitude of effect	Link sensitivity	Impact significance
			Base	Base + Cumul' Constr' flows					
						Route Hierarchy plan and is designed for high vehicle capacity. The entire route has no footways indicating minimal pedestrian movement.			
32	B1149 - Edgefield	Main Distributor Others – 3A2	82	470	471.2%	Receptors would experience a peak flow of 47 HGVs per hour during the defined hours of construction. Classified as 'Main Distributor Others' route within NCC Route Hierarchy plan. Majority of route has no footways, indicating minimal pedestrian movement. Link 32 routes through the villages of Holt and Edgefield where at least one footway is provided adjacent to the road. A speed limit of 30mph is in force throughout the village extents.	Medium	Medium	**Moderate Adverse**
33	B1149 -Holt Road	Main Distributor Others – 3A2	178	574	223.2%	Receptors would experience a peak flow of 58 HGVs per hour during the defined hours of construction. Classified as 'Main Distributor Others' route within NCC Route Hierarchy plan. Majority of route has no footways, indicating minimal pedestrian movement.	Medium	Low	**Minor Adverse**

Link	Link description	NCC route hierarchy	2022 HGV flows (movements)		HGV flow increase	Assessment	Magnitude of effect	Link sensitivity	Impact significance
			Base	Base + Cumul' Constr' flows					
34	B1145 – west of Cawston	Main Distributor Others – 3A2	29	395	1284.8%	Receptors would experience a peak flow of 40 HGVs per hour during the defined hours of construction. Classified as 'Main Distributor Others' route within NCC Route Hierarchy plan. Within Cawston there is evidence of direct frontage development with narrow footways lining the route. Resident parking on the carriageway. Evidence of existing industrial park and HGV movements routing through Cawston identified indicating the Highway has been adapted to accommodate some HGV demand.	High	Medium	**Major Adverse**
36	B1149 – Holt Road	Main Distributor Others – 3A2	159	581	265.1%	Receptors would experience a peak flow of 59 HGVs per hour during the defined hours of construction. Classified as 'Main Distributor Others' route within NCC Route Hierarchy plan. Majority of route has no footways indicating minimal pedestrian movement. Link 36 routes through the village of Horsford where a footway is provided on both sides of the road for the majority of the village and two uncontrolled crossing locations. A 30mph speed limit is in force which would reduce the speed of HGVs.	Medium	High	**Major Adverse**
41	B1436 - Felbrigg	Main Distributor Others –	158	785	397.0%	Classified as 'Main Distributor Others' route within NCC Route Hierarchy plan.	High	Low	**Moderate Adverse**

Link	Link description	NCC route hierarchy	2022 HGV flows (movements)		HGV flow increase	Assessment	Magnitude of effect	Link sensitivity	Impact significance
			Base	Base + Cumul' Constr' flows					
		3A2				Receptors would experience a peak flow of 79 HGVs per hour during the defined hours of construction.			
68	The Street / Heydon Road	Local Access – 3B2	44	258	487.2%	The road is classified as a 'Local Access' route which serves existing agricultural estates and an airfield. The route does not provide for pedestrian access along its length. Receptors would experience a peak flow of 26 HGVs per hour during the defined hours of construction.	High	Low	**Moderate Adverse**

49. With reference to **Table 1.14,** links assessed as having potentially significant cumulative pedestrian amenity impacts (**moderate** and **major adverse**) are considered here further.

50. The Norfolk Vanguard worst case construction traffic demand was developed based on all construction activities requiring that road link being undertaken concurrently. This ensured that study-wide local impacts were not underestimated by optimising programmes, however, for individual links there is scope to interrogate these construction traffic flows for Norfolk Vanguard alone in further detail, which is considered in the following sections.

1.5.2.2.1. Link 13b

51. Link 13b (shown on **Figure 24.2**) is the A148 from the junction with the A1067 to the junction with the B1110 and B1149 within Holt town centre. The link routes through a number of small settlements.

52. As shown in **Table 1.15**, link 13b enables Norfolk Vanguard construction traffic originating from Kings Lynn Port to the west to access the landfall, seven mobilisation areas (MA) and 10 trenchless crossing (TC) zones. A graphical representation of the construction programme with associated HGV movements is provided in **Appendix A**.

Table 1.15 Link 13b Norfolk Vanguard Construction Activities Breakdown

Project	Construction elements
Norfolk Vanguard	Landfall MA6 serving Cable Sections 9, 9a and 10. MA7 serving Cable Sections 11 and 12 MA8 serving Cable Sections 13 MA9 serving Cable Sections 14 and 15 MA10 serving Cable Sections 15 and 16a MA10a serving Cable Section 17a MA11 serving Cable Sections 17 and 18 TC Zones 7, 8, 9, 10, 11, 12, 13, 14, 15 and 16

53. The link is considered a high sensitivity route, specifically as it routes through Letheringset and Holt town centre with an increase in built up area with direct frontage development, local shops, a school and narrow footpaths lining the road.

54. The Norfolk Vanguard worst case traffic demand was developed assuming all construction activities requiring that road link could be undertaken concurrently. This approach results in 520 construction daily HGV movements predicted on link 13b (an 81% increase) for Norfolk Vanguard alone.

55. **Table 1.16** breaks down the worst-case scenario for link 13b into the separate construction activity and their indicative programmed date of works.

Table 1.16 Link 13b Norfolk Vanguard Traffic Derivation

Construction activity	ID	Indicative programmed date of construction activity	Work Team	Peak daily construction vehicle deliveries	Peak daily construction vehicle movements (**)	Peak construction duration
Section 9 and 9a: MA6-W	1	07.03.2022 – 30.12.2022 (inc)	Duct Installation Team	24	48 (33.6)***	20 consecutive weeks
Section 10:MA6-E	2	02.05.2022 – 30.10.2022 (inc)	Duct Installation Team	24	48 (33.6)***	19 consecutive weeks
Section 11:MA7-W	3	07.03.2022 – 02.10.2022 (inc)	Duct Installation Team	24	48 (33.6)***	19 consecutive weeks
Section 12: MA7-E	4	02.05.2022 – 18.06.2023 (inc)	Duct Installation Team	24	48 (33.6)***	29 consecutive weeks
Section 13: MA8-E	5	07.03.2022 – 25.12.2022 (inc)	Duct Installation Team	24	48 (33.6)***	19 consecutive weeks
Section 14: MA9-W	6	07.03.2022 – 05.02.2023 (inc)	Duct Installation Team	24	48 (33.6)***	24 consecutive weeks
Section 15: MA10-W	7	27.02.2023 – 24.09.2023 (inc)	Duct Installation Team	24	48 (33.6)***	10 consecutive weeks
Section 16a: MA10-E	8	24.04.2023 – 16.07.2023 (inc)	Duct Installation Team	24	48 (33.6)***	9 consecutive weeks
Section 17a: MA10a-W	9	27.02.2023 – 29.10.2023 (inc)	Duct Installation Team	24	48 (33.6)***	15 consecutive weeks
Section 17: MA11-W	10	07.03.2022 – 26.03.2023 (inc)	Duct Installation Team	24	48 (33.6)***	25 consecutive weeks
Section 18: MA11-E	11	02.05.2022 – 26.03.2023	Duct Installation Team	24	48 (33.6)***	28 consecutive weeks

Construction activity	ID	Indicative programmed date of construction activity	Work Team	Peak daily construction vehicle deliveries	Peak daily construction vehicle movements (**)	Peak construction duration
TC 7 – Marriott's Way North and Kerdiston CWS (north side)	12	22.08.2022 – 16.10.2022	TC Team 2*	36	72 (33.6)	2 weeks
TC8 – Orsted (west and east side)	13	27.02.2023 – 23.04.2023	TC Team 2*	72	144 (100.8)	2 weeks
TC9 – River Bure (west and east side)	14	02.05.2022 – 26.06.2022	TC Team 2*	72	144 (100.8)	2 weeks
TC 10 - A140 (west and east side)	15	07.03.2022 – 01.05.2022	TC Team 2*	72	144 (100.8)	2 weeks
TC 11 - Kings Beck (west and east side)	16	17.10.2022 – 11.12.2022	TC Team 2*	72	144 (100.8)	2 weeks
TC 12 - A149 (west and east side)	17	07.03.2022 – 01.05.2022	TC Team 3*	72	144 (100.8)	2 weeks
TC 13 - N.Walsham Railway (west and east side)	18	02.05.2022 – 26.06.2022	TC Team 3*	72	144 (100.8)	2 weeks
TC 14 - Paston Way CWS (west and east side)	19	27.06.2022 – 21.08.2022	TC Team 3*	72	144 (100.8)	2 weeks
TC 15 - N.Walsham and Dilham Canal (west and east side)	20	22.08.2022 – 16.10.2022	TC Team 3*	72	144 (100.8)	2 weeks
TC 16 - Bacton Woodland (west and east side)	21	17.10.2022 – 11.12.2022	TC Team 3*	72	144 (100.8)	2 weeks
Landfall	22	07.03.2022 – 24.07.2022	Landfall Team	30	60 (42)	2 weeks

* TC teams would only work on one TC at any one time during the construction programme.

** Movements in brackets include the 70% distance deterrent factor applied.

*** Primary collector route factor (75%) not applied for refined programme.

56. As can be seen from **Table 1.16** and **Appendix A** only 11 out of these 22 construction activities for Norfolk Vanguard alone could occur at the same time. The programme presents the following scenario peaks and averages predicted to occur on Link 13b.

- Primary peak of 2 weeks at 475 daily movements (incorporating ID 1, 2, 3, 4, 5, 6, 10, 11, 14, 18 and 22).
- Secondary peak of 2 weeks at 414 daily movements (incorporating ID 1, 2, 3, 4, 5, 6, 10, 11, 12 and 20).
- Typical movements for 26 weeks between 197 to 374 daily movements (277 average daily movements).
- Further typical movements for 54 weeks between 7 to 166 daily movements (63 average daily movements).

57. When this refined primary peak (2 week period) of 475 HGV movements for Norfolk Vanguard alone are added cumulatively to the peak Hornsea Three HGV movements (156) this represents a 101.7% increase over baseline flows, representing an impact of **moderate adverse** significance.

58. When this refined secondary peak (2 week period) of 414 HGV movements for Norfolk Vanguard alone are added cumulatively to the peak Hornsea Three HGV movements (570) this represents a 91.9% increase over baseline flows, representing an impact of **minor adverse** significance.

59. Therefore, the mitigation for link 13b is to ensure that the total cumulative HGV movements do not exceed 570 daily HGV movements. There are two mechanisms to achieve this aim:

- Co- ordination of Hornsea Project Three and Norfolk Vanguard peak construction traffic demand to ensure they do not overlap during this two window; or
- Extension of the Norfolk Vanguard programme that relates to this two week primary peak demand to reduce the daily demand. The construction programme for link 13b, set out in **Appendix A,** demonstrates there is adequate capacity in the programme to extend the peak activity across three weeks (rather than two) to reduce the daily HGV demand to the levels no greater than 570 daily HGV movements.

60. The outline Traffic Management Plan (OTMP) will be updated to reflect these two mechanisms for delivering this mitigation.

1.5.2.2.2. Link 32

61. Link 32 (shown on **Figure 24.2**) is the B1149 from the A148 Holt Road junction, through the village of Edgefield continuing south to the junction with the B1354.

62. **Table 1.17** shows the Norfolk Vanguard construction activities that require link 32.

Table 1.17 Link 32 Norfolk Vanguard Construction Activities Breakdown

Project	Construction Activities
Norfolk Vanguard	MA6 serving Cable Sections 9, 9a and 10. MA7 serving Cable Sections 11 and 12 TC Zones 7, 8 and 9

63. Link 32 is considered a medium sensitivity route, specifically due to routing through the village of Edgefield with evidence of direct frontage development, a village hall and a local pub. A single footpath is provided on the eastern side of the road throughout the village.

64. The Norfolk Vanguard worst case traffic demand was developed assuming all construction activities requiring link 32 are undertaken concurrently. This approach results in 235 construction HGV movements predicted on the link for Norfolk Vanguard alone (a 285% increase).

65. **Table 1.18** breaks down the worst-case scenario for link 32 into the separate construction activities and their indicative programmed date of works as detailed within Appendix 24.7 of the ES Chapter 24. A graphical representation of the refined construction programme with associated HGV movements is provided in **Appendix B**.

Table 1.18 Link 32 Norfolk Vanguard Traffic Derivation

Construction Activity	ID	Indicative programmed date of construction activity	Work Team	Peak daily construction vehicle deliveries	Peak daily construction vehicle movements (**)	Peak construction duration
Section 9 and 9a: MA6-W	1	07.03.2022 – 30.12.2022 (inc)	Duct Installation Team	24	48 (33.6)***	20 consecutive weeks
Section 10:MA6-E	2	02.05.2022 – 30.10.2022	Duct Installation Team	24	48 (33.6)***	19 consecutive weeks
Section 11:MA7-W	3	07.03.2022 – 02.10.2022 (inc)	Duct Installation Team	24	48 (33.6)***	19 consecutive weeks

Construction Activity	ID	Indicative programmed date of construction activity	Work Team	Peak daily construction vehicle deliveries	Peak daily construction vehicle movements (**)	Peak construction duration
Section 12: MA7-E	4	02.05.2022 – 18.06.2023	Duct Installation Team	24	48 (33.6)***	29 consecutive weeks
TC 7 – Marriott's Way North and Kerdiston CWS (north side)	5	22.08.2022 – 16.10.2022	TC Team 2*	36	72 (50.4)	2 weeks
TC8 – Orsted (west and east side)	6	27.02.2023 – 23.04.2023	TC Team 2*	72	144 (100.8)	2 weeks
TC9 – River Bure (west side)	7	02.05.2022 – 26.06.2022	TC Team 2*	36	72 (50.4)	2 weeks

* TC team 2 would only work on one TC at any one time during the construction programme.

**Movements in brackets include the 70% distance deterrent factor applied.

*** Primary collector route factor (75%) not applied for refined programme.

66. As can be seen from **Table 1.18** and **Appendix B**, only five of the seven construction activities for Norfolk Vanguard alone could occur at the same time. The programme presents the following scenario peaks and typical average flows predicted to occur on Link 32.

- Primary peak of 2 weeks at 184 daily movements (incorporating ID 1,2,3,4 and 7).
- Secondary peak of 1 week at 179 daily movements (incorporating ID 1,2,3,4 and 5).
- Typical movements for 22 weeks between 119 and 140 daily movements (132 average daily movements).
- Further typical movements for 34 weeks at between 7 and 92 daily movements (25 average daily movements).

67. The Norfolk Vanguard HGV primary peak in combination with Hornsea Project Three peak (337 daily movements) represents a 411% increase in cumulative HGVs on link 32 and an impact of **moderate adverse** significance .

68. The Norfolk Vanguard alone typical movements peak in combination with Hornsea Project Three's peak HGV movements, represents 293 cumulative movements, corresponding to an impact of minor adverse significance.

69. Therefore, the mitigation for the cumulative impact on link 32 will be to deliver enhanced traffic management plan measures (as already set out in the submitted OTMP) and to ensure that the total cumulative HGV movements do not exceed 293 daily HGV movements. The two mechanisms to achieve this aim are:

- Co- ordination between Hornsea Project Three and Norfolk Vanguard cumulative peak construction traffic demand to ensure they do not overlap during this three week window; or
- Extension of the Norfolk Vanguard programme that relates to this two week primary peak and secondary peak to reduce the daily construction traffic demand for Norfolk Vanguard alone to reduce the overall daily HGV demand, to Norfolk Vanguard alone to 140 HGVs. This would ensure the combined total for Hornsea Project Three and Norfolk Vanguard would not exceed 293 daily HGV movements.

70. The OTMP will be updated to reflect these two mechanisms for delivering this mitigation.

1.5.2.2.3. Link 41

71. Link 41 (shown on **Figure 24.2**) is the B1436 – Felbrigg Road which connects the A148 at its northern junction with the A140 at its southern junction. The link routes through the villages of Felbrigg and Roughton.

72. As shown in **Table 1.19**, link 41 enables Norfolk Vanguard construction traffic originating from Kings Lynn Port to the west to access the landfall, five mobilisation areas and eight TC zones.

Table 1.19 Link 41 Project Construction Activities Breakdown

Project	Construction Activity
Norfolk Vanguard	Landfall MA8 serving Cable Sections 13 MA9 serving Cable Sections 14 and 15 MA10 serving Cable Sections 15 and 16a MA10a serving Cable Section 17a MA11 serving Cable Sections 17 and 18 TC Zones 9, 10, 11, 12, 13, 14, 15 and 16

73. The link is considered a low sensitivity route with sporadic frontage development.

74. The Norfolk Vanguard worst case construction traffic demand was developed assuming all construction activities requiring link 41 could be undertaken concurrently. This approach results in 478 construction HGV movements predicted on the link for Norfolk Vanguard alone (a 302.7% increase). For Norfolk Vanguard alone, this link was assessed as having a residual impact of minor adverse significance, following mitigation which consisted of a series of enhanced traffic management plan measures as set out in **Table 1.12**.

75. **Table 1.20** breaks down the worst-case scenario for link 41 into the separate construction activities and their indicative programmed date of works as detailed within Appendix 24.7 of the ES Chapter 24. A graphical representation of the refined construction programme with associated HGV movements is provided in **Appendix C**.

Table 1.20 Link 41 Traffic Derivation

Construction Activity	ID	Indicative programmed date of construction activity	Work Team	Peak daily construction vehicle deliveries	Peak daily construction vehicle movements (**)	Peak construction duration
Section 13: MA8-E	1	07.03.2022 – 25.12.2022 (inc)	Duct Installation Team	24	48 (33.6)***	19 consecutive weeks
Section 14: MA9-W	2	07.03.2022 – 05.02.2023 (inc)	Duct Installation Team	24	48 (33.6)***	24 consecutive weeks
Section 15: MA10-W	3	27.02.2023 – 24.09.2023 (inc)	Duct Installation Team	24	48 (33.6)***	10 consecutive weeks
Section 16a: MA10-E	4	24.04.2023 – 16.07.2023 (inc)	Duct Installation Team	24	48 (33.6)***	9 consecutive weeks
Section 17a: MA10a-W	5	27.02.2023 – 29.10.2023 (inc)	Duct Installation Team	24	48 (33.6)***	15 consecutive weeks
Section 17: MA11-W	6	07.03.2022 – 26.03.2023 (inc)	Duct Installation Team	24	48 (33.6)***	25 consecutive weeks
Section 18: MA11-E	7	02.05.2022 – 26.03.2023	Duct Installation Team	24	48 (33.6)***	28 consecutive weeks
TC9 – River Bure (west and east side)	8	02.05.2022 – 26.06.2022	TC Team 2*	72	144 (100.8)	2 weeks

Construction Activity	ID	Indicative programmed date of construction activity	Work Team	Peak daily construction vehicle deliveries	Peak daily construction vehicle movements (**)	Peak construction duration
TC 10 - A140 (west and east side)	9	07.03.2022 – 01.05.2022	TC Team 2*	72	144 (100.8)	2 weeks
TC 11 - Kings Beck (west and east side)	10	17.10.2022 – 11.12.2022	TC Team 2*	72	144 (100.8)	2 weeks
TC 12 - A149 (west and east side)	11	07.03.2022 – 01.05.2022	TC Team 3*	72	144 (100.8)	2 weeks
TC 13 - N.Walsham Railway (west and east side)	12	02.05.2022 – 26.06.2022	TC Team 3*	72	144 (100.8)	2 weeks
TC 14 - Paston Way CWS (west and east side)	13	27.06.2022 – 21.08.2022	TC Team 3*	72	144 (100.8)	2 weeks
TC 15 - N.Walsham and Dilham Canal (west and east side)	14	22.08.2022 – 16.10.2022	TC Team 3*	72	144 (100.8)	2 weeks
TC 16 - Bacton Woodland (west and east side)	15	17.10.2022 – 11.12.2022	TC Team 3*	72	144 (100.8)	2 weeks
Landfall	16	07.03.2022 – 24.07.2022	Landfall Team	30	60 (42)	2 weeks

* TC team 2 would only work on one TC at any one time during the construction programme.

**Movements in brackets include the 70% distance deterrent factor applied.

*** Primary collector route factor (75%) not applied for refined programme.

76. As can be seen from **Table 1.20** and **Appendix C** only seven out of the 16 construction activities for Norfolk Vanguard alone could occur at the same time. The programme presents the following scenario peaks and averages predicted to occur on link 41.

- Primary peak of 2 weeks at 338 daily movements (incorporating ID 1, 2, 6, 7, 8 and 12)

- Secondary peak of 1 week at 324 daily movements (incorporating ID 1, 2, 6, 7, 10, and 15)
- Third peak for 7 weeks between 132 to 263 daily movements (234 average daily movements)
- Typical movements for 30 weeks between 104 to 160 daily movements (128 average daily movements)
- Further typical movements for 44 weeks between 7 to 99 daily movements (37 average daily movements)

77. The Norfolk Vanguard HGV primary peak in combination with Hornsea Project Three peak represents 487 daily HGV movements (a 308% increase in HGV flows) on link 41.

78. The HGV flows assessed for Norfolk Vanguard alone were 478 daily movements, i.e. nine daily movements lower that the expected cumulative traffic demand. This was assessed as having a residual impact of **minor adverse** significance, following mitigation (the application of an enhanced traffic management plan).

79. It is therefore, considered that the cumulative impact is within the tolerance of the assessment for Norfolk Vanguard alone, i.e. cumulative impacts would be no greater than f **minor adverse** significance, following mitigation (the application of an enhanced traffic management plan).

80. The total package of mitigation measures for link 41 would consist of:

- Enhanced traffic management plan measures (identified for Norfolk Vanguard alone); and
- Managed cumulative traffic demand to no greater than 487 daily HGV deliveries (to be captured in an update to the OTMP).

1.5.2.2.4. Link 68

81. Link 68 (shown on **Figure 24.2**) represents The Street, starting from the junction with the B1149 to the junction with Heydon Road located approximately 950m north. Link 68 continues along Heydon Road for a further 1.5km.

82. As shown in **Table 1.21**, link 68 is used to access a single construction activity for Norfolk Vanguard.

Table 1.21 Link 68 Norfolk Vanguard Construction Activity Breakdown

Project	Construction Activity
Norfolk Vanguard	MA7 serving Cable Sections 11 and 12

83. The link is considered a low sensitivity route, as The Street and Heydon Road are local access roads with sporadic frontage developments.

84. The Norfolk Vanguard worst case traffic demand was developed assuming construction activities using that link could all be undertaken concurrently. This approach results in 96 construction HGV movements predicted on the link for Norfolk Vanguard alone (a 218.3% increase) and was assessed as having an impact of minor adverse significance.

85. **Table 1.22** breaks down the worst-case scenario for link 68 into the separate construction activities and their programmed date of works as detailed within Appendix 24.7 of the ES Chapter 24. A graphical representation of the refined construction programme with associated HGV movements is provided in **Appendix D**.

Table 1.22 Link 68 Norfolk Vanguard Traffic Derivation

Construction Activity	ID	Programmed date of construction activity	Work Team	Peak daily construction vehicle deliveries	Peak daily construction vehicle movements	Peak construction duration
Section 11:MA7-W	1	07.03.2022 – 02.10.2022 (inc)	Duct Installation Team	24	48	19 consecutive weeks
Section 12: MA7-E	2	02.05.2022 – 18.06.2023 (inc)	Duct Installation Team	24	48	29 consecutive weeks

86. As can be seen from **Table 1.22** and **Appendix D** both construction activities for Norfolk Vanguard alone could occur at the same time. The programme presents the following scenario peaks and typical average flows predicted to occur on Link 32.

- Primary peak of 16 weeks at 96 daily movements (incorporating ID 1 and 2).
- Secondary peak of 6 weeks at 88 daily movements (incorporating ID 1 and 2).
- Typical movements for 17 weeks between 40 to 48 daily movements (43 average daily movements).
- Typical further movements for 16 weeks at 9 daily movements.

87. Link 68 serves Hornsea Project Three's main construction compound at Oulton Airfield and is predicted to generate 118 HGV daily movements over a three year 'Maximum Design Scenario' period.

88. Link 68 also serves Norfolk Vanguard's Mobilisation Area 7 (west and east) during the duct installation period and access points AC84, AC85 and AC88 during the Cable pull stage.

89. There has been extensive consultation between Hornsea Project Three and Norfolk County Council in regard to a highways mitigation scheme to address the cumulative impacts. Norfolk County Council has confirmed a preferred scheme option, which is summarised in **Table 1.23**.

Table 1.23 The Street, Oulton Proposed Highway Mitigation Scheme

Components
Improvement of existing bellmouth junction between The Street and the B1149 (Holt Road).
Up to 8 passing places along The Street for HGV opposing traffic (using Grasscrete paving) resulting in an overall carriageway width of 6.0m.
Widening of The Street near Dorking farm access (using full carriageway construction).
Trimming, but no removal, of vegetation and trees along The Street.
A means of priority work for southbound vehicles in the vicinity of The Old Railway. Gatehouse with a view to minimising the potential for two opposing HGVs to pass by this property simultaneously while also serving as a means of speed attenuation and mitigation to improve noise and vibration risk).
Temporary lowering of the existing 60mph speed limit to 30mph from the B1149 junction to the Hornsea Three main construction compound access.
Temporary signage along the B1145 and The Street as agreed with the Highway Authority to provide driver awareness and enforcement.
Regrading of existing road hump on The Street in the vicinity of the Old Railway Gatehouse to minimise noise and vibration impacts on the Old Railway Gatehouse.
Filter trench drainage of The Street along the regrading of the existing road hump.

90. Norfolk Vanguard Ltd. support the implementation of the above preferred scheme option, as agreed between Hornsea Project Three and NCC, as mitigation for the cumulative flows on the shared part of link 68. Following implementation of the scheme, the magnitude of effect is assessed as medium on a low sensitivity receptor resulting in a residual impact assessment of **minor adverse**.

91. Norfolk Vanguard is committed to adopting the preferred mitigation scheme option for Norfolk Vanguard in isolation. In effect this scheme of mitigation, on the shared part of Link 68, would be sufficient to mitigate impacts for Norfolk Vanguard alone, Hornsea Project Three alone or for both projects together. The first project to proceed to construction would deliver the full scheme of mitigation and the second project would be responsible for removing the measures once both project's construction phases are complete. This commitment, associated management of roadworks, and the process of coordination between the two projects will be captured in an update to the OTMP.

1.5.2.2.5. Link 34

92. Link 34 (shown on **Figure 24.2**) is the B1145 from the B1149 Holt Road junction, through Cawston village to the eastern town extents of Reepham.

93. As shown in **Table 1.24**, link 34 is used to access a number of the Norfolk Vanguard construction activities including one mobilisation area and two TC zones.

Table 1.24 Link 34 Norfolk Vanguard Construction Activities Breakdown

Project	Construction Activities
Norfolk Vanguard	MA6 serving Cable Sections 9, 9a and 10. TC Zones 7 and 8

94. The link is considered a medium sensitive route with evidence of direct frontage development and narrow footways lining the route through Cawston. There is also resident parking along the link within Cawston.

95. The Norfolk Vanguard worst case traffic demand was developed assuming all construction activities requiring that road link could be undertaken concurrently. This approach results in 240 construction HGV movements on the link for Norfolk Vanguard alone (an 839.4% increase). This was assessed as having a residual impact of minor adverse significance for Norfolk Vanguard alone (following the application of enhanced traffic management plan measures).

96. **Table 1.25** breaks down the worst-case scenario for link 34 into the separate construction activities and their indicative programmed date of works as detailed within Appendix 24.7 of the ES Chapter 24. A graphical representation of the refined construction programme with associated HGV movements is provided in **Appendix E**.

Table 1.25 Link 34 Norfolk Vanguard Traffic Derivation

Construction Activity	ID	Indicative programmed date of construction activity	Work Team	Peak daily construction vehicle deliveries	Peak daily construction vehicle movements	Peak construction duration
Section 9 and 9a: MA6-W	1	07.03.2022 – 30.12.2022 (inc)	Duct Installation Team	24	48	20 weeks
Section 10:MA6-E	2	02.05.2022 – 30.10.2022	Duct Installation Team	24	48	19 weeks
TC 7 – Marriott's Way North and Kerdiston CWS (north side)	3	22.08.2022 – 16.10.2022	TC Team 2*	36	72	2 weeks
TC 8 – Orsted (north and south side)	4	27.02.2023 – 23.04.2023	TC Team 2*	72	144	2 weeks

* TC team 2 would only work on one TC at any one time during the construction programme.

97. As can be seen from **Table 1.25** and **Appendix E** only three of the four construction activities for Norfolk Vanguard alone could occur at the same time. The programme presents the following scenario peaks and averages predicted to occur on link 34.

- Primary peak of 1 weeks at 168 daily movements (incorporating ID 1, 2 and 3)
- Secondary peak of 1 week at 152 daily movements (incorporating ID 1, 2 and 3)
- Third peak of 2 week at 144 daily movements (incorporating ID 4)
- Typical movements for 24 weeks at between 80 and 99 daily movements (93 average daily movements)
- Further Typical movements for 23 weeks at between 6 and 40 daily movements (10 average daily movements)

98. The Norfolk Vanguard HGV third peak in combination with Hornsea Project Three's peak construction HGV traffic is 271 daily movements, represents a 934 % increase in HGVs on link 34 and an impact of **moderate adverse** significance.

99. To ensure that the total cumulative HGV movements do not exceed 271 daily HGV movements, two mechanisms are available:

- Co- ordination between Hornsea Project Three and Norfolk Vanguard cumulative peak construction traffic demand to ensure they do not overlap during this two week window; or
- Extension of the Norfolk Vanguard programme that relates to this two week primary peak and secondary peak to reduce the daily construction traffic demand for Norfolk Vanguard alone does not exceed 144 HGVs. This would ensure the combined total for Hornsea Project Three and Norfolk Vanguard would not exceed 271 daily HGV movements.

100. The OTMP will be updated to reflect these two mechanisms for delivering the management of cumulative HGV traffic.

101. As the residual impact remains moderate adverse a range of additional traffic management measures are also proposed, including timing deliveries to avoid school pick up and drop off times during term time, enhanced pedestrian facilities, managed parking and road safety measures.

102. The total package of mitigation for link 34 would consist of:

- Enhanced traffic management plan measures (including the prohibition of deliveries during term time school pick up and drop off times – as already captured within OTMP);
- Managed cumulative traffic demand to no greater than 271 daily HGV deliveries (to be captured in an update to the OTMP); and
- Commitment to deliver a scheme of highway mitigation to include enhanced pedestrian facilities, managed parking and road safety measures (to be captured in an update to the OTMP).

103. With this package of mitigation implemented the magnitude of effect is assessed as low on a medium sensitivity receptor resulting in a residual impact of **minor adverse** significance.

104. Hornsea Project Three are currently in discussion with Norfolk County Council regarding a scheme of highway mitigation that would deliver the measures outlined above, i.e. enhanced pedestrian facilities, managed parking and road safety measures.

105. Norfolk Vanguard is continuing to engage with Hornsea Project Three and Norfolk County Council to further understand the details of this highway mitigation scheme for cumulative construction traffic with a view to adopting those measures following a review by Norfolk Vanguard to confirm its appropriateness.

1.5.2.2.6. Link 36

106. Link 36 (shown on **Figure 24.2**) is the B1149 between the A1270 to the south and the B1145 to the north. The link routes through the village of Horsford.

107. As shown in **Table 1.26**, link 36 is used to access a number of Norfolk Vanguard construction activities including two mobilisation areas and three TC zones.

Table 1.26 Link 36 Norfolk Vanguard Construction Activities

Project	Construction Activities
Norfolk Vanguard	MA6 serving Cable Sections 9, 9a and 10. MA7 serving Cable Sections 11 and 12 TC Zones 7, 8 and 9

108. The link is considered a high sensitivity route, specifically as it routes through the village of Horsford with evidence of direct frontage development, a local pub, shops, cafe, village hall, mechanics garage, medical centre and a primary school. Footpaths typically line both sides of the road throughout the village.

109. The Norfolk Vanguard worst case traffic demand was developed assuming construction activities requiring link 36 could be undertaken concurrently. This approach results in 235 construction vehicle movements on the link for Norfolk Vanguard alone (an increase of 147.5%) and was assessed as having a residual impact of minor adverse significance for Norfolk Vanguard alone (following the implementation of enhanced traffic management plan measures).

110.

111. **Table** 1.27 breaks down the worst-case scenario for link 36 into the separate construction activities and their indicative programmed date of works as detailed within Appendix 24.7 of the ES Chapter 24. A graphical representation of the refined construction programme with associated HGV movements is provided in **Appendix F**.

Table 1.27 Link 36 Norfolk Vanguard Traffic Derivation

Construction Activity	ID	Indicative programmed date of construction activity	Work Team	Peak daily construction vehicle deliveries	Peak daily construction vehicle movements (**)	Peak construction duration
Section 9 and 9a: MA6-W	1	07.03.2022 – 30.12.2022 (inc)	Duct Installation Team	24	48 (34)	20 consecutive weeks
Section 10:MA6-E	2	02.05.2022 – 30.10.2022	Duct Installation Team	24	48 (34)	19 consecutive weeks
Section 11:MA7-W	3	07.03.2022 – 02.10.2022 (inc)	Duct Installation Team	24	48 (34)	19 consecutive weeks
Section 12: MA7-E	4	02.05.2022 – 18.06.2023	Duct Installation Team	24	48 (34)	29 consecutive weeks
TC 7 – Marriott's Way North and Kerdiston CWS (north side)	5	22.08.2022 – 16.10.2022	TC Team 2*	36	72 (51)	2 weeks
TC8 – Orsted (west and east side)	6	27.02.2023 – 23.04.2023	TC Team 2*	72	144 (101)	2 weeks
TC9 – River Bure (west side)	7	02.05.2022 – 26.06.2022	TC Team 2*	36	72 (51)	2 weeks

* TC team 2 would only work on one TC at any one time during the construction programme.

**Movements within brackets have had a 70% distance deterrent factor applied.

112. As can be seen from

113. **Table** 1.27 and **Appendix F** only five out of the seven construction activities could occur at the same time. The programme presents two distinct scenario peaks.

- Primary peak of 2 weeks at 184 daily movements (incorporating ID 1,2,3,4 and 7)
- Secondary peak of 1 week at 179 daily movements (incorporating ID 1,2,3,4 and 5)
- Typical movements for 22 weeks at between 119 and 140 daily movements (132 average daily movements)
- Further typical movements for 34 weeks at between 7 and 92 daily movements (25 average daily movements)

114. Norfolk Vanguard's primary peak daily movements (184) when combined with Hornsea Three's peak movements total 371 cumulative daily HGV movements, which represents a 233.2% increase over baseline flows.

115. The B1149 is designated as a Main Distributor in Norfolk County Council's hierarchy which is predicated on the highway environment being suitable to receive high volumes of traffic. This is demonstrated on link 36 where the village of Horsford has a number of pedestrian amenity and safety features to mitigate the impact of traffic. These include:

- Advanced warning signs;
- A series of vehicle actuated signs;
- Two controlled crossings in proximity to community facilities;
- 30mph speed limit through the village;
- Provision of footways either side of the carriageway within the majority of the village; and
- No on road parking.

116. It is therefore assessed that with the application of enhanced traffic management measures (already committed to by Norfolk Vanguard alone, including restricted delivery times, restricted delivery routes, and monitoring construction traffic flows – refer to

117. **Table** 1.12) the total cumulative HGV movements of 371 HGVs would represent a very low magnitude of effect on a high sensitivity receptor resulting in residual cumulative impact of **minor adverse** significance.

118. Table 1.28 summarises the assessed CIA pedestrian amenity impacts.

Table 1.28 Pedestrian Amenity Summary

Link	Link description	Initial cumulative impact assessment	Mitigation measures (additional to Outline TMP)	Residual impact assessment
13a	A148	Minor adverse	n/a	n/a
13b	A148	Moderate adverse	• Managed Traffic Demand • Enhanced TMP measures.	Minor adverse
24	A1067	Minor adverse	n/a	n/a
32	B1149 - Edgefield	Moderate adverse	• Managed Traffic Demand • Enhanced TMP measures.	Minor adverse
33	B1149 -Holt Road	Minor adverse	n/a	n/a
34	B1145 – west of Cawston	Major adverse	• Managed Traffic Demand • Enhanced TMP measures. • Highway Mitigation Scheme	Minor adverse
36	B1149 – Holt Road	Major adverse	• Managed Traffic Demand • Enhanced TMP measures.	Minor adverse
41	B1436 - Felbrigg	Moderate adverse	• Managed Traffic Demand • Enhanced TMP measures.	Minor adverse
68	The Street / Heydon Road	Moderate adverse	• Managed Traffic Demand • Highway Mitigation Scheme	Minor adverse

1.5.2.3. Impact 3: Road safety

119. During stakeholder engagement, Highways England stated that they *'do not recognise GEART significance thresholds for assessing road safety (and capacity)'.* Therefore, as a 'first pass' only those links that exhibit a negligible increase in total traffic or HGV component have been screened out.

120. Table 1.29 provides a summary of the collision clusters identified in the baseline study (**Table 1.7.** refers) and includes details of the peak increase in daily cumulative construction flows in comparison to the forecast background daily traffic flows in 2022.

Table 1.29 Crashmap collision cluster information

Link	Cluster Ref No.	Description	% increase (cumulative traffic)		Summary
			All vehicles	HGVs	
2	1	A47 at the junction of Woodlane and Berrys Lane	4.4%	21.2%	It is considered that a peak change in total traffic of 4.4% and HGV traffic of 21.2% represents a very low magnitude of effect on a potentially high sensitivity receptor. Therefore, the impact is assessed as **minor adverse**.
3	14	A146 (Loddon Road) junction with slip road off A47	2.1%	15.7%	It is considered that a peak change in total traffic of 2.1% and HGV traffic of 15.7% represents a very low magnitude of effect on a potentially high sensitivity receptor. Therefore, the impact is assessed as **minor adverse**.
5	12	A47 Junction with the B1140 (Acle Road)	2.5%	29.7%	It is considered that the peak change in HGV traffic of 29.7% and 45.5% on low to medium sensitivity receptors could lead to potentially significant impacts, which are considered further below.
8	13	A146 (Loddon Road) junction with slip road onto A47	3.4%	45.5%	
8	15	A146 (Beccles Road) at the junction of B1136 (Yarmouth Road)			
12	17	A1065 junction with Gogg's Mill Road	0.7%	0.0%	It is considered that a peak change in total traffic of 0.7% represents a very low magnitude of effect on a potentially high sensitivity receptor. Therefore, the impact is assessed as **minor adverse**.
36/38/39	18	A140 (Holt Road) roundabout with B1149	5.3% - 11.8%	56.8% - 265.1%	It is considered that the peak change in HGV traffic of 56.8% to 265.1% on medium to high sensitivity receptors could lead to potentially significant impacts, which are considered further below..

121. Table 1.29 identifies that of the seven collision clusters within the CIA traffic and transport study area, three would experience a very low magnitude of effect resulting in a **minor adverse** impact. The remaining five sites would experience increases in HGV traffic which could potentially result in significant impacts and are therefore considered further.

122. Detailed collision data (known as STATS19[3]) has been obtained from Norfolk County

[3] Accidents on the public highway that are reported to the police and which involve injury or death are recorded by the police on a STATS19 form. The form collects a wide variety of information about the accident (such as time, date, location, road conditions).

Council and Suffolk County Council for the most recently available five year period (01.05.12 to 30.04.17 and 01.04.12 to 01.04.17 respectively).

123. The STATS19 collision data has been examined to identify any emerging patterns or factors that could be exacerbated by the project's traffic generation. The review is summarised below with full details included as Appendix 24.20 of ES Chapter 24.

1.5.2.3.1. Cluster site 12

124. Cluster site 12 is located on the A47, between the priority junction with Lingwood Lane and the staggered priority junction with the B1140 north and south.

125. This section of the A47 forms part of Highways England's Blofield to North Burlingham A47 corridor improvement Road Investment Strategy (RIS) scheme.

126. Highways England identify that the corridor acts as a bottleneck creating congestion and as a result has a poor safety record. A preferred route announcement (option 4) has been made by Highways England which would involve dualling a new section of the A47 south of the existing Lingwood Lane junctions and constructing a new junction at the B1140.

127. The construction of the proposed improvements is projected to start in spring 2020 and should be complete by the start of the project construction programme in 2022.

128. It is considered that the proposed corridor improvement programme would be appropriate to mitigate the cumulative traffic impact of Norfolk Vanguard and Hornsea Project Three and therefore this cluster location is considered as a low sensitivity receptor.

129. As such, a low magnitude of effect on a low sensitivity receptor is predicted, which represents cumulative impact of **minor adverse** significance.

130. Notwithstanding, during consultation, Highways England requested that a contingency mitigation plan for cluster site 12 was considered in the event that the corridor improvement programme is delayed.

131. In response, an investigation into collision patterns at cluster 12 has been undertaken. This review has established that cluster site 12 has experienced 25 collisions within the last five years. Of these 25 collisions, eight are located at the eastbound start of the dualling and junction within Lingwood Lane and 16 at the staggered crossing with the B1140. These two discrete patterns are considered further.

132. The first pattern is comprised of eight collisions of which four were rear end shunts associated with vehicles turning right at the junction of Lingwood Lane and four

involved rear end shunts where the A47 transitions between single and dual carriageway.

133. A review of the baseline highway environment at, and on the approaches to, the B1140 staggered junction has identified that the junctions are of a modern standard and incorporate road safety measures, including advanced warning and direction signing on the A47 approaches. A reduced speed limit of 50mph is maintained throughout the staggered junction layout and street lighting is also present.

134. The second pattern is associated with vehicles turning from the A47 on to the B1140 (South Walsham Road and Acle Road). In total there were 16 collisions of which five were rear end shunts and 11 involved drivers turning across the path of an oncoming vehicle.

135. To mitigate the potential cumulative construction traffic to escalate the identified pattern of rear end shunts it is proposed to provide a 'Queuing Ahead' sign. This sign would provide advance warning of potential queuing at the staggered B1140 junction reducing the potential for rear end shunts. This commitment was previously identified and is contained in the submitted OTMP (document reference 8.8).

136. No cumulative construction traffic is projected to turn from the A47 into the B1140 north or south. Therefore, it is considered that the increase in traffic through this junction will not exacerbate the existing pattern of collisions.

137. It is considered that the proposed signage would be appropriate to mitigate the impact of the development traffic if the RIS schemes are not in place at the start of the Norfolk Vanguard construction, and therefore the magnitude of effect would be very low on a high sensitivity receptor representing a residual cumulative impact of **minor adverse** significance.

1.5.2.3.2. Cluster site 13

138. Cluster site 13 is located in the vicinity of the grade separated signalised junctions between the A47 and A146.

139. There have been 26 collisions within the last five years of which 13 are located at the northbound off-slip from the A47 with the A146 and eight are located at the southbound off-slip from the A47 with the A146.

140. In total, approximately nine collisions were rear end shunt type collisions and 14 were vehicles turning across the path of an oncoming vehicle. It is therefore concluded that there is a pattern of rear end shunts and non-compliance with the traffic signals.

141. A review of the baseline highway environment has identified that the junctions are signalised and include advanced warning and direction signs with evidence of high friction surfacing on the approaches.

142. It is noted that whist there is a pattern of collision types, the junctions are of a modern standard and benefits from existing targeted road safety measures. Therefore, the junction is considered a low sensitivity receptor.

143. Cluster 13 is located on link 8 that is projected to experience an increase in cumulative HGV traffic of up to 45.5%. This is considered to represent a low magnitude of effect on a low sensitivity receptor representing a cumulative impact of **minor adverse** significance. No mitigation is proposed.

1.5.2.3.3. Cluster site 15

144. Cluster site 15 is located at the priority junction of the A146 and B1136. The junction also includes a left turn deceleration lane from the A146 to B1136. The A146 is a single carriageway road with the traffic lanes separated by a narrow hatched central area. The B1136 is a single carriageway road which approaches the A146 from the village of Hales from the east immediately after a sharp bend in the road.

145. The junction has experienced 12 collisions within the last five years. A review of these 12 collisions identified that three involve vehicles turning off the A146 being struck from behind and eight collisions involve vehicles right turning from the B1136 colliding with oncoming vehicles. It is therefore considered that there is a pattern of right turn collisions.

146. A review of the baseline highway environment in the locality of the junction has identified that there is good visibility from the B1136 of oncoming vehicles. However, vehicles using the off-slip from the A146 to B1136 could mask oncoming vehicles reducing the forward visibility of oncoming vehicles.

147. Cluster 15 is located on link 8 that is projected to experience a cumulative increase in HGV traffic of up to 45.5%; however, no traffic is projected to turn from the A146 into the B1136. Therefore, it is considered that the increase in traffic through this junction will not exacerbate the existing pattern of collisions.

148. In view of the above, the magnitude of effect is assessed as low on a medium sensitivity receptor representing a cumulative impact of **minor adverse** significance. No mitigation is proposed.

1.5.2.3.4. Cluster site 18

149. Cluster site 18 is located at the four arm roundabout of the A140 and B1149 and the

priority junction of the B1149 and Holly Lane immediately to the north of the roundabout.

150. Cluster site 18 has experienced 12 collisions within the last five years. These 12 collisions form two discrete clusters, with five centred on the junction of the B1149 and Holly Lane and seven at the roundabout junction of the A140 and B1149.

151. Cluster 18 is located at the intersection of links 36, 38 and 39 and would therefore experience an increase in cumulative HGV traffic of up to 265.1%.

152. However, both of the considered junctions are located adjacent to the recently completed Norwich Northern Distributor Road (NNDR) and are subject to a number of highway layout revisions. These revisions include:

- The stopping up of Holly Lane to create a 3m wide 'private means of access' with combined cycle track; and
- Conversion of the current roundabout to a five arm roundabout which includes an on and off slip road connecting to the NNDR and additional footway/ cycleway facilities.

153. It is considered that the recently completed NNDR improvements would remove the conflict at the junction of the B1149 and Holly Lane and would be appropriate to mitigate the existing road safety issues at the roundabout junction. Therefore, the cluster is assessed as a very low sensitivity receptor. The high magnitude of effect on this low sensitivity receptor represents a cumulative impact of **minor adverse** significance. No mitigation is proposed.

1.5.3. Cumulative Impacts during Operation

154. No cumulative impacts are anticipated as there are no operational impacts associated with Norfolk Vanguard.

1.5.4. Cumulative Impacts during Decommissioning

155. Decommissioning of Norfolk Boreas and Hornsea Project Three may potentially take place at the same time as the Norfolk Vanguard project. The detail and scope of the decommissioning works for the Norfolk Vanguard project will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. Cumulative impacts during the decommissioning stage are assumed to be no worse than those identified during the construction stage.

1.6. Summary

156. This traffic and transport CIA has assessed the potential impacts of the onshore

aspects of the Norfolk Vanguard and Hornsea Project Three projects on the surrounding traffic sensitive receptors.

157. In accordance with national guidance (GEART), a CIA traffic and transport study area was identified via common links shared by Norfolk Vanguard, Norfolk Boreas and Hornsea Project Three projects, baseline conditions established and sensitive receptors identified.

158. The CIA traffic and transport study area was screened to identify highway links (defined as sections of road with similar characteristics and traffic flows) that could be potentially subjected to significant impacts by the projects' traffic generation.

159. A total of 27 highway links within the CIA traffic and transport study area were screened in and have been assessed for the effects of severance, pedestrian amenity and road safety.

160. With the application of mitigation measures (where required) the residual impact for all highway links was assessed to be not significant.

161. **Table 1.30** summarises the cumulative traffic and transport impact assessment.

Table 1.30 Potential cumulative impacts identified for traffic and transport

Potential impact	Receptor	Value/ sensitivity	Magnitude	Significance	Mitigation	Residual impact
Construction						
Impact 1: Pedestrian Severance	Links: 1a, 1b, 5, 8, 13a, 13b, 14, 18, 19, 24, 29, 30, 32, 33, 34, 36, 37, 39, 40b, 41, 58, 59, 60, 68	Low – High	Very Low - Low	Negligible – Minor adverse	N/A	Negligible – Minor adverse
Impact 2: Pedestrian Amenity	Links: 1a, 1b, 5, 8, 13a, 14, 18, 19, 24, 29, 30, 33, 37, 39, 40b, 58, 59, 60	Low – High	Very Low	Negligible – Minor Adverse	N/A	Negligible – Minor adverse
	13b, 32, 41, 68	Low – High	Low to High	Moderate Adverse	Managed Traffic Demand Enhanced TMP measures. Highway Mitigation Scheme	Minor adverse
	34, 36	Medium - High	Medium - High	Major Adverse	Managed Traffic Demand Enhanced TMP measures. Highway Mitigation Scheme	Minor adverse
Impact 3: Road Safety	Clusters: 1, 12, 13, 14, 15, 17, 18.	Negligible - Medium	Low - Medium	Minor adverse	Enhanced TMP measures.	Minor adverse
Operation						
All impacts	All links	Low - High	Very Low	Negligible, or up to localised minor adverse	n/a	Negligible, or up to localised minor adverse
Decommissioning						
Impacts upon those links serving the cable route works would be significantly less than the construction phase whilst impacts upon those links primarily serving the onshore project substation (link 1) would be no worse than construction. Therefore, the overall magnitude of effect would be negligible to minor adverse and where appropriate similar mitigation strategies as presented for construction would be valid.						

Potential impact	Receptor	Value/ sensitivity	Magnitude	Significance	Mitigation	Residual impact
Cumulative during operation						
No cumulative impacts are anticipated as there are no operational impacts associated with Norfolk Vanguard.						
Cumulative during decommissioning						
The detail and scope of the decommissioning works will be determined by the relevant legislation and guidance at the time of decommissioning and agreed with the regulator. A decommissioning plan will be provided. As such, cumulative impacts during the decommissioning stage are assumed to be no worse than those identified during the construction stage.						

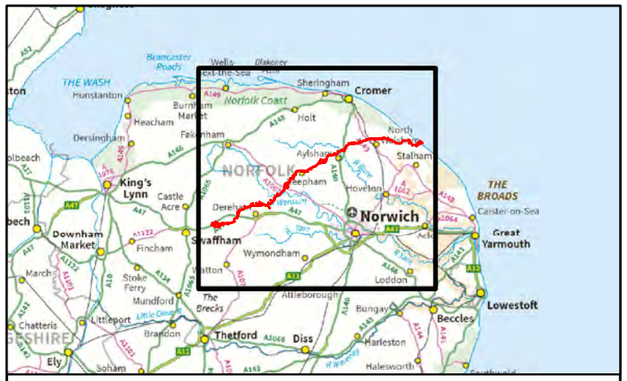
1.7. References

Royal HaskoningDHV (July 2018) *Norfolk Vanguard Offshore Wind Farm Environmental Statement. Chapter 24 Traffic and Transport,* Peterborough: Royal HaskoningDHV.
Royal HaskoningDHV, October 2018. *Norfolk Boreas Preliminary Environmental Information Report (PEIR),* Peterborough: Royal HaskoningDHV.

590000 600000 610000 620000 630000 640000

340000 330000 320000 310000 300000

N



Legend:

- Norfolk Vanguard onshore red line boundary
- Norfolk Vanguard Onshore project substation location
- National Grid substation extension location

Hornsea Project Three

- Onshore cable route
- Main construction compound
- Booster station
- Hornsea Project Three onshore substation

Project: Norfolk Vanguard	Report: Norfolk Vanguard Traffic CIA

Title: Location of Norfolk Vanguard and Hornsea Project Three

Figure: 1 | Drawing No: PB4476-008-006-008

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	13/03/2019	LB	JA	A3	1:200,000

Co-ordinate system: British National Grid **EPSG:** 27700

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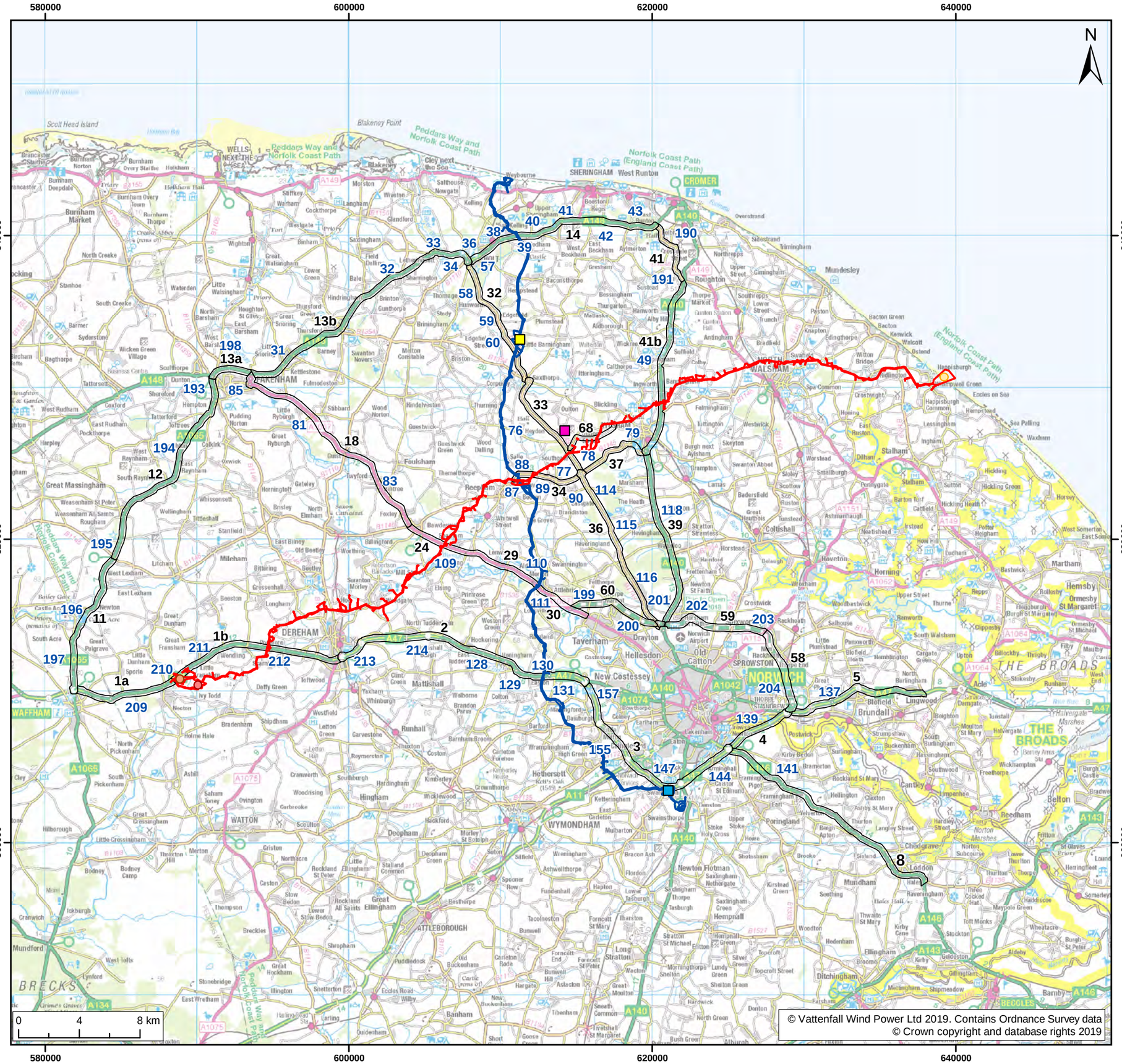
0 5 10 km



Legend:

- Norfolk Vanguard onshore red line boundary
- Landfall zone location
- Onshore project substation location
- National Grid substation extension location

Hornsea Project Three

- Onshore cable route
- Main construction compound
- Booster station
- Hornsea Project Three onshore substation
- Cumulative Impact Assessment study area

Project:	Report:
Norfolk Vanguard	Norfolk Vanguard Traffic CIA

Title:

Highways links jointly used by Norfolk Vanguard and Hornsea Project Three

Figure: 2 | Drawing No: PB4476-008-006-009

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	13/03/2019	LB	RE	A3	1:250,000

Co-ordinate system: British National Grid **EPSG:** 27700

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Royal HaskoningDHV
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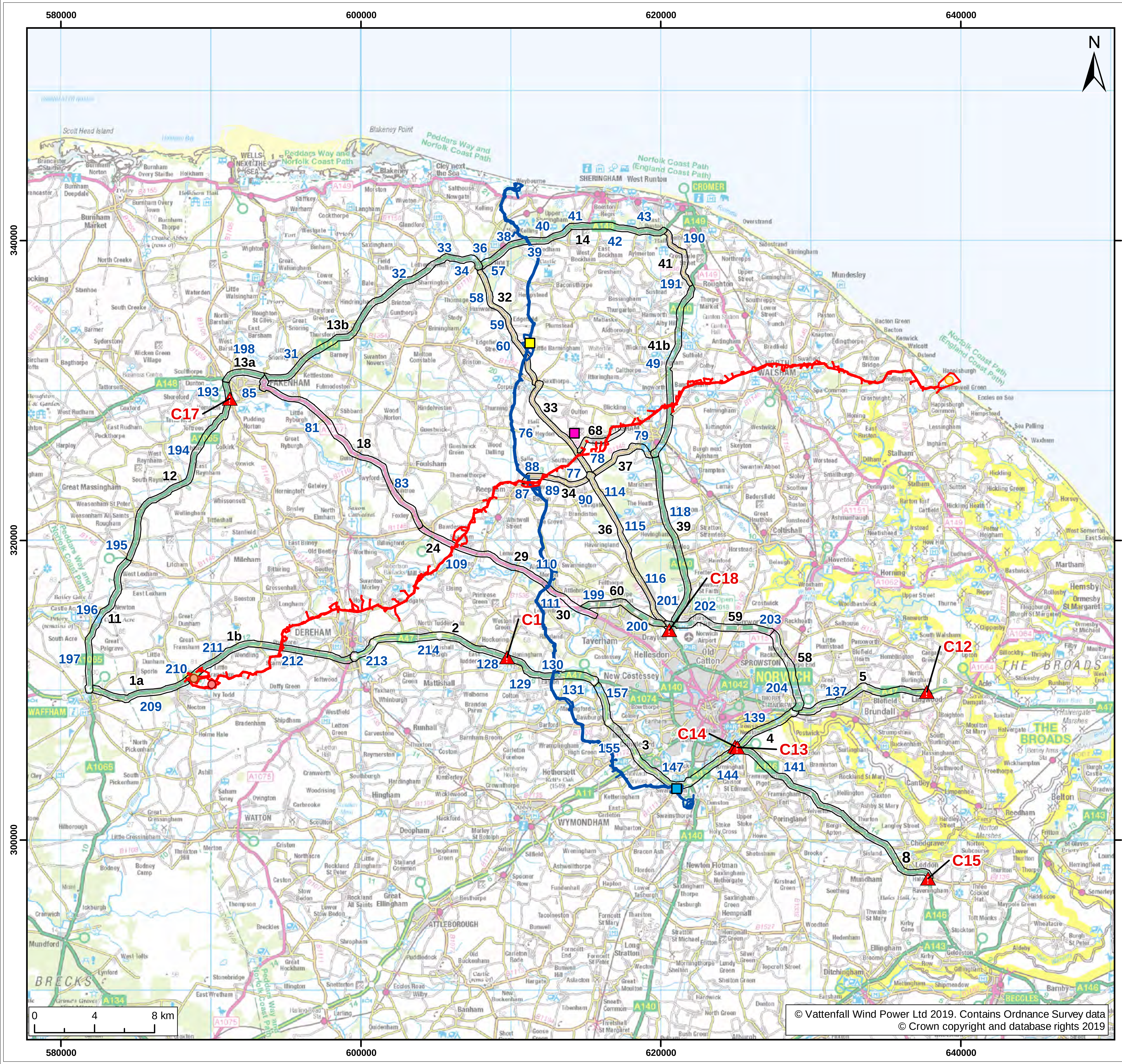

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Legend:

- ▭ Norfolk Vanguard onshore red line boundary
- ● Landfall zone location
- ● Onshore project substation location
- ● National Grid substation extension location

Hornsea Project Three

- ▭ Onshore cable route
- ■ Main construction compound
- ■ Booster station
- ■ Hornsea Project Three onshore substation
- ▭ Cumulative Impact Assessment study area
- ▲ Collision cluster[1]

[1] crashmap.co.uk, 2017.

Project:	Report:
Norfolk Vanguard	Norfolk Vanguard Traffic CIA

Title:

Collision cluster location plan

Figure: 3
Drawing No: PB4476-008-006-010

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	13/03/2019	LB	RE	A3	1:250,000

Co-ordinate system: British National Grid **EPSG:** 27700

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1.8. Appendices

Appendix A Link 13b Construction Programme and HGV Profiles

Link 13b HGV Summary Table*

	NV HVDC	03/01/2022	10/01/2022	17/01/2022	24/01/2022	31/01/2022	07/02/2022	14/02/2022	21/02/2022	28/02/2022	07/03/2022	14/03/2022	21/03/2022	28/03/2022	04/04/2022	11/04/2022	18/04/2022	25/04/2022	02/05/2022	09/05/2022	16/05/2022	23/05/2022	30/05/2022	06/06/2022	13/06/2022	20/06/2022	27/06/2022
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
ID	Infrastructure Component Cable Route Section																										
1	Section 9 & 9a: MA6-W	0	0	0	0	0	0	0	0	0	9	9	9	9	9	9	9	9	48	48	48	48	48	48	48	48	48
2	Section 10: MA6-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	48	48	48	48	48	48	48	48
3	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	9	9	9	9	9	9	9	9	48	48	48	48	48	48	48	48	48
4	Section 12: MA7-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	48	48	48	48	48	48	48	48
5	Section 13: MA8-E	0	0	0	0	0	0	0	0	0	9	9	9	9	9	9	9	9	48	48	48	48	48	48	48	48	48
6	Section 14: MA9-W	0	0	0	0	0	0	0	0	0	9	9	9	9	9	9	9	9	48	48	48	48	48	48	48	48	48
7	Section 15: MA10-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	Section 16a: MA10-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Section 17a: MA10a-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	Section 17: MA11-W	0	0	0	0	0	0	0	0	0	9	9	9	9	9	9	9	9	48	48	48	48	48	48	48	48	48
11	Section 18: MA11-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	48	48	48	48	48	48	48	48
ID	Trenchless Crossings																										
12	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	144	6	6	6	6	6	6	144	0
15	TC 10 - A140 (TC Gang 2)	0	0	0	0	0	0	0	0	0	144	6	6	6	6	6	6	144	0	0	0	0	0	0	0	0	0
16	TC 11 - Kings Beck (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	TC 12 - A149 (TC Gang 3)	0	0	0	0	0	0	0	0	0	144	6	6	6	6	6	6	144	0	0	0	0	0	0	0	0	0
18	TC 13 - N.Walsham Railway (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	144	6	6	6	6	6	6	144	0
19	TC 14 - Paston Way CWS (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	144
20	TC 15 - N.Walsham and Dilham Canal (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	TC 16 - Bacton Woodland (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	Landfall (HDD)	0	0	0	0	0	0	0	0	0	61	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
	Total HGV movements with 'Distance Deterrent' factor (70%)	0	0	0	0	0	0	0	0	0	276	46	46	46	46	46	46	239	475	282	282	282	282	282	282	475	374
	Number of Norfolk Vanguard Infrastructure components active in each week	0	0	0	0	0	0	0	0	0	8	8	8	8	8	8	8	8	11	11	11	11	11	11	11	11	10
	Hornsea Three Link 13b HGV movements	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156

	NV HVDC	04/07/2022	11/07/2022	18/07/2022	25/07/2022	01/08/2022	08/08/2022	15/08/2022	22/08/2022	29/08/2022	05/09/2022	12/09/2022	19/09/2022	26/09/2022	03/10/2022	10/10/2022	17/10/2022	24/10/2022	31/10/2022	07/11/2022	14/11/2022	21/11/2022	28/11/2022	05/12/2022	12/12/2022	19/12/2022	26/12/2022
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
ID	Infrastructure Component Cable Route Section																										
1	Section 9 & 9a: MA6-W	48	48	48	48	48	48	48	48	48	48	48	40	40	40	40	40	40	40	9	9	9	9	9	9	9	9
2	Section 10: MA6-E	48	48	48	48	48	48	48	48	48	48	40	40	40	40	40	40	40	0	0	0	0	0	0	0	0	0
3	Section 11: MA7-W	48	48	48	48	48	48	48	40	40	40	40	40	40	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Section 12: MA7-E	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	40	40	0	0	0	0
5	Section 13: MA8-E	48	48	48	48	48	48	48	48	48	48	40	40	40	40	40	40	40	9	9	9	9	9	9	9	9	0
6	Section 14: MA9-W	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	40	40	40	40	40	40	40	40	9	9	9
7	Section 15: MA10-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	Section 16a: MA10-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Section 17a: MA10a-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	Section 17: MA11-W	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	40	40	40	40	40	0	0	0	0
11	Section 18: MA11-E	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	40	40	40	0	0	0	0
ID	Trenchless Crossings																										
12	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	72	3	3	3	3	3	3	72	0	0	0	0	0	0	0	0	0	0	0
13	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	TC 10 - A140 (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	TC 11 - Kings Beck (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	144	6	6	6	6	6	6	144	0	0	0
17	TC 12 - A149 (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	TC 13 - N.Walsham Railway (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	TC 14 - Paston Way CWS (TC Gang 3)	6	6	6	6	6	6	144	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	TC 15 - N.Walsham and Dilham Canal (TC Gang 3)	0	0	0	0	0	0	0	144	6	6	6	6	6	6	144	0	0	0	0	0	0	0	0	0	0	0
21	TC 16 - Bacton Woodland (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	144	6	6	6	6	6	6	144	0	0	0
22	Landfall (HDD)	8	8	61	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total HGV movements with 'Distance Deterrent' factor (70%)	278	278	315	273	273	273	369	414	269	269	258	252	252	224	369	414	221	166	145	139	133	133	242	20	20	13
	Number of Norfolk Vanguard Infrastructure components active in each week	10	10	10	9	9	9	9	10	10	10	10	10	10	9	9	9	9	8	8	8	8	8	5	3	3	2
	Hornsea Three Link 13b HGV movements	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156

	NV HVDC	02/01/2023	09/01/2023	16/01/2023	23/01/2023	30/01/2023	06/02/2023	13/02/2023	20/02/2023	27/02/2023	06/03/2023	13/03/2023	20/03/2023	27/03/2023	03/04/2023	10/04/2023	17/04/2023	24/04/2023	01/05/2023	08/05/2023	15/05/2023	22/05/2023	29/05/2023	05/06/2023	12/06/2023	19/06/2023	26/06/2023
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
ID	Infrastructure Component Cable Route Section																										
1	Section 9 & 9a: MA6-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Section 10: MA6-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Section 12: MA7-E	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	40	9	9	9	9	9	9	9	9	0	0
5	Section 13: MA8-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Section 14: MA9-W	9	9	9	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	Section 15: MA10-W	0	0	0	0	0	0	0	0	9	9	9	9	9	9	9	9	48	48	48	48	48	48	48	48	48	48
8	Section 16a: MA10-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	48	48	48	48	48	48	48	48	40
9	Section 17a: MA10a-W	0	0	0	0	0	0	0	0	9	9	9	9	9	9	9	9	48	48	48	48	48	48	48	48	48	48
10	Section 17: MA11-W	0	0	0	0	0	0	0	0	40	40	40	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	Section 18: MA11-E	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	9	9	9	9	9	9	9	9	0	0	0
ID	Trenchless Crossings																										
12	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	144	6	6	6	6	6	6	144	0	0	0	0	0	0	0	0	0	0
14	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	TC 10 - A140 (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	TC 11 - Kings Beck (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	TC 12 - A149 (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	TC 13 - N.Walsham Railway (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	TC 14 - Paston Way CWS (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	TC 15 - N.Walsham and Dilham Canal (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	TC 16 - Bacton Woodland (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	Landfall (HDD)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total HGV movements with 'Distance Deterrent' factor (70%)	7	7	7	7	7	0	0	0	197	101	101	101	73	73	73	148	114	114	114	114	114	114	114	107	101	95
	Number of Norfolk Vanguard Infrastructure components active in each week	1	1	1	1	1	0	0	0	6	6	6	6	5	5	5	5	5	5	5	5	5	5	5	4	3	3
	Hornsea Three Link 13b HGV movements	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156

	NV HVDC	03/07/2023	10/07/2023	17/07/2023	24/07/2023	31/07/2023	07/08/2023	14/08/2023	21/08/2023	28/08/2023	04/09/2023	11/09/2023	18/09/2023	25/09/2023	02/10/2023	09/10/2023	16/10/2023	23/10/2023	30/10/2023	06/11/2023	13/11/2023	20/11/2023	27/11/2023	04/12/2023	11/12/2023	18/12/2023	25/12/2023	Main Duct Installation Totals 03.01.2022 - 25.12.2023	
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52		
ID	Infrastructure Component Cable Route Section																											Totals	Max
1	Section 9 & 9a: MA6-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6932	48
2	Section 10: MA6-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5948	48
3	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5402	48
4	Section 12: MA7-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9314	48
5	Section 13: MA8-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6692	48
6	Section 14: MA9-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8089	48
7	Section 15: MA10-W	40	40	40	40	9	9	9	9	9	9	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3938	48
8	Section 16a: MA10-E	40	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2755	48
9	Section 17a: MA10a-W	48	48	48	48	48	40	40	40	40	40	9	9	9	9	9	9	9	9	0	0	0	0	0	0	0	0	5335	48
10	Section 17: MA11-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8396	48
11	Section 18: MA11-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9075	48
ID	Trenchless Crossings																												
12	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	810	72
13	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1620	144
14	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1620	144
15	TC 10 - A140 (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1620	144
16	TC 11 - Kings Beck (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1620	144
17	TC 12 - A149 (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1620	144
18	TC 13 - N.Walsham Railway (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1620	144
19	TC 14 - Paston Way CWS (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1620	144
20	TC 15 - N.Walsham and Dilham Canal (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1620	144
21	TC 16 - Bacton Woodland (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1620	144
22	Landfall (HDD)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1280	61
	Total HGV movements with 'Distance Deterrent' factor (70%)	89	89	61	61	40	34	34	34	34	34	13	13	7	7	7	7	7	7	0	0	0	0	0	0	0	0		
	Number of Norfolk Vanguard Infrastructure components active in each week	3	3	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0	0	0	0	0	0	0	0		
	Hornsea Three Link 13b HGV movements	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156	156		

*HGV Contingencies applied within Summary Table

Duct Installation	1.2
Trenchless Crossings	1.1
Cable Pull	1.2
A47 Highway Works	1.2
Onshore Project Substation	1.2
NGET Substation	1.2

HGV Key

2 weeks @ 475 daily movements	Peak HGV demand per activity
2 weeks at 414 daily movements	Secondary Peak HGV demand activity
26 weeks at 277 average daily movements	Third Peak HGV demand activity
54 weeks at 63 average daily movements	4th Peak HGV demand activity

Link 13b total duration = 84 weeks

Link 13b Employee Summary Table

	NV HVDC	03/01/2022	10/01/2022	17/01/2022	24/01/2022	31/01/2022	07/02/2022	14/02/2022	21/02/2022	28/02/2022	07/03/2022	14/03/2022	21/03/2022	28/03/2022	04/04/2022	11/04/2022	18/04/2022	25/04/2022	02/05/2022	09/05/2022	16/05/2022	23/05/2022	30/05/2022	06/06/2022	13/06/2022	20/06/2022	27/06/2022
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
ID	Infrastructure Component Cable Route Section																										
1	Section 9 & 9a: MA6-W	0	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	40	40	40	40	40	40	40	40	40
2	Section 10: MA6-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	40	40
3	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	40	40	40	40	40	40	40	40	40
4	Section 12: MA7-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	40	40
5	Section 13: MA8-E	0	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	40	40	40	40	40	40	40	40	40
6	Section 14: MA9-W	0	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	40	40	40	40	40	40	40	40	40
7	Section 15: MA10-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	Section 16a: MA10-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Section 17a: MA10a-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	Section 17: MA11-W	0	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	40	40	40	40	40	40	40	40	40
11	Section 18: MA11-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	40	40
ID	Trenchless Crossings (employees)																										
12	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0
15	TC 10 - A140 (TC Gang 2)	0	0	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0	0	0	0	0	0	0	0	0
16	TC 11 - Kings Beck (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	TC 12 - A149 (TC Gang 3)	0	0	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0	0	0	0	0	0	0	0	0
18	TC 13 - N.Walsham Railway (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0
19	TC 14 - Paston Way CWS (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
20	TC 15 - N.Walsham and Dilham Canal (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	TC 16 - Bacton Woodland (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	Landfall (HDD) (employees)	0	0	0	0	0	0	0	0	0	40	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
	Norfolk Vanguard total person trips (two-way)	0	0	0	0	0	0	0	0	0	180	140	140	140	140	140	140	160	380	360	360	360	360	360	360	380	360
	Hornsea Three total person trips (two-way)	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139

	NV HVDC	04/07/2022	11/07/2022	18/07/2022	25/07/2022	01/08/2022	08/08/2022	15/08/2022	22/08/2022	29/08/2022	05/09/2022	12/09/2022	19/09/2022	26/09/2022	03/10/2022	10/10/2022	17/10/2022	24/10/2022	31/10/2022	07/11/2022	14/11/2022	21/11/2022	28/11/2022	05/12/2022	12/12/2022	19/12/2022	26/12/2022
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
ID	Infrastructure Component Cable Route Section																										
1	Section 9 & 9a: MA6-W	40	40	40	40	40	40	40	40	40	40	40	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
2	Section 10: MA6-E	40	40	40	40	40	40	40	40	40	40	20	20	20	20	20	20	20	0	0	0	0	0	0	0	0	0
3	Section 11: MA7-W	40	40	40	40	40	40	40	20	20	20	20	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Section 12: MA7-E	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	20	20	0	0	0	0
5	Section 13: MA8-E	40	40	40	40	40	40	40	40	40	40	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	0
6	Section 14: MA9-W	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	20	20	20	20	20	20	20	20	20	20	20
7	Section 15: MA10-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	Section 16a: MA10-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Section 17a: MA10a-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	Section 17: MA11-W	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	20	20	20	20	20	0	0	0	0
11	Section 18: MA11-E	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	20	20	20	0	0	0	0
ID	Trenchless Crossings (employees)																										
12	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0	0	0	0	0	0	0	0	0	0	0
13	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	TC 10 - A140 (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	TC 11 - Kings Beck (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0	0	0
17	TC 12 - A149 (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	TC 13 - N.Walsham Railway (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	TC 14 - Paston Way CWS (TC Gang 3)	10	10	10	10	10	10	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	TC 15 - N.Walsham and Dilham Canal (TC Gang 3)	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0	0	0	0	0	0	0	0	0	0	0
21	TC 16 - Bacton Woodland (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0	0	0
22	Landfall (HDD) (employees)	20	20	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Norfolk Vanguard total person trips (two-way)	350	350	370	330	330	330	340	340	320	320	280	260	260	240	260	240	220	180	180	160	140	140	100	60	60	40
	Hornsea Three total person trips (two-way)	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139

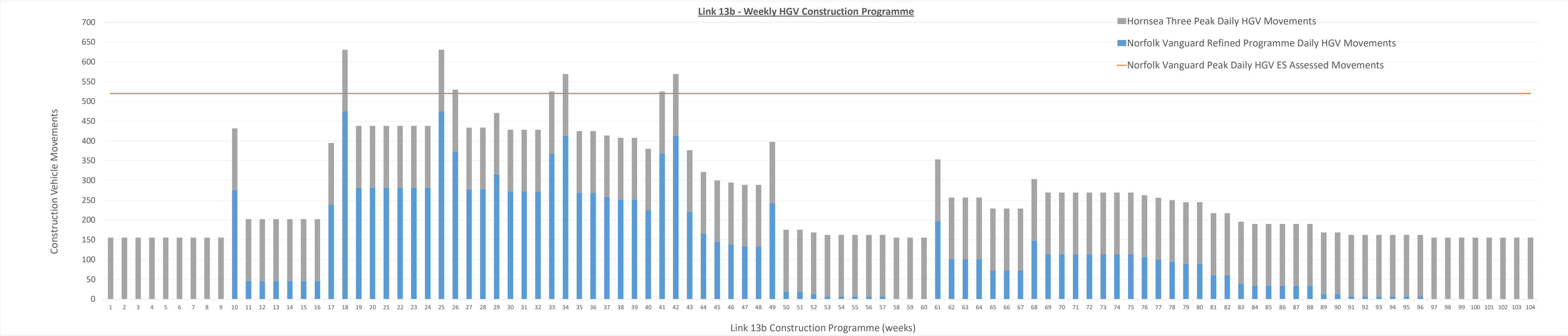
	NV HVDC	02/01/2023	09/01/2023	16/01/2023	23/01/2023	30/01/2023	06/02/2023	13/02/2023	20/02/2023	27/02/2023	06/03/2023	13/03/2023	20/03/2023	27/03/2023	03/04/2023	10/04/2023	17/04/2023	24/04/2023	01/05/2023	08/05/2023	15/05/2023	22/05/2023	29/05/2023	05/06/2023	12/06/2023	19/06/2023	26/06/2023
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
ID	Infrastructure Component Cable Route Section																										
1	Section 9 & 9a: MA6-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Section 10: MA6-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Section 12: MA7-E	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	0	0
5	Section 13: MA8-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Section 14: MA9-W	20	20	20	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	Section 15: MA10-W	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	40	40	40	40	40	40	40	40	40	40
8	Section 16a: MA10-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	40	40	20
9	Section 17a: MA10a-W	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	40	40	40	40	40	40	40	40	40	40
10	Section 17: MA11-W	0	0	0	0	0	0	0	0	20	20	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	Section 18: MA11-E	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	0	0	0
ID	Trenchless Crossings (employees)																										
12	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0	0	0	0	0	0	0	0	0	0
14	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	TC 10 - A140 (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	TC 11 - Kings Beck (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	TC 12 - A149 (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	TC 13 - N.Walsham Railway (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	TC 14 - Paston Way CWS (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	TC 15 - N.Walsham and Dilham Canal (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	TC 16 - Bacton Woodland (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	Landfall (HDD) (employees)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Norfolk Vanguard total person trips (two-way)	20	20	20	20	20	0	0	0	120	110	110	110	90	90	90	100	160	160	160	160	160	160	160	140	120	100
	Hornsea Three total person trips (two-way)	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139

	NV HVDC	03/07/2023	10/07/2023	17/07/2023	24/07/2023	31/07/2023	07/08/2023	14/08/2023	21/08/2023	28/08/2023	04/09/2023	11/09/2023	18/09/2023	25/09/2023	02/10/2023	09/10/2023	16/10/2023	23/10/2023	30/10/2023	06/11/2023	13/11/2023	20/11/2023	27/11/2023	04/12/2023	11/12/2023	18/12/2023	25/12/2023	Main Duct Installation Totals 03.01.2022 - 25.12.2023	
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	Main Duct Installation Totals 03.01.2022 - 25.12.2023	
ID	Infrastructure Component Cable Route Section																											Totals	Max
1	Section 9 & 9a: MA6-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6300	40
2	Section 10: MA6-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4500	40
3	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4600	40
4	Section 12: MA7-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7600	40
5	Section 13: MA8-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6100	40
6	Section 14: MA9-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7200	40
7	Section 15: MA10-W	20	20	20	20	20	20	20	20	20	20	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4000	40
8	Section 16a: MA10-E	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2100	40
9	Section 17a: MA10a-W	40	40	40	40	40	20	20	20	20	20	20	20	20	20	20	20	20	20	0	0	0	0	0	0	0	0	5100	40
10	Section 17: MA11-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6900	40
11	Section 18: MA11-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7400	40
ID	Trenchless Crossings (employees)																												
12	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
13	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
14	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
15	TC 10 - A140 (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
16	TC 11 - Kings Beck (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
17	TC 12 - A149 (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
18	TC 13 - N.Walsham Railway (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
19	TC 14 - Paston Way CWS (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
20	TC 15 - N.Walsham and Dilham Canal (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
21	TC 16 - Bacton Woodland (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
22	Landfall (HDD) (employees)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2200	40
	Norfolk Vanguard total person trips (two-way)	80	80	60	60	60	40	40	40	40	40	40	40	20	20	20	20	20	20	0	0	0	0	0	0	0	0		
	Hornsea Three total person trips (two-way)	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139	139		

Employee Key

2 weeks @ 380 peak daily movements	Peak employee demand per activity
17 weeks at 347 average daily movements	Secondary Peak employee demand activity
33 weeks at 169 average daily movements	Third Peak employee demand activity
32 weeks at 49 average daily movements	4th Peak employee demand activity

Link 13b total duration = 84 weeks



Appendix B Link 32 Construction Programme and HGV Profiles

Link 32 HGV Summary Table*

		03/01/2022	10/01/2022	17/01/2022	24/01/2022	31/01/2022	07/02/2022	14/02/2022	21/02/2022	28/02/2022	07/03/2022	14/03/2022	21/03/2022	28/03/2022	04/04/2022	11/04/2022	18/04/2022	25/04/2022	02/05/2022	09/05/2022	16/05/2022	23/05/2022	30/05/2022	06/06/2022	13/06/2022	20/06/2022	27/06/2022
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
ID	Infrastructure Component Cable Route Section																										
1	Section 9 & 9a: MA6-W	0	0	0	0	0	0	0	0	0	9	9	9	9	9	9	9	9	48	48	48	48	48	48	48	48	48
2	Section 10: MA6-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	48	48	48	48	48	48	48	48
3	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	9	9	9	9	9	9	9	9	48	48	48	48	48	48	48	48	48
4	Section 12: MA7-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	48	48	48	48	48	48	48	48
ID	Trenchless Crossings																										
5	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	72	3	3	3	3	3	3	72	0
	Total HGV movements with 'Distance Deterrent' factor (70%)	0	0	0	0	0	0	0	0	0	13	13	13	13	13	13	13	13	184	136	136	136	136	136	136	184	134
	Number of Norfolk Vanguard Infrastructure components active in each week	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	5	5	5	5	5	5	5	5	4
	Hornsea Three Link 32 HGV movements	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153

		04/07/2022	11/07/2022	18/07/2022	25/07/2022	01/08/2022	08/08/2022	15/08/2022	22/08/2022	29/08/2022	05/09/2022	12/09/2022	19/09/2022	26/09/2022	03/10/2022	10/10/2022	17/10/2022	24/10/2022	31/10/2022	07/11/2022	14/11/2022	21/11/2022	28/11/2022	05/12/2022	12/12/2022	19/12/2022	26/12/2022
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
ID	Infrastructure Component Cable Route Section																										
1	Section 9 & 9a: MA6-W	48	48	48	48	48	48	48	48	48	48	48	40	40	40	40	40	40	40	9	9	9	9	9	9	9	9
2	Section 10: MA6-E	48	48	48	48	48	48	48	48	48	48	40	40	40	40	40	40	40	0	0	0	0	0	0	0	0	0
3	Section 11: MA7-W	48	48	48	48	48	48	48	40	40	40	40	40	40	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Section 12: MA7-E	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	40	40	0	0	0	0
ID	Trenchless Crossings																										
5	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	72	3	3	3	3	3	3	72	0	0	0	0	0	0	0	0	0	0	0
6	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total HGV movements with 'Distance Deterrent' factor (70%)	134	134	134	134	134	134	134	179	131	131	125	119	119	92	140	89	89	61	40	40	34	34	7	7	7	7
	Number of Norfolk Vanguard Infrastructure components active in each week	4	4	4	4	4	4	4	5	5	5	5	5	5	4	4	3	3	2	2	2	2	2	1	1	1	1
	Hornsea Three Link 32 HGV movements	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153

		02/01/2023	09/01/2023	16/01/2023	23/01/2023	30/01/2023	06/02/2023	13/02/2023	20/02/2023	27/02/2023	06/03/2023	13/03/2023	20/03/2023	27/03/2023	03/04/2023	10/04/2023	17/04/2023	24/04/2023	01/05/2023	08/05/2023	15/05/2023	22/05/2023	29/05/2023	05/06/2023	12/06/2023	19/06/2023	26/06/2023
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
ID	Infrastructure Component Cable Route Section																										
1	Section 9 & 9a: MA6-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Section 10: MA6-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Section 12: MA7-E	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	40	9	9	9	9	9	9	9	9	0	0
ID	Trenchless Crossings																										
5	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	144	6	6	6	6	6	6	144	0	0	0	0	0	0	0	0	0	0
7	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total HGV movements with 'Distance Deterrent' factor (70%)	0	0	0	0	0	0	0	0	129	32	32	32	32	32	32	129	7	7	7	7	7	7	7	7	0	0
	Number of Norfolk Vanguard Infrastructure components active in each week	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	0	0
	Hornsea Three Link 32 HGV movements	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153

		03/07/2023	10/07/2023	17/07/2023	24/07/2023	31/07/2023	07/08/2023	14/08/2023	21/08/2023	28/08/2023	04/09/2023	11/09/2023	18/09/2023	25/09/2023	02/10/2023	09/10/2023	16/10/2023	23/10/2023	30/10/2023	06/11/2023	13/11/2023	20/11/2023	27/11/2023	04/12/2023	11/12/2023	18/12/2023	25/12/2023	Main Duct Installation Totals 03.01.2022 - 25.12.2023	
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52		
ID	Infrastructure Component Cable Route Section																											Totals	Max
1	Section 9 & 9a: MA6-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6932	48
2	Section 10: MA6-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5948	48
3	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5402	48
4	Section 12: MA7-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9314	48
ID	Trenchless Crossings																												
5	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	810	72
6	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1620	144
7	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	810	72
	Total HGV movements with 'Distance Deterrent' factor (70%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Number of Norfolk Vanguard Infrastructure components active in each week	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Hornsea Three Link 32 HGV movements	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153		

***HGV Contingencies applied within Summary Table**

Duct Installation	1.2
Trenchless Crossings	1.1
Cable Pull	1.2
A47 Highway Works	1.2
Onshore Project Substation	1.2
NGET Substation	1.2

HGV Key

2 weeks at 184 daily movements	Peak HGV demand per activity
1 weeks at 179 daily movements	Secondary Peak HGV demand activity
22 weeks at 132 average daily movements	Third Peak HGV demand activity
34 weeks at 25 average daily movements	4th Peak HGV demand activity
Link 32 total duration = 59 weeks	

Link 32 Employee Summary Table

		03/01/2022	10/01/2022	17/01/2022	24/01/2022	31/01/2022	07/02/2022	14/02/2022	21/02/2022	28/02/2022	07/03/2022	14/03/2022	21/03/2022	28/03/2022	04/04/2022	11/04/2022	18/04/2022	25/04/2022	02/05/2022	09/05/2022	16/05/2022	23/05/2022	30/05/2022	06/06/2022	13/06/2022	20/06/2022	27/06/2022
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
ID	Infrastructure Component Cable Route Section																										
1	Section 9 & 9a: MA6-W	0	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	40	40	40	40	40	40	40	40	40
2	Section 10: MA6-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	40	40
3	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	40	40	40	40	40	40	40	40	40
4	Section 12: MA7-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	40	40
ID	Trenchless Crossings (employees)																										
5	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0
	Norfolk Vanguard total person trips (two-way)	0	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	40	180	170	170	170	170	170	170	180	160
	Hornsea Three total person trips (two-way)	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138

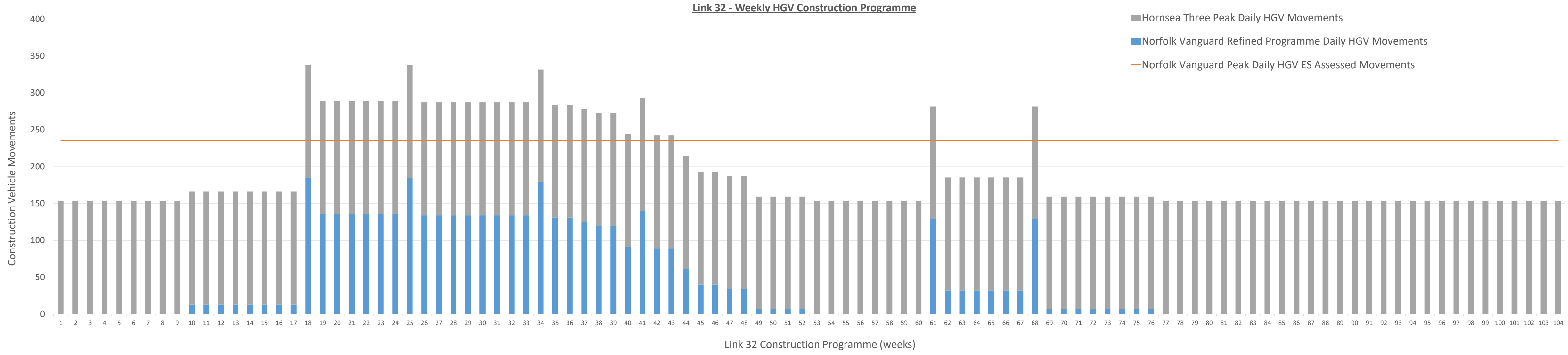
		04/07/2022	11/07/2022	18/07/2022	25/07/2022	01/08/2022	08/08/2022	15/08/2022	22/08/2022	29/08/2022	05/09/2022	12/09/2022	19/09/2022	26/09/2022	03/10/2022	10/10/2022	17/10/2022	24/10/2022	31/10/2022	07/11/2022	14/11/2022	21/11/2022	28/11/2022	05/12/2022	12/12/2022	19/12/2022	26/12/2022
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
ID	Infrastructure Component Cable Route Section																										
1	Section 9 & 9a: MA6-W	40	40	40	40	40	40	40	40	40	40	40	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
2	Section 10: MA6-E	40	40	40	40	40	40	40	40	40	40	20	20	20	20	20	20	20	0	0	0	0	0	0	0	0	0
3	Section 11: MA7-W	40	40	40	40	40	40	40	20	20	20	20	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Section 12: MA7-E	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	20	20	0	0	0	0
ID	Trenchless Crossings (employees)																										
5	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0	0	0	0	0	0	0	0	0	0	0
6	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Norfolk Vanguard total person trips (two-way)	160	160	160	160	160	160	160	160	150	150	130	110	110	90	100	80	80	60	60	60	40	40	20	20	20	20
	Hornsea Three total person trips (two-way)	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138

		02/01/2023	09/01/2023	16/01/2023	23/01/2023	30/01/2023	06/02/2023	13/02/2023	20/02/2023	27/02/2023	06/03/2023	13/03/2023	20/03/2023	27/03/2023	03/04/2023	10/04/2023	17/04/2023	24/04/2023	01/05/2023	08/05/2023	15/05/2023	22/05/2023	29/05/2023	05/06/2023	12/06/2023	19/06/2023	26/06/2023
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
ID	Infrastructure Component Cable Route Section																										
1	Section 9 & 9a: MA6-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Section 10: MA6-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Section 12: MA7-E	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	0	0
ID	Trenchless Crossings (employees)																										
5	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0	0	0	0	0	0	0	0	0	0
7	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Norfolk Vanguard total person trips (two-way)	0	0	0	0	0	0	0	0	40	30	30	30	30	30	30	40	20	20	20	20	20	20	20	20	0	0
	Hornsea Three total person trips (two-way)	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138

		03/07/2023	10/07/2023	17/07/2023	24/07/2023	31/07/2023	07/08/2023	14/08/2023	21/08/2023	28/08/2023	04/09/2023	11/09/2023	18/09/2023	25/09/2023	02/10/2023	09/10/2023	16/10/2023	23/10/2023	30/10/2023	06/11/2023	13/11/2023	20/11/2023	27/11/2023	04/12/2023	11/12/2023	18/12/2023	25/12/2023	Main Duct Installation Totals 03.01.2022 - 25.12.2023	
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52		
ID	Infrastructure Component Cable Route Section																											Totals	Max
1	Section 9 & 9a: MA6-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6300	40
2	Section 10: MA6-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4500	40
3	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4600	40
4	Section 12: MA7-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7600	40
ID	Trenchless Crossings (employees)																												
5	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
6	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
7	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
	Norfolk Vanguard total person trips (two-way)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Hornsea Three total person trips (two-way)	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138	138		

Employee Key

2 weeks at 180 peak daily movements	Peak employee demand per activity
15 weeks at 164 average daily movements	Secondary Peak employee demand activity
9 weeks at 112 average daily movements	Third Peak employee demand activity
33 weeks at 32 average daily movements	4th Peak employee demand activity
Link 32 total duration = 59 weeks	



Appendix C Link 41 Construction Programme and HGV Profiles

Link 41 HGV Summary Table*

ID	NV HVDC	03/01/2022	10/01/2022	17/01/2022	24/01/2022	31/01/2022	07/02/2022	14/02/2022	21/02/2022	28/02/2022	07/03/2022	14/03/2022	21/03/2022	28/03/2022	04/04/2022	11/04/2022	18/04/2022	25/04/2022	02/05/2022	09/05/2022	16/05/2022	23/05/2022	30/05/2022	06/06/2022	13/06/2022	20/06/2022	27/06/2022
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
ID	Infrastructure Component Cable Route Section																										
1	Section 13: MA8-E	0	0	0	0	0	0	0	0	0	9	9	9	9	9	9	9	9	48	48	48	48	48	48	48	48	48
2	Section 14: MA9-W	0	0	0	0	0	0	0	0	0	9	9	9	9	9	9	9	9	48	48	48	48	48	48	48	48	48
3	Section 15: MA10-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Section 16a: MA10-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Section 17a: MA10a-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Section 17: MA11-W	0	0	0	0	0	0	0	0	0	9	9	9	9	9	9	9	9	48	48	48	48	48	48	48	48	48
7	Section 18: MA11-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	48	48	48	48	48	48	48	48
ID	Trenchless Crossings																										
8	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	144	6	6	6	6	6	6	144	0
9	TC 10 - A140 (TC Gang 2)	0	0	0	0	0	0	0	0	0	144	6	6	6	6	6	6	144	0	0	0	0	0	0	0	0	0
10	TC 11 - Kings Beck (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	TC 12 - A149 (TC Gang 3)	0	0	0	0	0	0	0	0	0	144	6	6	6	6	6	6	144	0	0	0	0	0	0	0	0	0
12	TC 13 - N.Walsham Railway (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	144	6	6	6	6	6	6	144	0
13	TC 14 - Paston Way CWS (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	144
14	TC 15 - N.Walsham and Dilham Canal (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	TC 16 - Bacton Woodland (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	Landfall (HDD)	0	0	0	0	0	0	0	0	0	30	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Norfolk Vanguard total HGV movements with 'Distance Deterrent' factor (70%)	0	0	0	0	0	0	0	0	0	242	31	31	31	31	31	31	223	338	145	145	145	145	145	145	338	237
	Number of Norfolk Vanguard Infrastructure components active in each week	0	0	0	0	0	0	0	0	0	6	6	6	6	6	6	6	6	7	7	7	7	7	7	7	7	6
	Hornsea Three Link 41 HGV movements	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149

ID	NV HVDC	04/07/2022	11/07/2022	18/07/2022	25/07/2022	01/08/2022	08/08/2022	15/08/2022	22/08/2022	29/08/2022	05/09/2022	12/09/2022	19/09/2022	26/09/2022	03/10/2022	10/10/2022	17/10/2022	24/10/2022	31/10/2022	07/11/2022	14/11/2022	21/11/2022	28/11/2022	05/12/2022	12/12/2022	19/12/2022	26/12/2022
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
ID	Infrastructure Component Cable Route Section																										
1	Section 13: MA8-E	48	48	48	48	48	48	48	48	48	48	40	40	40	40	40	40	40	9	9	9	9	9	9	9	9	0
2	Section 14: MA9-W	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	40	40	40	40	40	40	40	40	9	9	9
3	Section 15: MA10-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Section 16a: MA10-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Section 17a: MA10a-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Section 17: MA11-W	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	40	40	40	40	40	0	0	0	0
7	Section 18: MA11-E	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	40	40	40	0	0	0	0
ID	Trenchless Crossings																										
8	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	TC 10 - A140 (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	TC 11 - Kings Beck (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	144	6	6	6	6	6	6	144	0	0	0
11	TC 12 - A149 (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	TC 13 - N.Walsham Railway (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	TC 14 - Paston Way CWS (TC Gang 3)	6	6	6	6	6	6	144	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	TC 15 - N.Walsham and Dilham Canal (TC Gang 3)	0	0	0	0	0	0	0	144	6	6	6	6	6	6	144	0	0	0	0	0	0	0	0	0	0	0
15	TC 16 - Bacton Woodland (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	144	6	6	6	6	6	6	144	0	0	0
16	Landfall (HDD)	4	4	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Norfolk Vanguard total HGV movements with 'Distance Deterrent' factor (70%)	141	141	160	138	138	138	235	235	138	138	133	133	133	133	229	324	132	104	104	99	99	99	236	13	13	7
	Number of Norfolk Vanguard Infrastructure components active in each week	6	6	6	5	5	5	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6	6	4	2	2	1
	Hornsea Three Link 41 HGV movements	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149

ID	NV HVDC	02/01/2023	09/01/2023	16/01/2023	23/01/2023	30/01/2023	06/02/2023	13/02/2023	20/02/2023	27/02/2023	06/03/2023	13/03/2023	20/03/2023	27/03/2023	03/04/2023	10/04/2023	17/04/2023	24/04/2023	01/05/2023	08/05/2023	15/05/2023	22/05/2023	29/05/2023	05/06/2023	12/06/2023	19/06/2023	26/06/2023
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
ID	Infrastructure Component Cable Route Section																										
1	Section 13: MA8-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Section 14: MA9-W	9	9	9	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Section 15: MA10-W	0	0	0	0	0	0	0	0	9	9	9	9	9	9	9	9	48	48	48	48	48	48	48	48	48	48
4	Section 16a: MA10-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	48	48	48	48	48	48	48	48	40
5	Section 17a: MA10a-W	0	0	0	0	0	0	0	0	9	9	9	9	9	9	9	9	48	48	48	48	48	48	48	48	48	48
6	Section 17: MA11-W	0	0	0	0	0	0	0	0	40	40	40	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	Section 18: MA11-E	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	9	9	9	9	9	9	9	9	0	0	0
ID	Trenchless Crossings																										
8	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	TC 10 - A140 (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	TC 11 - Kings Beck (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	TC 12 - A149 (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	TC 13 - N.Walsham Railway (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	TC 14 - Paston Way CWS (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	TC 15 - N.Walsham and Dilham Canal (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	TC 16 - Bacton Woodland (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	Landfall (HDD)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Norfolk Vanguard total HGV movements with 'Distance Deterrent' factor (70%)	7	7	7	7	7	0	0	0	69	69	69	69	41	41	41	20	107	107	107	107	107	107	107	101	101	95
	Number of Norfolk Vanguard Infrastructure components active in each week	1	1	1	1	1	0	0	0	4	4	4	4	3	3	3	3	4	4	4	4	4	4	4	3	3	3
	Hornsea Three Link 41 HGV movements	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149

ID	NV HVDC	03/07/2023	10/07/2023	17/07/2023	24/07/2023	31/07/2023	07/08/2023	14/08/2023	21/08/2023	28/08/2023	04/09/2023	11/09/2023	18/09/2023	25/09/2023	02/10/2023	09/10/2023	16/10/2023	23/10/2023	30/10/2023	06/11/2023	13/11/2023	20/11/2023	27/11/2023	04/12/2023	11/12/2023	18/12/2023	25/12/2023	Main Duct Installation Totals 03.01.2022 - 25.12.2023	
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	Totals	Max
ID	Infrastructure Component Cable Route Section																												
1	Section 13: MA8-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6692	48
2	Section 14: MA9-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8089	48
3	Section 15: MA10-W	40	40	40	40	9	9	9	9	9	9	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3938	48
4	Section 16a: MA10-E	40	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2755	48
5	Section 17a: MA10a-W	48	48	48	48	48	40	40	40	40	40	9	9	9	9	9	9	9	9	0	0	0	0	0	0	0	0	5335	48
6	Section 17: MA11-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8396	48
7	Section 18: MA11-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9075	48
ID	Trenchless Crossings																												
8	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1620	144
9	TC 10 - A140 (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1620	144
10	TC 11 - Kings Beck (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1620	144
11	TC 12 - A149 (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1620	144
12	TC 13 - N.Walsham Railway (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1620	144
13	TC 14 - Paston Way CWS (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1620	144
14	TC 15 - N.Walsham and Dilham Canal (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1620	144
15	TC 16 - Bacton Woodland (TC Gang 3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1620	144
16	Landfall (HDD)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	640	30
	Norfolk Vanguard total HGV movements with 'Distance Deterrent' factor (70%)	89	89	61	61	40	34	34	34	34	34	13	13	7	7	7	7	7	7	0	0	0	0	0	0	0	0		
	Number of Norfolk Vanguard Infrastructure components active in each week	3	3	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	0	0	0	0	0	0	0	0		
	Hornsea Three Link 41 HGV movements	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149	149		

*HGV Contingencies applied within Summary Table

Duct Installation	1.2
Trenchless Crossings	1.1
Cable Pull	1.2
A47 Highway Works	1.2
Onshore Project Substation	1.2
NGET Substation	1.2

HGV Key

2 weeks at 338 daily movements	Peak HGV demand per activity
1 weeks at 324 daily movements	Secondary Peak HGV demand activity
7 weeks at 234 average daily movements	Third Peak HGV demand activity
30 weeks at 128 average daily movements	4th Peak HGV demand activity
44 weeks at 37 average daily movements	5th Peak HGV demand activity
Link 41 total duration = 84 weeks	

Link 41 Employee Summary Table

ID	NV HVDC	03/01/2022	10/01/2022	17/01/2022	24/01/2022	31/01/2022	07/02/2022	14/02/2022	21/02/2022	28/02/2022	07/03/2022	14/03/2022	21/03/2022	28/03/2022	04/04/2022	11/04/2022	18/04/2022	25/04/2022	02/05/2022	09/05/2022	16/05/2022	23/05/2022	30/05/2022	06/06/2022	13/06/2022	20/06/2022	27/06/2022
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
ID	Infrastructure Component Cable Route Section (employees)																										
1	Section 13: MA8-E	0	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	40	40	40	40	40	40	40	40	40
2	Section 14: MA9-W	0	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	40	40	40	40	40	40	40	40	40
3	Section 15: MA10-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Section 16a: MA10-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Section 17a: MA10a-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Section 17: MA11-W	0	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	40	40	40	40	40	40	40	40	40
7	Section 18: MA11-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	40	40
ID	Trenchless Crossings (employees)																										
8	TC 9 - R.Bure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0
9	TC 10 - A140	0	0	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0	0	0	0	0	0	0	0	0
10	TC 11 - Kings Beck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	TC 12 - A149	0	0	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0	0	0	0	0	0	0	0	0
12	TC 13 - N.Walsham Railway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0
13	TC 14 - Paston Way CWS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
14	TC 15 - N.Walsham and Dilham Canal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	TC 16 - Bacton Woodland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	Landfall (HDD) (employees)	0	0	0	0	0	0	0	0	0	40	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
	Norfolk Vanguard total person trips (two-way)	0	0	0	0	0	0	0	0	0	140	100	100	100	100	100	100	120	220	200	200	200	200	200	200	220	200
	Hornsea Three total person trips (two-way)	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322

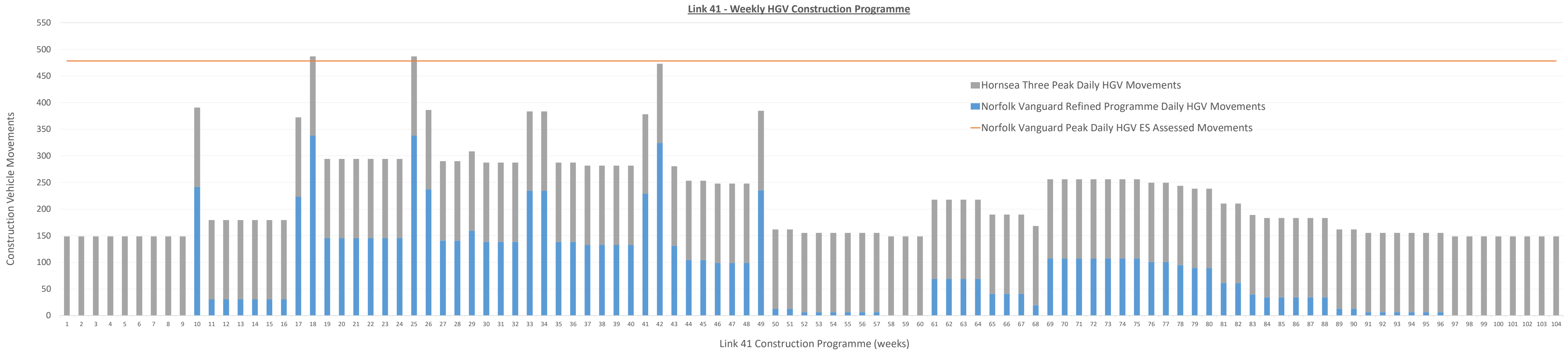
ID	NV HVDC	04/07/2022	11/07/2022	18/07/2022	25/07/2022	01/08/2022	08/08/2022	15/08/2022	22/08/2022	29/08/2022	05/09/2022	12/09/2022	19/09/2022	26/09/2022	03/10/2022	10/10/2022	17/10/2022	24/10/2022	31/10/2022	07/11/2022	14/11/2022	21/11/2022	28/11/2022	05/12/2022	12/12/2022	19/12/2022	26/12/2022
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
ID	Infrastructure Component Cable Route Section (employees)																										
1	Section 13: MA8-E	40	40	40	40	40	40	40	40	40	40	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	0
2	Section 14: MA9-W	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	20	20	20	20	20	20	20	20	20	20	20
3	Section 15: MA10-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Section 16a: MA10-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Section 17a: MA10a-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Section 17: MA11-W	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	20	20	20	20	20	0	0	0	0
7	Section 18: MA11-E	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	20	20	20	0	0	0	0
ID	Trenchless Crossings (employees)																										
8	TC 9 - R.Bure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	TC 10 - A140	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	TC 11 - Kings Beck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0	0	0
11	TC 12 - A149	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	TC 13 - N.Walsham Railway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	TC 14 - Paston Way CWS	10	10	10	10	10	10	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	TC 15 - N.Walsham and Dilham Canal	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0	0	0	0	0	0	0	0	0	0	0
15	TC 16 - Bacton Woodland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0	0	0
16	Landfall (HDD) (employees)	20	20	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Norfolk Vanguard total person trips (two-way)	190	190	210	170	170	170	180	180	170	170	150	150	150	150	160	160	140	120	120	100	100	100	80	40	40	20
	Hornsea Three total person trips (two-way)	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322

ID	NV HVDC	02/01/2023	09/01/2023	16/01/2023	23/01/2023	30/01/2023	06/02/2023	13/02/2023	20/02/2023	27/02/2023	06/03/2023	13/03/2023	20/03/2023	27/03/2023	03/04/2023	10/04/2023	17/04/2023	24/04/2023	01/05/2023	08/05/2023	15/05/2023	22/05/2023	29/05/2023	05/06/2023	12/06/2023	19/06/2023	26/06/2023
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
ID	Infrastructure Component Cable Route Section (employees)																										
1	Section 13: MA8-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Section 14: MA9-W	20	20	20	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Section 15: MA10-W	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	40	40	40	40	40	40	40	40	40	40
4	Section 16a: MA10-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	40	40	20
5	Section 17a: MA10a-W	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	40	40	40	40	40	40	40	40	40	40
6	Section 17: MA11-W	0	0	0	0	0	0	0	0	20	20	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	Section 18: MA11-E	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	0	0	0
ID	Trenchless Crossings (employees)																										
8	TC 9 - R.Bure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	TC 10 - A140	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	TC 11 - Kings Beck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	TC 12 - A149	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	TC 13 - N.Walsham Railway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	TC 14 - Paston Way CWS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	TC 15 - N.Walsham and Dilham Canal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	TC 16 - Bacton Woodland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	Landfall (HDD) (employees)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Norfolk Vanguard total person trips (two-way)	20	20	20	20	20	0	0	0	80	80	80	80	60	60	60	60	140	140	140	140	140	140	140	120	120	100
	Hornsea Three total person trips (two-way)	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322

ID	NV HVDC	03/07/2023	10/07/2023	17/07/2023	24/07/2023	31/07/2023	07/08/2023	14/08/2023	21/08/2023	28/08/2023	04/09/2023	11/09/2023	18/09/2023	25/09/2023	02/10/2023	09/10/2023	16/10/2023	23/10/2023	30/10/2023	06/11/2023	13/11/2023	20/11/2023	27/11/2023	04/12/2023	11/12/2023	18/12/2023	25/12/2023	Main Duct Installation Totals 03.01.2022 - 25.12.2023	
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	Totals	Max
ID	Infrastructure Component Cable Route Section (employees)																												
1	Section 13: MA8-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6100	40
2	Section 14: MA9-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7200	40
3	Section 15: MA10-W	20	20	20	20	20	20	20	20	20	20	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4000	40
4	Section 16a: MA10-E	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2100	40
5	Section 17a: MA10a-W	40	40	40	40	40	20	20	20	20	20	20	20	20	20	20	20	20	20	0	0	0	0	0	0	0	0	5100	40
6	Section 17: MA11-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6900	40
7	Section 18: MA11-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7400	40
ID	Trenchless Crossings (employees)																												
8	TC 9 - R.Bure	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
9	TC 10 - A140	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
10	TC 11 - Kings Beck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
11	TC 12 - A149	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
12	TC 13 - N.Walsham Railway	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
13	TC 14 - Paston Way CWS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
14	TC 15 - N.Walsham and Dilham Canal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
15	TC 16 - Bacton Woodland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
16	Landfall (HDD) (employees)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2200	40
	Norfolk Vanguard total person trips (two-way)	80	80	60	60	60	40	40	40	40	40	40	40	20	20	20	20	20	20	0	0	0	0	0	0	0	0		
	Hornsea Three total person trips (two-way)	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322	322		

Employee Key

2 weeks @ 220 daily movements	Peak employee demand per activity
7 weeks at 200 daily movements	Secondary Peak employee demand activity
16 weeks at 170 average daily movements	Third Peak employee demand activity
30 weeks at 111 average daily movements	4th Peak employee demand activity
29 weeks at 39 average daily movements	5th Peak HGV demand activity
Link 41 total duration = 84 weeks	



Appendix D Link 68 Construction Programme and HGV Profiles

Link 68 HGV Summary Table*

ID	Infrastructure Component Cable Route Section	03/01/2022	10/01/2022	17/01/2022	24/01/2022	31/01/2022	07/02/2022	14/02/2022	21/02/2022	28/02/2022	07/03/2022	14/03/2022	21/03/2022	28/03/2022	04/04/2022	11/04/2022	18/04/2022	25/04/2022	02/05/2022	09/05/2022	16/05/2022	23/05/2022	30/05/2022	06/06/2022	13/06/2022	20/06/2022	27/06/2022
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	9	9	9	9	9	9	9	9	48	48	48	48	48	48	48	48	48
2	Section 12: MA7-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	48	48	48	48	48	48	48	48
	Norfolk Vanguard total HGV movements with 'Distance Deterrent' factor (70%)	0	0	0	0	0	0	0	0	0	9	9	9	9	9	9	9	9	96	96	96	96	96	96	96	96	96
	Number of Norfolk Vanguard Infrastructure components active in each week	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
	Hornsea Three Link 41 HGV movements	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118

ID	Infrastructure Component Cable Route Section	04/07/2022	11/07/2022	18/07/2022	25/07/2022	01/08/2022	08/08/2022	15/08/2022	22/08/2022	29/08/2022	05/09/2022	12/09/2022	19/09/2022	26/09/2022	03/10/2022	10/10/2022	17/10/2022	24/10/2022	31/10/2022	07/11/2022	14/11/2022	21/11/2022	28/11/2022	05/12/2022	12/12/2022	19/12/2022	26/12/2022
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
1	Section 11: MA7-W	48	48	48	48	48	48	48	40	40	40	40	40	40	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Section 12: MA7-E	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	40	40	0	0	0	0
	Norfolk Vanguard total HGV movements with 'Distance Deterrent' factor (70%)	96	96	96	96	96	96	96	88	88	88	88	88	88	48	48	48	48	48	48	48	40	40	0	0	0	0
	Number of Norfolk Vanguard Infrastructure components active in each week	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	0	0	0	0
	Hornsea Three Link 41 HGV movements	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118

ID	Infrastructure Component Cable Route Section	02/01/2023	09/01/2023	16/01/2023	23/01/2023	30/01/2023	06/02/2023	13/02/2023	20/02/2023	27/02/2023	06/03/2023	13/03/2023	20/03/2023	27/03/2023	03/04/2023	10/04/2023	17/04/2023	24/04/2023	01/05/2023	08/05/2023	15/05/2023	22/05/2023	29/05/2023	05/06/2023	12/06/2023	19/06/2023	26/06/2023
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Section 12: MA7-E	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	40	9	9	9	9	9	9	9	9	0	0
	Norfolk Vanguard total HGV movements with 'Distance Deterrent' factor (70%)	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	40	9	9	9	9	9	9	9	9	0	0
	Number of Norfolk Vanguard Infrastructure components active in each week	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0
	Hornsea Three Link 41 HGV movements	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118

ID	Infrastructure Component Cable Route Section	03/07/2023	10/07/2023	17/07/2023	24/07/2023	31/07/2023	07/08/2023	14/08/2023	21/08/2023	28/08/2023	04/09/2023	11/09/2023	18/09/2023	25/09/2023	02/10/2023	09/10/2023	16/10/2023	23/10/2023	30/10/2023	06/11/2023	13/11/2023	20/11/2023	27/11/2023	04/12/2023	11/12/2023	18/12/2023	25/12/2023	Main Duct Installation Totals 03.01.2022 - 25.12.2023	
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	Totals	Max
1	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5402	48
2	Section 12: MA7-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9314	48
	Norfolk Vanguard total HGV movements with 'Distance Deterrent' factor (70%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14716	96
	Number of Norfolk Vanguard Infrastructure components active in each week	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Hornsea Three Link 41 HGV movements	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118		

***HGV Contingencies applied within Summary Table**

Duct Installation	1.2
Trenchless Crossings	1.1
Cable Pull	1.2
A47 Highway Works	1.2
Onshore Project Substation	1.2
NGET Substation	1.2

HGV Key

16 weeks @ 96 daily movements	Peak HGV demand per activity
6 weeks at 88 daily movements	Secondary Peak HGV demand activity
17 weeks at 43 average daily movements	Third Peak HGV demand activity
16 weeks at 9 daily movements	4th Peak HGV demand activity
Link 68 total duration = 55 weeks	

Link 68 Employee Summary Table

ID	Infrastructure Component Cable Route Section	03/01/2022	10/01/2022	17/01/2022	24/01/2022	31/01/2022	07/02/2022	14/02/2022	21/02/2022	28/02/2022	07/03/2022	14/03/2022	21/03/2022	28/03/2022	04/04/2022	11/04/2022	18/04/2022	25/04/2022	02/05/2022	09/05/2022	16/05/2022	23/05/2022	30/05/2022	06/06/2022	13/06/2022	20/06/2022	27/06/2022
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	40	40	40	40	40	40	40	40	40
2	Section 12: MA7-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	40	40
	Norfolk Vanguard total person trips (two-way)	0	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	80	80	80	80	80	80	80	80	80
	Hornsea Three total person trips (two-way)	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130

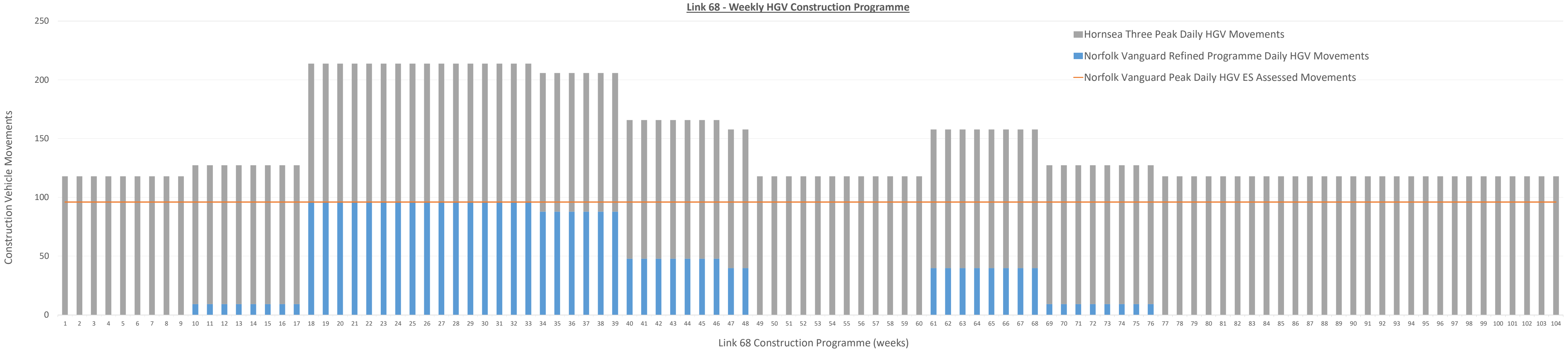
ID	Infrastructure Component Cable Route Section	04/07/2022	11/07/2022	18/07/2022	25/07/2022	01/08/2022	08/08/2022	15/08/2022	22/08/2022	29/08/2022	05/09/2022	12/09/2022	19/09/2022	26/09/2022	03/10/2022	10/10/2022	17/10/2022	24/10/2022	31/10/2022	07/11/2022	14/11/2022	21/11/2022	28/11/2022	05/12/2022	12/12/2022	19/12/2022	26/12/2022
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
1	Section 11: MA7-W	40	40	40	40	40	40	40	20	20	20	20	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Section 12: MA7-E	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	20	20	0	0	0	0
	Norfolk Vanguard total person trips (two-way)	80	80	80	80	80	80	80	60	60	60	60	60	60	40	40	40	40	40	40	40	20	20	0	0	0	0
	Hornsea Three total person trips (two-way)	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130

ID	Infrastructure Component Cable Route Section	02/01/2023	09/01/2023	16/01/2023	23/01/2023	30/01/2023	06/02/2023	13/02/2023	20/02/2023	27/02/2023	06/03/2023	13/03/2023	20/03/2023	27/03/2023	03/04/2023	10/04/2023	17/04/2023	24/04/2023	01/05/2023	08/05/2023	15/05/2023	22/05/2023	29/05/2023	05/06/2023	12/06/2023	19/06/2023	26/06/2023
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Section 12: MA7-E	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	0	0
	Norfolk Vanguard total person trips (two-way)	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	0	0
	Hornsea Three total person trips (two-way)	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130

ID	Infrastructure Component Cable Route Section	03/07/2023	10/07/2023	17/07/2023	24/07/2023	31/07/2023	07/08/2023	14/08/2023	21/08/2023	28/08/2023	04/09/2023	11/09/2023	18/09/2023	25/09/2023	02/10/2023	09/10/2023	16/10/2023	23/10/2023	30/10/2023	06/11/2023	13/11/2023	20/11/2023	27/11/2023	04/12/2023	11/12/2023	18/12/2023	25/12/2023	Main Duct Installation Totals 03.01.2022 - 25.12.2023	
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	Totals	Max
1	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4600	40
2	Section 12: MA7-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7600	40
	Norfolk Vanguard total person trips (two-way)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12200	80
	Hornsea Three total person trips (two-way)	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130		

Employee Key

16 weeks @ 80 daily movements	Peak employee demand per activity
6 weeks at 60 daily movements	Secondary Peak employee demand activity
7 weeks at 40 daily movements	Third Peak employee demand activity
26 weeks at 20 daily movements	4th Peak employee demand activity
Link 68 total duration = 55 weeks	



Appendix E Link 34 Construction Programme and HGV Profiles

Link 34 HGV Summary Table*

ID	Infrastructure Component / Cable Route Section	Totals	Max
1	Section 9 & 9a: MA6-W	6932	48
2	Section 10: MA6-E	5948	48
	Trenchless Crossings		
3	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	810	72
4	TC 8 - Orsted (TC Gang 2)	1620	144
	Total HGV movements	15311	168
	Number of Norfolk Vanguard Infrastructure components active in each week		
	Hornsea Three Link 34 HGV movements		

*HGV Contingencies applied within Summary Table

Duct Installation	1.2
Trenchless Crossings	1.1
Cable Pull	1.2
A47 Highway Works	1.2
Onshore Project Substation	1.2
NGET Substation	1.2

HGV Key

- 1 weeks @ 168 daily movements — Peak HGV demand per activity
- 1 weeks at 152 daily movements — Secondary Peak HGV demand activity
- 2 weeks at 144 daily movements — Third Peak HGV demand activity
- 24 weeks at 93 average daily movements — 4th Peak HGV demand activity
- 23 weeks at 10 average daily movements — 5th Peak HGV demand activity
- Link 51 total duration = 51 weeks

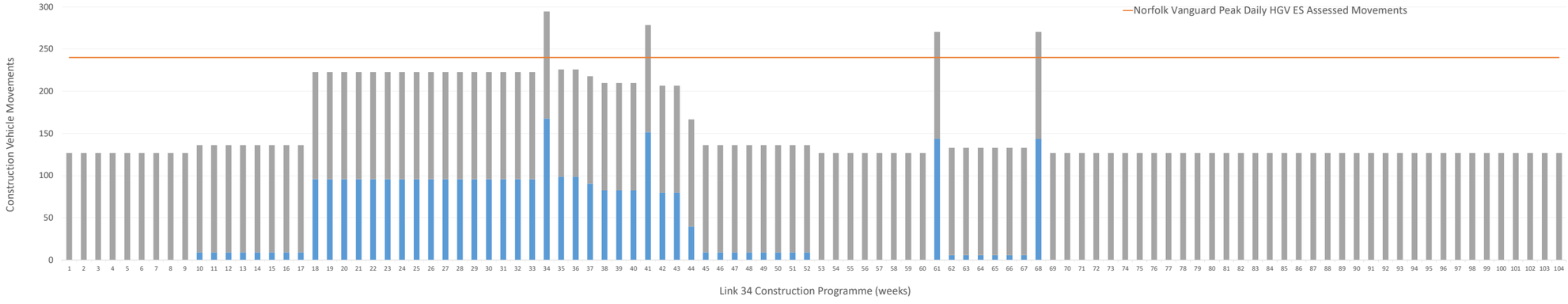
Link 34 Employee Summary Table

ID	Infrastructure Component / Cable Route Section	Totals	Max
1	Section 9 & 9a: MA6-W	6300	40
2	Section 10: MA6-E	4500	40
	Trenchless Crossings (employee movements)		
3	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	500	20
4	TC 8 - Orsted (TC Gang 2)	500	20
	Norfolk Vanguard total person trips (two-way)		
	Hornsea Three total person trips (two-way)		

Employee Key

- 1 weeks @ 93 average daily movements — Peak employee demand per activity
- 17 weeks at 79 average daily movements — Secondary Peak employee demand activity
- 6 weeks at 48 average daily movements — Third Peak employee demand activity
- 19 weeks at 20 daily movements — 4th Peak employee demand activity
- 6 weeks at 10 daily movements — 5th Peak HGV demand activity
- Link 34 total duration = 51 weeks

Link 34 - Weekly HGV Construction Programme



Appendix F Link 36 Construction Programme and HGV Profiles

Link 36 HGV Summary Table*

	NV HVDC	03/01/2022	10/01/2022	17/01/2022	24/01/2022	31/01/2022	07/02/2022	14/02/2022	21/02/2022	28/02/2022	07/03/2022	14/03/2022	21/03/2022	28/03/2022	04/04/2022	11/04/2022	18/04/2022	25/04/2022	02/05/2022	09/05/2022	16/05/2022	23/05/2022	30/05/2022	06/06/2022	13/06/2022	20/06/2022	27/06/2022
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
ID	**Infrastructure Component** **Cable Route Section**																										
1	Section 9 & 9a: MA6-W	0	0	0	0	0	0	0	0	0	9	9	9	9	9	9	9	9	48	48	48	48	48	48	48	48	48
2	Section 10: MA6-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	48	48	48	48	48	48	48	48
3	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	9	9	9	9	9	9	9	9	48	48	48	48	48	48	48	48	48
4	Section 12: MA7-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	48	48	48	48	48	48	48	48
ID	**Trenchless Crossings**																										
5	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	72	3	3	3	3	3	3	72	0
	Total HGV movements with 'Distance Deterrent' factor (70%)	0	0	0	0	0	0	0	0	0	13	13	13	13	13	13	13	13	184	136	136	136	136	136	136	184	134
	Number of Norfolk Vanguard Infrastructure components active in each week	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	5	5	5	5	5	5	5	5	4
	Hornsea Three Link 36 HGV movements	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187

	NV HVDC	04/07/2022	11/07/2022	18/07/2022	25/07/2022	01/08/2022	08/08/2022	15/08/2022	22/08/2022	29/08/2022	05/09/2022	12/09/2022	19/09/2022	26/09/2022	03/10/2022	10/10/2022	17/10/2022	24/10/2022	31/10/2022	07/11/2022	14/11/2022	21/11/2022	28/11/2022	05/12/2022	12/12/2022	19/12/2022	26/12/2022
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
ID	**Infrastructure Component** **Cable Route Section**																										
1	Section 9 & 9a: MA6-W	48	48	48	48	48	48	48	48	48	48	48	40	40	40	40	40	40	40	9	9	9	9	9	9	9	9
2	Section 10: MA6-E	48	48	48	48	48	48	48	48	48	48	40	40	40	40	40	40	40	0	0	0	0	0	0	0	0	0
3	Section 11: MA7-W	48	48	48	48	48	48	48	40	40	40	40	40	40	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Section 12: MA7-E	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	48	40	40	0	0	0	0
ID	**Trenchless Crossings**																										
5	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	72	3	3	3	3	3	3	72	0	0	0	0	0	0	0	0	0	0	0
6	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total HGV movements with 'Distance Deterrent' factor (70%)	134	134	134	134	134	134	134	179	131	131	125	119	119	92	140	89	89	61	40	40	34	34	7	7	7	7
	Number of Norfolk Vanguard Infrastructure components active in each week	4	4	4	4	4	4	4	5	5	5	5	5	5	4	4	3	3	2	2	2	2	2	1	1	1	1
	Hornsea Three Link 36 HGV movements	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187

	NV HVDC	02/01/2023	09/01/2023	16/01/2023	23/01/2023	30/01/2023	06/02/2023	13/02/2023	20/02/2023	27/02/2023	06/03/2023	13/03/2023	20/03/2023	27/03/2023	03/04/2023	10/04/2023	17/04/2023	24/04/2023	01/05/2023	08/05/2023	15/05/2023	22/05/2023	29/05/2023	05/06/2023	12/06/2023	19/06/2023	26/06/2023
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
ID	**Infrastructure Component** **Cable Route Section**																										
1	Section 9 & 9a: MA6-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Section 10: MA6-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Section 12: MA7-E	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	40	9	9	9	9	9	9	9	9	0	0
ID	**Trenchless Crossings**																										
5	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	144	6	6	6	6	6	6	144	0	0	0	0	0	0	0	0	0	0
7	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total HGV movements with 'Distance Deterrent' factor (70%)	0	0	0	0	0	0	0	0	129	32	32	32	32	32	32	129	7	7	7	7	7	7	7	7	0	0
	Number of Norfolk Vanguard Infrastructure components active in each week	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1	0	0
	Hornsea Three Link 36 HGV movements	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187

	NV HVDC	03/07/2023	10/07/2023	17/07/2023	24/07/2023	31/07/2023	07/08/2023	14/08/2023	21/08/2023	28/08/2023	04/09/2023	11/09/2023	18/09/2023	25/09/2023	02/10/2023	09/10/2023	16/10/2023	23/10/2023	30/10/2023	06/11/2023	13/11/2023	20/11/2023	27/11/2023	04/12/2023	11/12/2023	18/12/2023	25/12/2023	**Main Duct Installation Totals 03.01.2022 - 25.12.2023**	
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52		
ID	**Infrastructure Component** **Cable Route Section**																											**Totals**	**Max**
1	Section 9 & 9a: MA6-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6932	48
2	Section 10: MA6-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5948	48
3	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5402	48
4	Section 12: MA7-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9314	48
ID	**Trenchless Crossings**																												
5	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	810	72
6	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1620	144
7	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	810	72
	Total HGV movements with 'Distance Deterrent' factor (70%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Number of Norfolk Vanguard Infrastructure components active in each week	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Hornsea Three Link 36 HGV movements	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187	187		

*HGV Contingencies applied within Summary Table

Duct Installation	1.2
Trenchless Crossings	1.1
Cable Pull	1.2
A47 Highway Works	1.2
Onshore Project Substation	1.2
NGET Substation	1.2

HGV Key

2 weeks at 184 daily movements	Peak HGV demand per activity
1 weeks at 179 daily movements	Secondary Peak HGV demand activity
22 weeks at 132 average daily movements	Third Peak HGV demand activity
34 weeks at 25 average daily movements	4th Peak HGV demand activity
Link 36 total duration = 59 weeks	

Link 36 Employee Summary Table

	NV HVDC	03/01/2022	10/01/2022	17/01/2022	24/01/2022	31/01/2022	07/02/2022	14/02/2022	21/02/2022	28/02/2022	07/03/2022	14/03/2022	21/03/2022	28/03/2022	04/04/2022	11/04/2022	18/04/2022	25/04/2022	02/05/2022	09/05/2022	16/05/2022	23/05/2022	30/05/2022	06/06/2022	13/06/2022	20/06/2022	27/06/2022
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
ID	**Infrastructure Component** **Cable Route Section**																										
1	Section 9 & 9a: MA6-W	0	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	40	40	40	40	40	40	40	40	40
2	Section 10: MA6-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	40	40
3	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	40	40	40	40	40	40	40	40	40
4	Section 12: MA7-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	40	40
ID	**Trenchless Crossings (employees)**																										
5	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0
	Norfolk Vanguard total person trips (two-way)	0	0	0	0	0	0	0	0	0	40	40	40	40	40	40	40	40	180	170	170	170	170	170	170	180	160
	Hornsea Three total person trips (two-way)	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448

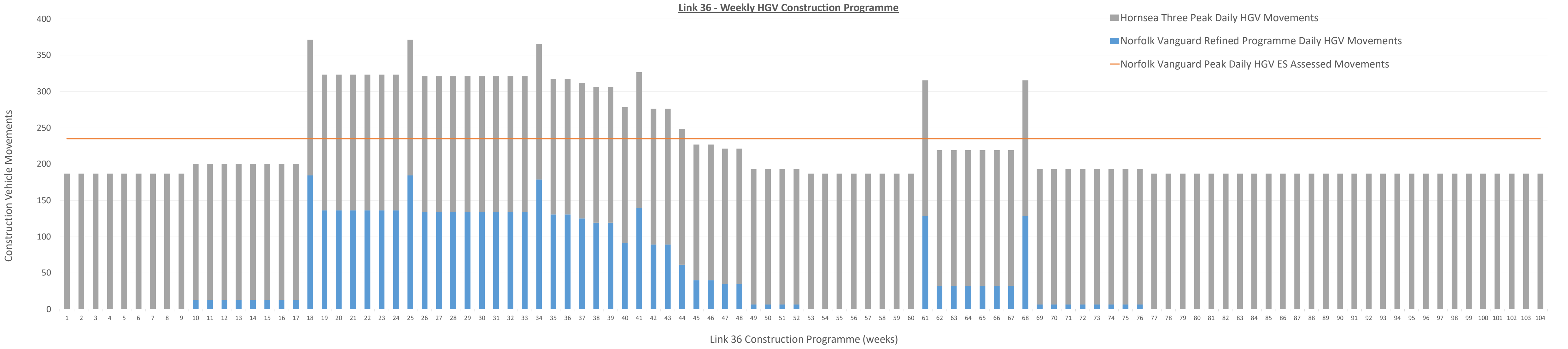
	NV HVDC	04/07/2022	11/07/2022	18/07/2022	25/07/2022	01/08/2022	08/08/2022	15/08/2022	22/08/2022	29/08/2022	05/09/2022	12/09/2022	19/09/2022	26/09/2022	03/10/2022	10/10/2022	17/10/2022	24/10/2022	31/10/2022	07/11/2022	14/11/2022	21/11/2022	28/11/2022	05/12/2022	12/12/2022	19/12/2022	26/12/2022
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
ID	**Infrastructure Component** **Cable Route Section**																										
1	Section 9 & 9a: MA6-W	40	40	40	40	40	40	40	40	40	40	40	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
2	Section 10: MA6-E	40	40	40	40	40	40	40	40	40	40	20	20	20	20	20	20	20	0	0	0	0	0	0	0	0	0
3	Section 11: MA7-W	40	40	40	40	40	40	40	20	20	20	20	20	20	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Section 12: MA7-E	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	20	20	0	0	0	0
ID	**Trenchless Crossings (employees)**																										
5	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0	0	0	0	0	0	0	0	0	0	0
7	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Norfolk Vanguard total person trips (two-way)	160	160	160	160	160	160	160	160	150	150	130	110	110	90	100	80	80	60	60	60	40	40	20	20	20	20
	Hornsea Three total person trips (two-way)	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448

	NV HVDC	02/01/2023	09/01/2023	16/01/2023	23/01/2023	30/01/2023	06/02/2023	13/02/2023	20/02/2023	27/02/2023	06/03/2023	13/03/2023	20/03/2023	27/03/2023	03/04/2023	10/04/2023	17/04/2023	24/04/2023	01/05/2023	08/05/2023	15/05/2023	22/05/2023	29/05/2023	05/06/2023	12/06/2023	19/06/2023	26/06/2023
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
ID	**Infrastructure Component** **Cable Route Section**																										
1	Section 9 & 9a: MA6-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Section 10: MA6-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Section 12: MA7-E	0	0	0	0	0	0	0	0	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	0	0
ID	**Trenchless Crossings (employees)**																										
5	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	20	10	10	10	10	10	10	20	0	0	0	0	0	0	0	0	0	0
6	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Norfolk Vanguard total person trips (two-way)	0	0	0	0	0	0	0	0	40	30	30	30	30	30	30	40	20	20	20	20	20	20	20	20	0	0
	Hornsea Three total person trips (two-way)	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448

	NV HVDC	03/07/2023	10/07/2023	17/07/2023	24/07/2023	31/07/2023	07/08/2023	14/08/2023	21/08/2023	28/08/2023	04/09/2023	11/09/2023	18/09/2023	25/09/2023	02/10/2023	09/10/2023	16/10/2023	23/10/2023	30/10/2023	06/11/2023	13/11/2023	20/11/2023	27/11/2023	04/12/2023	11/12/2023	18/12/2023	25/12/2023	**Main Duct Installation Totals 03.01.2022 - 25.12.2023**	
		27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52		
ID	**Infrastructure Component** **Cable Route Section**																											**Totals**	**Max**
1	Section 9 & 9a: MA6-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6300	40
2	Section 10: MA6-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4500	40
3	Section 11: MA7-W	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4600	40
4	Section 12: MA7-E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7600	40
ID	**Trenchless Crossings (employees)**																												
5	TC 7 - Marriotts Way (North) & Kerdiston CWS (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
7	TC 8 - Orsted (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
6	TC 9 - R.Bure (TC Gang 2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	500	20
	Norfolk Vanguard total person trips (two-way)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Hornsea Three total person trips (two-way)	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448	448		

Employee Key

2 weeks at 180 peak daily movements	Peak employee demand per activity
18 weeks at 161 average daily movements	Secondary Peak employee demand activity
9 weeks at 83 average daily movements	Third Peak employee demand activity
30 weeks at 30 average daily movements	4th Peak employee demand activity
Link 36 total duration = 59 weeks	



Appendix G Traffic Related Cumulative Noise Impact Assessment

Royal HaskoningDHV
Enhancing Society Together

VATTENFALL

Norfolk Vanguard Offshore Wind Farm

Appendix G Cumulative Impact Assessment

Traffic Related Noise and Vibration

Applicant: Norfolk Vanguard Limited

Document Reference: ExA; ISH1; 10.D5.3

Date: March 2019

Photo: Kentish Flats Offshore Wind Farm

Date	Issue No.	Remarks / Reason for Issue	Author	Checked	Approved
15/03/19	01D	First draft for Norfolk Vanguard Ltd review	DC	AB	JA
20/03/19	01F	Final for submission	DC	AB	JA

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Glossary

AAWT	Annual Average Weekday Traffic
BAT	Best Available Technology
BPM	Best Practicable Means
BS	British Standard
CNMP	Construction Noise Management Plan
CoCP	Code of Construction Practice
CRTN	Calculation of Road Traffic Noise
DMRB	Design Manual for Roads and Bridges
EPA	Environmental Protection Act
ETG	Expert Topic Group
eVDV	Estimated Vibration Dose Value
ISO	International Standards Organisation
LOAEL	Lowest Observed Adverse Effect Level
NOEL	No Observed Effect Level
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPSE	Noise Policy Statement for England
OAE	Observed Adverse Effect
OCoCP	Outline Code of Construction Practice
PPG	Planning Practice Guidance
PPV	Peak Particle Velocity
SOAEL	Significant Observed Adverse Effect Level
SoS	Secretary of State
TMP	Traffic Management Plan
TRL	Transport Research Laboratory
TRRL	Transport and Road Research Laboratory
UAE	Unacceptable Adverse Effect
UAEL	Unacceptable Adverse Effect Level
VDV	Vibration Dose Value
WHO	World Health Organisation

Terminology

dB(A)	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
dB(Z) (or previously L_{leq})	Decibels measured on a sound level meter incorporating a flat frequency weighting (Z weighting) across the frequency range.
Decibel (dB)	A unit of noise level derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 µPa, the threshold of normal hearing is 0dB, and 140dB is the threshold of pain. A change of 1dB is only perceptible under controlled conditions. Under normal conditions a change in noise level of 3dB(A) is the smallest perceptible change.
$L_{A10,T}$	The A weighted noise level exceeded for 10% of the specified measurement period (T). L_{A10} is the index generally adopted to assess traffic noise.
$L_{A90,\ T}$	The A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142: 2014 it is used to define the 'background' noise level.
$L_{Aeq,T}$	The equivalent continuous sound level – the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq,\ T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter.
L_{Amax}	The maximum A-weighted sound pressure level recorded during a measurement.
Onshore infrastructure	The combined name for all onshore infrastructure associated with the project from landfall to grid connection.
Onshore project area	All onshore electrical infrastructure (landfall; onshore cable route, accesses, trenchless crossing technique (e.g. Horizontal Directional Drilling (HDD)) zones and mobilisation areas; onshore project substation and extension to the Necton National Grid substation and overhead line modification)
The Applicant	Norfolk Vanguard Limited.
The project	Norfolk Vanguard Offshore Wind Farm, including the onshore and offshore infrastructure.

1 INTRODUCTION

1. This Cumulative Impact Assessment (CIA) has been prepared to consider the potential cumulative traffic related noise and vibration impacts of Norfolk Vanguard in combination with other projects. This is provided in part response to action point 9 from Issue Specific Hearing 1 held on 5th February 2019.

1.1.1 Hornsea Project Three Offshore Wind Farm

2. Ørsted is proposing to develop an offshore wind farm located in the southern North Sea, with a total generating capacity of up to 2,400MW (Hornsea Project Three). The outline Export Cable Route (ECR) of Hornsea Project Three will make landfall at a location between Sheringham and Cley next the Sea. From the landfall location, the ECR heads approximately 55km south to connect to the Norwich Main National Grid Substation. A high level construction programme indicates that onshore construction is currently planned to commence in 2021 and last for a period of six years. Hornsea Project Three construction will likely coincide with Norfolk Vanguard's duct installation and onshore project substation construction works period.

3. The Hornsea Project Three application for development consent was submitted in May 2018 and the data necessary for Norfolk Vanguard Ltd to undertake a CIA taking into account Hornsea Project Three construction traffic was not publicly available at the time the Norfolk Vanguard application was submitted. This CIA assesses the updated traffic information that been submitted to the Hornsea Project Three examination to address this gap.

1.2 Assessment Methodology

1.2.1 Impact Assessment Methodology

1.2.1.1 Receptor sensitivity

4. For the cumulative traffic assessment (noise and vibration) indicative sensitive receptors are detailed in Table 1 and shown on Figure 2 of the main Traffic and Transport CIA.

Table 1 Receptor identification, sensitivity and classification

Road Link Number/Receptor Identifier	Receptor Classification	Receptor Sensitivity
1a	Residential	Medium
1b	Residential	Medium
2	Residential	Medium

Road Link Number/Receptor Identifier	Receptor Classification	Receptor Sensitivity
3	Residential	Medium
4	Residential	Medium
5	Residential	Medium
8	Residential	Medium
11	Residential	Medium
12	Residential	Medium
13a	Residential	Medium
13b	Residential	Medium
14	Residential	Medium
18	Residential	Medium
19	Residential	Medium
24	Residential	Medium
29	Residential	Medium
30	Residential	Medium
32	Residential	Medium
33	Residential	Medium
34	Residential	Medium
36	Residential	Medium
37	Residential	Medium
39	Residential	Medium
40b	Residential	Medium
41	Residential	Medium
58	Residential	Medium
59	Residential	Medium
60	Residential	Medium
68	Residential	Medium

1.2.1.2 Cumulative road traffic noise assessment

5. The Norfolk Vanguard traffic consultants provided 18hr Annual Average Weekday Traffic (AAWT) flows on shared road links that both Norfolk Vanguard and Hornsea Project Three traffic would utilise during the onshore construction phase. For Norfolk Vanguard the data was taken from ES Chapter 24 Traffic and Transport submitted in July 2018. For Hornsea Project Three this was based on updated traffic data submitted to the Hornsea Project Three examination in February 2019.

6. The assessment methodology for the cumulative road traffic noise and vibration assessment follows the same procedure outlined in Section 25.4.1.1.3 of ES Chapter 25 Noise and Vibration - *Road traffic noise and vibration emissions assessment*. This methodology was also agreed during Expert Topic Group (ETG) meetings held in January and July 2017.

7. Cumulative construction phase road link decibel (dB) change was assessed using the impact magnitude criteria in Table 2. The thresholds for differentiating the criteria are taken from recommendations outlined in the Design Manual for Roads and Bridges (DMRB) (Volume 11, Section 3, Chapter 3), which are specific to short-term impacts (such as the construction phase traffic) and are an indication of the relative change in ambient noise as a result of the project.

Table 2 Significance criteria for relative change due to road traffic (short term)

Change in noise level ($L_{A10\ (18\ hour)}$ dB)	Impact magnitude
0.0	No change
0.1 – 0.9	Negligible
1.0 – 2.9	Minor
3.0 – 4.9	Moderate
5.0+	Major

1.2.1.3 Construction Phase Vibration Assessment

8. The response of a building to ground-borne vibration is affected by the type of foundation, ground conditions, the building construction and the condition of the building. For construction vibration, the vibration level and effects detailed in Table 3were adopted based on British Standard (BS) 5228:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration*. Limits for transient vibration, above which cosmetic damage could occur, are given numerically in terms of Peak Particle Velocity (PPV).

Table 3 Transient vibration guide values for cosmetic damage

Line	Type of building	Peak component particle velocity in frequency range of predominant pulse (PPV levels above which cosmetic damage to buildings likely to occur)	
		4Hz to 15Hz	15Hz and above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50mms^{-1} at 4Hz and above	
2	Un-reinforced or light framed structures Residential or light commercial type buildings	15mms^{-1} at 4Hz increasing to 20mms^{-1} at 15Hz	20mms^{-1} at 15Hz increasing to 50mms^{-1} at 40Hz and above

Note 1 Values referred to are at the base of the building.
Note 2 Limits for transient vibration, above which cosmetic damage could occur.

9. For construction vibration from sources, the vibration level and effects presented in Table 4 were adopted based on Table B-1 of BS 5228-2. These levels and effects are based on human perception of vibration in residential environments.

Table 4 Construction vibration - impact magnitude

Vibration limit PPV (mm/s)	Interpreted significance to humans	Impact magnitude
≤0.14	Vibration unlikely to be perceptible	No Impact
0.14 to 0.3	Vibration might just be perceptible in the most sensitive situations for most vibration frequencies associated with construction	Negligible
0.3 to 1.0	Vibration might just be perceptible in residential environments	Minor (Adverse)
1.0 to ≤10.0	It is likely that vibration at this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents	Moderate (Adverse)
≥10.0	Vibration is likely to be intolerable for any more than a brief exposure to this level	Major (Adverse)

10. Humans are very sensitive to vibration, which can result in concern being expressed at energy levels well below the threshold of damage. Guidance on the human response to vibration in buildings is found in BS 6472-1:2008 *Guide to evaluation of human exposure to vibration in buildings, Part 1*, Vibration sources other than blasting.

11. BS 6472 describes how to determine the vibration dose value (VDV) from frequency-weighted vibration measurements. VDV is defined by the following equation:

$$VDV_{b/d,\ day/night} = (\int_0^T a^4(t)dt)^{0.25}$$

12. The VDV is used to estimate the probability of adverse comment which might be expected from human beings experiencing vibration in buildings. Consideration is given to the time of day and use made of occupied space in buildings, whether residential, office or workshop.

13. BS 6472 states that in homes, adverse comment about building vibrations is likely when the vibration levels to which occupants are exposed are only slightly above thresholds of perception.

14. BS 6472 contains a methodology for assessing the human response to vibration in terms of either the VDV, or in terms of the acceleration or the peak velocity of the vibration, which is also referred to as PPV. The VDV is determined over a 16-hour daytime period or 8-hour night-time period. Table 5 is reproduced from BS6472.

Table 5 Vibration dose value ranges which might result in various probabilities of adverse comment within residential buildings

Place and Time	Low probability of adverse comment ($m.s^{-1.75}$)[1]	Adverse comment possible ($m.s^{-1.75}$)	Adverse comment probable ($m.s^{-1.75}$)[2]
Residential buildings 16h day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8h night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

[1]Below these ranges adverse comment is not expected, [2]Above these ranges adverse comment is very likely

15. Table 6 details the VDV impact magnitude matrix for humans.

Table 6 Construction vibration – VDV impact magnitude

Daytime Vibration limit VDV ($m.s^{-1.75}$)	Interpreted significance to humans	Impact magnitude
<0.2	Less than a low probability of adverse comment	Negligible
≥0.2 to <0.4	Low probability of adverse comment	Minor (Adverse)
≥0.4 to <0.8	Adverse comment possible	Moderate (Adverse)
≥0.8 to <1.6	Adverse comment probable	Major (Adverse)

1.2.1.4 Impact Significance

16. Following the identification of receptor sensitivity and magnitude of the effect, it is possible to determine the significance of the impact. A matrix is presented in Table 7 and will be used as a guide to inform the determination of impact significance.

Table 7 Impact significance matrix

		magnitude				
		High/ Major	Medium/ Moderate	Low/ Minor	Negligible	No Impact
Sensitivity	High	*Major*	*Major*	*Moderate*	*Minor*	*Minor*
	Medium	*Major*	*Moderate*	*Minor*	*Minor*	*Negligible*
	Low	*Moderate*	*Minor*	*Minor*	*Negligible*	*Negligible*
	Negligible	*Minor*	*Negligible*	*Negligible*	*Negligible*	*Negligible*

1.3 Scope

1.3.1 Study Area

17. The project study area comprises the shared road links that both Norfolk Vanguard and Hornsea Project Three traffic would utilise during the onshore construction phase. The noise and vibration study area matches that identified for the traffic and transport CIA presented in Figure 2 of the main report.

1.4 Potential Cumulative Impacts

1.4.1 Noise

1.4.1.1 Road Traffic Noise Emissions 2022

18. An assessment was undertaken following the methodology contained in DMRB (Volume 11, Section 3, Chapter 3) to assess whether there would be any significant changes in traffic volumes and composition on surrounding local roads as a result of the construction of both Norfolk Vanguard and Hornsea Project Three. The significance of any predicted change in noise level was then assessed in accordance with the criteria contained in the DMRB.

19. Traffic impacts were assessed for the peak construction years of 2022 and 2023 (as per the programme detailed in ES Chapter 24 Traffic and Transport), taking base flows, annual growth, Norfolk Vanguard project-generated and Hornsea Three-generated construction traffic into consideration.

20. Table 8 identifies all the shared road links from both projects' construction traffic.

Table 8 Assessment link classification and survey detail

Link No.	Road	Survey type	Survey year
1a	A47	DfT – AADT	2015
1b	A47	DfT – AADT	2015
2	A47	DfT – AADT	2015
3	A47	DfT – AADT	2015
4	A47	DfT – AADT	2015
5	A47	NDR Data	2015
8	A146	DfT – AADT	2015
11	A1065	DfT – AADT	2015
12	A1065	DfT – AADT	2015
13a	A148	DfT – AADT	2015
13b	A148	DfT – AADT	2015
14	A148	DfT – AADT	2015
18	A1067	DfT – AADT	2015
19	A148	DfT – AADT	2015
24	A1067	DfT – AADT	2015
29	A1067	DfT – AADT	2015
30	A1067	DfT – AADT	2015
32	B1149 - Norwich Road	7-day ATC	2017
33	B1149 - Holt Road	7-day ATC	2017
34	B1145 - West of Cawston	7-day ATC	2017
36	B1149 - Holt Road	7-day ATC	2017
37	B1145 - Cawston Road	7-day ATC	2017
39	A140 - Hevingham	NDR Data	2015
40b	A140 - Roughton	DfT – AADT	2015
41	B1436 - Felbrigg	7-day ATC	2017
58	NDR - Link a	NDR Data	2015
59	NDR - Link b	NDR Data	2015
60	NDR - Link c	NDR Data	2015
68	The Street/Heydon Road	Estimated	2017

21. Following the methodology contained in DMRB (Volume 11, Section 3, Chapter 3) an initial screening exercise was undertaken to determine whether there would be any significant changes in traffic volume and composition on these shared links related to both projects' construction traffic during the year 2022. A significant change in traffic volume would represent an increase in traffic volume of 25% or a decrease of 20%. The predicted changes in traffic volume for all shared links is given in Table 9.

Table 9 Link screening assessment 2022

	2022 Baseline + Growth (18hr AAWT)		2022 Baseline + Growth + NV + Hornsea Three (18hr AAWT)		% Increase	
Link No.	**Total Flow**	**HGVs**	**Total Flow**	**HGVs**	**Total Flow**	**HGVs**
1a	18,080	2,084	18,988	2,705	5.0	29.8
1b	18,080	2,084	19,153	2,637	5.9	26.5
2	24,305	2,747	25,367	3,268	4.4	18.9
3	43,425	3,708	44,574	4,224	2.6	13.9
4	50,021	3,931	50,902	4,426	1.8	12.6
5	47,095	2,714	48,062	3,390	2.1	24.9
8	14,044	869	14,498	1,201	3.2	38.1
11	7,940	723	8,227	847	3.6	17.2
12	5,720	624	5,976	748	4.5	19.9
13a	15,148	988	16,349	1,901	7.9	92.4
13b	10,929	740	11,794	1,416	7.9	91.4
14	12,782	677	13,743	1,244	7.5	83.9
18	9,049	743	9,607	1,164	6.2	56.7
19	13,406	1,318	14,264	2,080	6.4	57.8
24	10,745	621	11,482	1,139	6.9	83.2
29	13,592	1,054	14,212	1,487	4.6	41.1
30	11,908	863	12,734	1,302	6.9	50.9
32	4,639	101	5,205	490	12.2	384.4
33	6,075	218	6,859	614	12.9	182.3
34	3,113	32	3,876	397	24.5	1157.0
36	8,715	193	9,665	616	10.9	218.5
37	4,354	65	4,616	161	6.0	146.6
39	15,583	595	16,377	877	5.1	47.4
40b	13,783	709	14,628	1,049	6.1	47.9

	2022 Baseline + Growth (18hr AAWT)		2022 Baseline + Growth + NV + Hornsea Three (18hr AAWT)		% Increase	
Link No.	**Total Flow**	**HGVs**	**Total Flow**	**HGVs**	**Total Flow**	**HGVs**
41	6,954	190	7,966	816	14.5	329.3
58	38,575	1,874	39,765	2,567	3.1	37.0
59	26,711	1,298	27,888	1,991	4.4	53.4
60	19,929	968	20,711	1,408	3.9	45.4
68	1,142	52	1,566	266	37.1	408.1
	Change >25% in accordance with DMRB screening criteria.					

22. For those links in Table 9 where the DMRB screening criteria were exceeded an assessment of impact significance is then presented in Table 10 . The impact significance presented in Table 10 takes into account the receptor sensitivity and speed limit of each road link.

Table 10 Cumulative construction phase road traffic noise emissions assessment 2022

Link No.	dB Change $LA_{10, 18hr}$	Speed (mph)	Impact magnitude	Impact significance
1a	0.5	70.0	Negligible	Negligible
1b	0.5	70.0	Negligible	Negligible
8	0.6	40.0	Negligible	Negligible
13a	1.5	30.0	Minor	Minor
13a	1.3	40.0	Minor	Minor
13a	1.1	60.0	Minor	Minor
13b	1.5	30.0	Minor	Minor
13b	1.4	40.0	Minor	Minor
13b	1.1	60.0	Minor	Minor
14	1.3	30.0	Minor	Minor
14	0.9	60.0	Negligible	Negligible
18	1.1	30.0	Minor	Minor
18	0.8	60.0	Negligible	Negligible
19	1.0	50.0	Negligible	Negligible
24	1.0	60.0	Negligible	Negligible
29	0.6	60.0	Negligible	Negligible

Link No.	dB Change $LA_{10, 18hr}$	Speed (mph)	Impact magnitude	Impact significance
30	0.8	50.0	Negligible	Negligible
32	2.2	40.1	Minor	Minor
33	1.6	46.7	Minor	Minor
34	3.0	43.3	Moderate	Moderate
36	1.4	44.9	Minor	Minor
37	0.8	43.3	Negligible	Negligible
39	0.5	50.0	Negligible	Negligible
39	0.5	60.0	Negligible	Negligible
40b	0.8	30.0	Negligible	Negligible
40b	0.6	60.0	Negligible	Negligible
41	2.4	36.2	Minor	Minor
58	0.4	60.0	Negligible	Negligible
59	0.6	60.0	Negligible	Negligible
60	0.5	60.0	Negligible	Negligible
68	3.2	60.0	Moderate	Moderate

23. Two shared road links indicate a potential significant change in relative ambient noise as a result of cumulative (Norfolk Vanguard and Hornsea Project Three) construction road traffic emissions. In accordance with the DMRB criteria detailed in Table 2, significant cumulative noise impacts (in the absence of mitigation) are predicted to occur on Link 34 and Link 68 – **moderate adverse** impact. These two links, and any requirement for mitigation, are considered further in this report.

24. No other significant cumulative construction traffic noise impacts have been identified on any of the other shared road links, with most links experiencing a **negligible** impact.

1.4.1.2 Road Traffic Noise Emissions 2023

25. The screening assessment was repeated for 2023 construction traffic to assess whether there would be any significant changes in traffic volume and composition on surrounding local roads. Any road links with a predicted increase in traffic volume of 25% or a decrease of 20% were identified in Table 11.

Table 11 Link screening assessment 2023

	2023 Baseline + Growth (18hr AAWT)		2023 Baseline + Growth + Cumulative + Development (18hr AAWT)		% Increase	
Link No.	**Total Flow**	**HGVs**	**Total Flow**	**HGVs**	**Total Flow**	**HGVs**
1a	18,431	2,124	19,002	2,746	3.1	29.2
1b	18,431	2,124	19,168	2,678	4.0	26.0
2	24,776	2,801	25,469	3,321	2.8	18.6
3	44,267	3,780	44,794	4,296	1.2	13.6
4	50,991	4,007	51,386	4,503	0.8	12.4
5	47,497	2,737	48,201	3,413	1.5	24.7
8	14,317	886	14,657	1,218	2.4	37.4
11	8,094	737	8,163	861	0.9	16.8
12	5,831	636	5,869	760	0.7	19.5
13a	15,442	1,007	16,189	1,920	4.8	90.6
13b	11,141	754	11,711	1,431	5.1	89.6
14	13,030	690	13,521	1,257	3.8	82.3
18	9,225	757	9,626	1,178	4.3	55.6
19	13,666	1,344	14,422	2,105	5.5	56.7
24	10,953	634	11,532	1,151	5.3	81.6
29	13,855	1,075	14,306	1,508	3.2	40.3
30	12,139	879	12,586	1,319	3.7	50.0
32	4,728	103	5,003	492	5.8	377.1
33	6,192	222	6,582	619	6.3	178.8
34	3,173	32	3,567	398	12.4	1135.1
36	8,883	197	9,230	620	3.9	214.3
37	4,438	67	4,619	162	4.1	143.8
39	15,701	599	16,064	881	2.3	47.1
40b	14,051	723	14,425	1,062	2.7	47.0
41	7,089	194	7,630	820	7.6	323.0
58	39,381	1,914	39,917	2,607	1.4	36.2
59	27,465	1,335	27,987	2,028	1.9	51.9
60	20,386	991	20,788	1,430	2.0	44.3
68	1,164	53	1,340	267	15.1	400.4
	Change >25% in accordance with DMRB screening criteria.					

26. Table 12 details the results of the cumulative construction phase noise road traffic emissions calculations for 2023 for links where the DMRB screening criteria were exceeded only.

Table 12 Cumulative construction phase road traffic noise emissions assessment 2023

Link No.	dB Change $LA_{10, 18hr}$	Speed (mph)	Impact magnitude	Impact significance
1a	0.5	70.0	Negligible	Negligible
1b	0.5	70.0	Negligible	Negligible
5	0.3	70.0	Negligible	Negligible
8	0.6	40.0	Negligible	Negligible
13a	1.4	30.0	Minor	Minor
13a	1.3	40.0	Minor	Minor
13a	1.0	60.0	Minor	Minor
13b	1.5	30.0	Minor	Minor
13b	1.3	40.0	Minor	Minor
13b	1.0	60.0	Minor	Minor
14	1.2	30.0	Minor	Minor
14	0.8	60.0	Negligible	Negligible
18	1.1	30.0	Minor	Minor
18	0.8	60.0	Negligible	Negligible
19	1.0	50.0	Negligible	Negligible
24	0.9	60.0	Negligible	Negligible
29	0.6	60.0	Negligible	Negligible
30	0.7	50.0	Negligible	Negligible
32	2.0	40.1	Minor	Minor
33	1.4	46.7	Minor	Minor
34	2.8	43.3	Minor	Minor
36	1.2	44.9	Minor	Minor
37	0.7	43.3	Negligible	Negligible
39	0.4	50.0	Negligible	Negligible
39	0.4	60.0	Negligible	Negligible
40b	0.7	30.0	Negligible	Negligible
40b	0.5	60.0	Negligible	Negligible
41	2.2	36.2	Minor	Minor
58	0.3	60.0	Negligible	Negligible

Link No.	dB Change $LA_{10, 18hr}$	Speed (mph)	Impact magnitude	Impact significance
59	0.5	60.0	Negligible	Negligible
60	0.4	60.0	Negligible	Negligible
68	2.8	60.0	Minor	Minor

27. Relative change in ambient noise as a result of cumulative (Norfolk Vanguard and Hornsea Project Three) construction road traffic emissions is calculated to not increase by greater than 2.8dBA in 2023 on any of the shared road links. In accordance with the DMRB criteria detailed in Table 2, cumulative project generated construction traffic will have at most a **minor adverse** impact, with most links experiencing a **negligible** impact. No mitigation is proposed.

1.4.1.3 Mitigation – Link 68

28. For the 2022 cumulative construction traffic scenario, a **moderate adverse** impact is predicted along receptor Link 68 based on a relative increase of +3.2dBA at residential receptors. The shared part of Link 68 includes a single noise sensitive receptor – The Old Railway Gatehouse (Grid reference 614812, 326538). Noise impacts are exacerbated at this receptor due to the presence of an historic level crossing which creates a hump in the road surface directly outside that property.

29. A scheme of mitigation has been proposed by Hornsea Project Three on Link 68 to mitigate potential pedestrian amenity impacts related to construction traffic. A commitment has been made by Norfolk Vanguard to deliver the same scheme of mitigation which will mitigate these pedestrian amenity impacts for Norfolk Vanguard alone, Hornsea Project Three alone or both projects together. With regards to traffic related noise, this scheme of mitigation includes the re-grading of the road and the introduction of the temporary speed limit, which will also provide noise mitigation in the cumulative traffic scenario.

30. Norfolk Vanguard has reviewed this scheme of mitigation and calculated the relative change in noise level for Link 68, with these measures in place. The magnitude of effect would reduce to “no change”, for this medium sensitive receptor, which represents a residual impact of **negligible** significance.

31. A commitment has been made by Norfolk Vanguard to deliver this mitigation, which will be captured in an update to the outline Traffic Management Plan (OTMP). The commitments within the OTMP are secured through DCO Requirement 21.

1.4.1.4 Mitigation – Link 34

32. For the 2022 cumulative construction traffic scenario, a **moderate adverse** impact is predicted along receptor Link 34 (residential) based on a relative increase of +3.0dBA.

33. In order to reduce the predicted noise emission impacts from cumulative construction traffic flows along Link 34 to **minor adverse** (i.e. not significant) the relative change in noise level needs to be no greater than +2.9dBA (Refer to Table 2). This will be achieved through a commitment to maintain cumulative peak construction traffic flows below the levels that generate noise increases in excess of 2.9dB. Proposed amended traffic flows to achieve this are detailed in Table 13.

Table 13 Assessment 2022 – Proposed amended traffic flows mitigation

		2022 Baseline + Growth (18hr AAWT)		2022 Baseline + Growth + Cumulative + Development (18hr AAWT)		% Increase	
Link No.		**Total Flow**	**HGVs**	**Total Flow**	**HGVs**	**Total Flow**	**HGVs**
34	*Before mitigation*	3,113	32	3,876	397	24.5	1157.0
34	*After mitigation*	3,113	32	3,858	379	23.9	1099.7
		Change >25% in accordance with DMRB screening criteria.					

Table 14 Cumulative construction phase road traffic noise emissions assessment 2022 – proposed amended traffic flows mitigation

Link No.	dB Change $LA_{10, 18hr}$	Speed (mph)	Impact magnitude	Impact significance
34	2.9	43.3	Minor	Minor

34. Total HGV flow (baseline + Norfolk Vanguard + Hornsea Project Three) must not exceed 379 HGVs to ensure that the impact magnitude is reduced to minor and the overall impact to **minor adverse** significance as detailed in Table 14. This represents a cumulative HGV threshold of 347 (379 – 32). The traffic CIA, at section 1.5.2.2.5, has demonstrated that the cumulative peak HGV demand on link 34 (after further interrogation of the construction programmes) will in fact not exceed 271 HGVs when combining the Norfolk Vanguard third peak HGV demand and the Hornsea Project Three peak traffic demand. This commitment will be captured within an update to the OTMP.

1.4.1.5 Summary of Road Traffic Noise Emissions

35. Cumulative construction road traffic noise emissions are anticipated to result in at most temporary and reversible **moderate adverse** impacts along two shared road links during 2022 (Links 34 and 68), and no greater than **minor adverse** impacts at any of the shared road links during the 2023 scenario.

36. Traffic flow data (18hr AAWT) detailed in Table 1.9 was used to predict the relative change in noise level for Link 34 and Link 68. The predicted relative change was 3.2dBA for Link 68 and 3.0dBA for Link 34.

37. A scheme of mitigation has been proposed by Hornsea Project Three on Link 68 to mitigate potential pedestrian amenity impacts related to construction traffic. A commitment has been made by Norfolk Vanguard to deliver the same scheme of mitigation for pedestrian amenity impacts for Norfolk Vanguard alone, Hornsea Project Three alone or both projects together. With regards to traffic related noise, the scheme of mitigation includes the re-grading of the road and the introduction of the temporary speed limit, which will also provide noise mitigation in the cumulative traffic scenario. With the implementation of this scheme of measures on Link 68, noise impacts are assessed to reduce down to **negligible** significance. The commitment for Norfolk Vanguard to deliver the scheme of mitigation related to pedestrian amenity on Link 68 will be captured in an update to the OTMP .

38. For link 34 total HGV flow (baseline + Norfolk Vanguard + Hornsea Project Three) must not exceed 379 to lower the impact magnitude to minor and the overall impact to **minor adverse** significance as detailed in Table 13. This represents a cumulative HGV threshold of 347 (379 – 32). The traffic CIA has demonstrated that the cumulative peak HGV demand on link 34 (after further interrogation) will in fact not exceed 271 when combining the Norfolk Vanguard third peak HGV demand and the Hornsea Project Three peak traffic demand. This commitment will be also captured within an update to the OTMP.

1.4.2 Cumulative construction phase vibration

39. Predicted cumulative noise impacts along Link 34 and Link 68 were significant without mitigation (**moderate adverse**). This formed the basis of approach for the vibration assessment, whereby Link 34 and Link 68 would likely be subjected to increased levels of vibration from construction traffic flows.

1.4.2.1 Cumulative Construction Phase Vibration – Link 68

40. Along the shared part of Link 68 there is one noise sensitive receptor (The Old Railway Gatehouse) (Grid reference 614812, 326538).

1.4.2.1.1 Peak Particle Velocity (PPV)

41. Hornsea Project Three has undertaken vibration monitoring and an assessment of vibration effects related to cumulative construction on this shared link (Hornsea Three Offshore Wind Farm - Appendix 23 to Deadline 6 submission). This information has been reviewed by Norfolk Vanguard and has informed the assessment presented below.

42. Section 4.19 of the Hornsea Project Three report states:

"*The PPV levels, with a maximum level of 2 mm/s, are within the banding which would suggest that vibration at these levels may cause complaints but can be tolerated if prior warning and explanation has been given to residents*".

43. Furthermore Section 4.19 of the report continues:

"*These levels are also well below the 10 mm/s which constitutes the threshold of intolerable vibration for any more than a very brief exposure. In the absence of any passing vehicles, baseline vibration levels are negligible*."

44. Norfolk Vanguard construction traffic movements for the cumulative scenario are modelled during the daytime period (07:00 to 19:00). A review of the Hornsea Project Three vibration survey, highlights that the maximum PPV measured for existing vehicle movements (including HGVs) was 2 mm/s during the daytime of Monday 15 October 2018 and Tuesday 16 October 2018.

45. For effects on buildings, 2 mm/s represents no impact related to vibration effects from existing vehicle movements based on the criteria set out in Table 1.3.

46. For effects on humans, 2 mm/s corresponds to a moderate magnitude effect related to vibration effects from existing vehicle movements based on the criteria set out in Table 1.4. Additionally, vibration levels were obtained by Hornsea Project Three on Thursday 18 October 2018 through until Sunday 21 October 2018, with measured PPV levels at <1.0mm/s. This represents a negligible to minor magnitude effect (on humans) related to vibration effects from existing vehicle movements based on the criteria set out in Table 1.4.

47. Cumulatively, Norfolk Vanguard and Hornsea Project Three will temporarily increase the number of HGVs along Link 68 which pass in proximity to The Old Railway Gatehouse. Measured PPV vibration levels at the property have shown that this type of vehicle is not expected to generate vibration at a significant level to affect the structural integrity of the building. The effect of generated vibration from passing vehicles will however be expected to be more frequent due to the increased number of total and percentage HGV movements.

48. Paragraph 3.32 of DMRB states that "*PPVs in the structure of buildings close to heavily trafficked roads rarely exceed 2 mm/s and typically are below 1 mm/s. Normal use of a building such as closing doors, walking on suspended wooden floors and operating domestic appliances can generate similar levels of vibration to those from road traffic*".

1.4.2.1.2 Vibration Dose Value (VDV)

49. The highest measured 16 hour VDV recorded during the Hornsea Project Three vibration monitoring on Link 68 was 0.048m.s$^{-1.75}$ (Tuesday 16 October). This corresponds to a 'less than a low probability of adverse comment' from existing vehicle numbers.

50. Table 5.2 of Hornsea Project Three's 2019 report details a highest VDV measurement for an HGV movement and is reproduced as Table 15.

Table 15 Measured maximum design scenario for HGV movement

X-axis	Y-axis	Z-axis	Weighted Root Mean Squared (RMS)
0.0006m.s$^{-1.75}$	0.01m.s$^{-1.75}$	0.033m.s$^{-1.75}$	0.035m.s$^{-1.75}$

51. For Link 68, the 2022 Baseline + growth + cumulative + development traffic flows (detailed in Table 9) show an 18hr AAWT of 1,566 Total Vehicles, comprising of 266 HGVs movements.

52. The VDV is calculated by multiplying the weighted RMS acceleration stated as 0.035m.s$^{-1.75}$ in Table 6, by the number of movements, 266$^{\wedge 0.25}$. The resultant predicted VDV is 0.14m.s$^{-1.75}$. In accordance with Table 6, this corresponds to a 'less than a low probability of adverse comment' at a medium sensitivity receptor, which represents an impact of **negligible** significance.

53. The survey undertaken by Hornsea Project Three notes that the largest vehicles typically using Link 68 during the vibration monitoring survey were agricultural vehicles – tractor and trailer. To allow for the larger size of construction HGVs vehicle weights were assumed to be double for HGVs (this would double the vibration acceleration levels), and vehicle speeds were assumed to also double to again account for the difference in speed between agricultural vehicles and HGVs (which would increase that factor by 3.3). Within these increases the resultant VDV would be 0.28m.s$^{-1.75}$. In accordance with Table 1.6, this corresponds to a 'low probability of adverse comment' at a medium sensitivity receptor, which represents an impact of **minor adverse** significance. On this basis, no mitigation measures are deemed to be required.

1.4.2.2 Cumulative Construction Phase Vibration – Link 34

54. For Link 34, the cumulative traffic, detailed in Table 9 shows an 18hr AAWT of 3,876 Total Vehicles, comprising of 397 HGVs movements.

55. To calculate an indicative VDV, the weighted RMS acceleration stated as 0.035m.s$^{-1.75}$ in Table 15 measured at The Old Railway Cottage was used as a proxy value for baseline vibration. This was multiplied by the number of HGV movements, 397$^{\wedge 0.25}$. The resultant predicted VDV is 0.31m.s$^{-1.75}$. In accordance with Table 6, this corresponds to a 'low probability of adverse comment' at a medium sensitivity receptor, which represents an impact of **minor adverse** significance. On this basis, no mitigation measures are deemed to be required.

56. A vibration monitoring survey is currently being undertaken at sensitive receptors along Link 34 by Hornsea Project Three. A review of that monitoring data will be undertaken to determine if this alters the findings presented here and whether additional mitigation is considered necessary..

1.5 Conclusion

1.5.1 Traffic Related Noise Emissions

57. In accordance with the DMRB criteria detailed in Table 2 project generated construction traffic (including growth and Hornsea Project Three cumulative traffic) will have **moderate adverse** impacts along two shared links (Link 34 and 68) during the assessed worst case construction year (2022), with most links experiencing an impact of **negligible** significance.

58. A scheme of mitigation has been proposed by Hornsea Project Three (and agreed with Norfolk County Council) on Link 68 to mitigate for potential pedestrian amenity impacts. The scheme of mitigation includes re-grading the road surface and introducing a temporary speed limit in proximity to the single noise sensitive receptor, which also serves to provide noise reductions. This mitigation scheme has been reviewed by Norfolk Vanguard and assessed to reduce traffic related noise impacts down to negligible significance in the cumulative scenario. Norfolk Vanguard has committed to adopt this scheme of mitigation and the OTMP will be updated to capture this detail.

59. For link 34 total HGV flow (baseline + Norfolk Vanguard + Hornsea Project Three) must not exceed 379 to lower the impact magnitude to minor and the overall impact to **minor adverse** significance as detailed in Table 13. This represents a cumulative HGV threshold of 347 (379 – 32). The traffic CIA has demonstrated that the cumulative peak HGV demand on link 34 (after further interrogation) will in fact not exceed 271 when combining the Norfolk Vanguard third peak HGV demand and the

Hornsea Project Three peak traffic demand. This commitment will be also captured within an update to the OTMP.

1.5.2 Traffic Related Vibration

60. Vibration monitoring has been undertaken by Hornsea Project Three at Link 68 and the findings of this surveys were used to inform an assessment of traffic related vibration effects associated with cumulative construction traffic. The data was also used as a proxy to inform an assessment of vibration effects on Link 34.

61. The predicted cumulative VDV impact magnitudes on Link 34 and Link 68 were calculated and corresponded to a magnitude of 'low probability of adverse comment'. A low probability at medium sensitivity receptors represents impacts of **minor adverse** significance related to vibration effects. On this basis, no mitigation measures are deemed to be required.

62. A vibration monitoring survey is currently being undertaken at sensitive receptors along Link 34 by Hornsea Project Three. A review of that monitoring data will be undertaken to determine if this alters the findings presented here and whether additional mitigation is considered necessary.

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Appendix H Traffic Related Cumulative Air Quality Impact Assessment

Royal HaskoningDHV
Enhancing Society Together

VATTENFALL

Norfolk Vanguard Offshore Wind Farm

Appendix H Cumulative Impact Assessment

Traffic Related Air Quality

Applicant: Norfolk Vanguard Limited

Document Reference: ExA; ISH1; 10.D5.3

Date: March 2019

Photo: Kentish Flats Offshore Wind Farm

Date	Issue No.	Remarks / Reason for Issue	Author	Checked	Approved
15/03/19	01D	First draft for Norfolk Vanguard Ltd review	CG	JD	JA
20/03/19	01F	Final for submission	CG	JD	JA

Table of Contents

Glossary

CIA	Cumulative Impact Assessment
Defra	Department of Environment Food and Rural Affairs
EIA	Environmental Impact Assessment
ES	Environmental Statement
HDD	Horizontal Directional Drill
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NOx	Oxides of Nitrogen
PEIR	Preliminary Environmental Information Report
PM_{10}	Particulate Matter with an aerodynamic diameter of less than 10 µm
$PM_{2.5}$	Particulate Matter with an aerodynamic diameter of less than 2.5 µm
SAC	Special Areas of Conservation
SPA	Special Protection Areas
SSSI	Site of Special Scientific Interest
UK	United Kingdom

Terminology

Air pollutants	Amounts of foreign and/or natural substances occurring in the atmosphere that may result in adverse effects on humans, animals, vegetation and/or materials
Air quality objectives	A series of objectives set by the UK Government's Expert Panel on Air Quality to be achieved either without exception or with a permitted number of exceedances within a specific timescale.
Annual mean concentration	The average (mean) of the hourly pollutant concentrations measured or predicted for a one year period
Dust	A generic term that BS6069 (Part 2) used to describe particulate matter in the size range 1 – 75 µm (micrometres) in diameter
Ecological receptors	Area where the ecology is considered valuable and has one or more designations such as SSSI, SPA, SAC, RAMSAR, LNR or Ancient Woodlands.
Emission factors	The average emission rate of a given pollutant for a given source, relative to units of activity. Used to model future pollution concentrations under different scenarios
Human receptors	Areas where the occupants are more susceptible to the adverse effects of pollutants
Particulate matter	Solid particles or liquid droplets suspended or carried in the air
The project	Norfolk Vanguard Offshore Wind Farm, including the onshore and offshore infrastructure

1 INTRODUCTION

1. This Cumulative Impact Assessment (CIA) has been prepared to consider the potential cumulative traffic related air quality impacts of Norfolk Vanguard in combination with other projects. This is provided in part response to action point 9 from Issue Specific Hearing 1 held on 5th February 2019.

2. Ørsted is proposing to develop an offshore wind farm located in the southern North Sea, with a total generating capacity of up to 2,400MW (Hornsea Project Three). The outline Export Cable Route (ECR) of Hornsea Project Three will make landfall at a location between Sheringham and Cley next the Sea. From the landfall location, the ECR heads approximately 55km south to connect to the Norwich Main National Grid Substation. A high level construction programme indicates that onshore construction is currently planned to commence in 2021 and last for a period of six years. Hornsea Project Three construction will likely coincide with Norfolk Vanguard's duct installation and onshore project substation construction works period.

3. The Hornsea Project Three application for development consent was submitted in May 2018 and the data necessary for Norfolk Vanguard Ltd to undertake a CIA taking into account Hornsea Project Three construction traffic was not publicly available at the time the Norfolk Vanguard application was submitted. This CIA assesses the updated traffic information that been submitted to the Hornsea Project Three examination to address this gap.

1.1 Approach

4. For Norfolk Vanguard construction traffic data was taken from ES Chapter 24 Traffic and Transport submitted in July 2018. For Hornsea Project Three data updated construction traffic data submitted to the Hornsea Project Three examination in February 2019 has been used to inform this assessment.

5. The assessment methodology for the cumulative construction vehicle exhaust emissions follows the same procedure outlined in Section 24.4.1.2 of ES Chapter 26 Air Quality. This methodology was also agreed as part of the Evidence Plan Process in 2017.

6. A dispersion modelling assessment was carried out to consider potential air quality impacts at sensitive human and ecological receptors as a result of cumulative traffic flows generated by concurrent works on Norfolk Vanguard and Hornsea Project Three.

7. The methodology for the assessment was as presented in the Norfolk Vanguard Environmental Statement. Traffic associated with Hornsea Project Three has been included in the 'with project' scenario, to consider the overall cumulative impacts that may be experienced at receptors should the peak construction periods of both projects occur concurrently. Cumulative traffic flows have been considered on the road links shared by both projects. Impacts have been considered at sensitive receptors identified in the original assessment presented in Environmental Statement Chapter 26 Air Quality.

8. Peak onshore construction for Norfolk Vanguard is programmed to take place between 2022 and 2023. 2023 represents the year with the projected greatest background traffic flows based on standard annual traffic growth and therefore the largest total traffic with the introduction of cumulative construction traffic[1]. The following scenarios were therefore considered:

   - 2023 background traffic without Norfolk Vanguard or Hornsea Project Three construction traffic, 'without project'; and
   - 2023 background traffic with the worst case peak construction traffic for both Norfolk Vanguard and Hornsea Project Three construction traffic 'with project'.

[1] Vehicle exhaust emission assessment considers the total number of vehicles present on the road – existing traffic and the introduction of the cumulative construction traffic. The worst case total traffic numbers comprise the 2023 baseline flows with the addition of the worst case cumulative construction traffic. This contrasts with the traffic noise impact assessment where the worst case is the year with the lowest baseline traffic flows (2022) with the addition of the worst case cumulative construction traffic.

2 ASSESSMENT BENCHMARKS

9. The relevant benchmarks considered in this assessment with regard to impacts at human and ecological receptors remain the same as those identified in the original assessment and are detailed in Table 1 and Table 2 respectively.

Table 1 Air Quality Strategy Objectives (England)

Pollutant	Air quality objective		To be achieved by
	Concentration	Measured as*	
Nitrogen Dioxide (NO_2)	200 µg.m^{-3}	1 hour mean not to be exceeded more than 18 times per year	31/12/2005
	40 µg.m^{-3}	Annual mean	31/12/2005
Particles (PM_{10})	50 µg.m^{-3}	24-hour mean not to be exceeded more than 35 times per year	31/12/2004
	40 µg.m^{-3}	Annual mean	31/12/2004
Particles ($PM_{2.5}$)	25 µg.m^{-3}	Annual mean (target)	2020
	15% cut in annual mean (urban background exposure)	Annual mean	2010 - 2020

Table 2 Designated Ecological Sites and Critical Load Values

Designated ecological site	Habitat or feature	Lowest Critical Load (kgN.ha^{-1}.y^{-1})
Breydon Water SSSI	Littoral sediment/ wigeon, shelduck	20
Felbrigg Woods SSSI	Broadleaved, mixed and yew woodland	10
Broadland SPA	Eurasian marsh harrier Eurasian wigeon Great bittern	15
The Broads SAC	Floodplain and coastal grazing marsh	20
Cawston and Marsham Heaths SSSI	Dry heaths	10
Buxton Heath SSSI	Dwarf shrub heath	10
Holt Lowes SSSI	Fen, marsh and swamp/ dwarf shrub heath	10
Foxley Wood SSSI	Broadleaved, mixed and yew woodland	10

3 RESULTS

3.1 Human Receptors

Predicted NO_2, PM_{10} and $PM_{2.5}$ concentrations for the 2023 year of peak construction 'with project' scenario are detailed in Table 3 to

10. Table 5. Concentrations for 'without project' scenarios and the predicted change in NO_2, PM_{10} and $PM_{2.5}$ concentrations, as a result of the cumulative traffic (with project), are also shown for comparison purposes.

Table 3 Annual mean NO_2 results at sensitive human receptor locations

Local Authority	Receptor ID	Annual mean NO_2 concentrations ($\mu g.m^{-3}$)				
		Without Norfolk Vanguard and Hornsea Project Three	With Norfolk Vanguard and Hornsea Project Three	Change	Change as % of objective	Impact descriptor
Breckland	R3	16.59	17.47	0.88	2	Negligible
	R4	17.48	18.42	0.94	2	Negligible
	R9	11.61	12.10	0.49	1	Negligible
	R10	8.98	9.30	0.32	1	Negligible
	R11	9.28	9.71	0.43	1	Negligible
	R12	9.62	10.11	0.49	1	Negligible
	R15	10.56	10.89	0.33	1	Negligible
	R16	16.73	17.76	1.03	3	Negligible
	R22	15.91	16.40	0.49	1	Negligible
	R80	8.31	8.39	0.08	0	Negligible
	R81	8.54	8.65	0.11	0	Negligible
	R82	8.95	9.07	0.12	0	Negligible
	R83	10.87	11.21	0.34	1	Negligible
	R87	10.08	10.44	0.36	1	Negligible
Broadland	R17	10.14	11.00	0.86	2	Negligible
	R18	9.78	10.38	0.6	2	Negligible
	R19	14.10	14.67	0.57	1	Negligible
	R20	15.15	16.23	1.08	3	Negligible
	R21	12.64	13.21	0.57	1	Negligible

Local Authority	Receptor ID	Annual mean NO_2 concentrations ($\mu g.m^{-3}$)				
		Without Norfolk Vanguard and Hornsea Project Three	With Norfolk Vanguard and Hornsea Project Three	Change	Change as % of objective	Impact descriptor
	R35	25.75	26.44	0.69	2	Negligible
	R36	24.01	24.64	0.63	2	Negligible
	R42	13.89	14.32	0.43	1	Negligible
	R43	12.49	12.85	0.36	1	Negligible
	R49	16.06	17.11	1.05	3	Negligible
	R69	15.33	15.89	0.56	1	Negligible
	R70	20.50	21.43	0.93	2	Negligible
	R71	30.30	31.58	1.28	3	Slight adverse
	R75	13.35	14.69	1.34	3	Negligible
	R76	15.37	17.21	1.84	5	Negligible
	R77	13.36	14.25	0.89	2	Negligible
	R79	10.76	11.48	0.72	2	Negligible
	R85	13.47	14.40	0.93	2	Negligible
	R86	17.51	19.43	1.92	5	Negligible
	R88	9.18	9.55	0.37	1	Negligible
Great Yarmouth	R33	18.62	19.56	0.94	2	Negligible
	R34	23.66	24.52	0.86	2	Negligible
	R37	15.62	16.03	0.41	1	Negligible
	R38	21.48	21.94	0.46	1	Negligible
	R39	21.45	22.09	0.64	2	Negligible
	R40	14.12	14.35	0.23	1	Negligible
	R41	15.85	16.16	0.31	1	Negligible
	R67	18.83	19.78	0.95	2	Negligible
	R68	13.60	14.45	0.85	2	Negligible
	R72	24.82	26.20	1.38	3	Negligible

Local Authority	Receptor ID	Annual mean NO_2 concentrations (µg.m^{-3})				
		Without Norfolk Vanguard and Hornsea Project Three	With Norfolk Vanguard and Hornsea Project Three	Change	Change as % of objective	Impact descriptor
King's Lynn	R1	21.78	22.38	0.6	1	Negligible
	R2	17.28	17.77	0.49	1	Negligible
North Norfolk	R5	12.46	13.34	0.88	2	Negligible
	R6	11.60	12.30	0.7	2	Negligible
	R7	13.34	14.92	1.58	4	Negligible
	R8	12.26	13.58	1.32	3	Negligible
	R13	13.48	14.25	0.77	2	Negligible
	R14	13.52	14.86	1.34	3	Negligible
	R44	12.88	14.09	1.21	3	Negligible
	R45	14.27	15.84	1.57	4	Negligible
	R46	10.65	11.74	1.09	3	Negligible
	R47	12.08	13.65	1.57	4	Negligible
	R48	13.18	14.41	1.23	3	Negligible
	R50	13.08	14.06	0.98	2	Negligible
	R51	8.92	9.04	0.12	0	Negligible
	R52	13.16	14.14	0.98	2	Negligible
	R53	12.54	13.39	0.85	2	Negligible
	R54	12.03	12.36	0.33	1	Negligible
	R55	10.87	11.06	0.19	0	Negligible
	R56	9.92	10.30	0.38	1	Negligible
	R57	9.98	10.48	0.5	1	Negligible
	R58	12.92	13.80	0.88	2	Negligible
	R59	10.24	10.98	0.74	2	Negligible
	R60	12.89	13.38	0.49	1	Negligible
	R61	11.66	11.92	0.26	1	Negligible

Local Authority	Receptor ID	Annual mean NO_2 concentrations (µg.m^{-3})				
		Without Norfolk Vanguard and Hornsea Project Three	With Norfolk Vanguard and Hornsea Project Three	Change	Change as % of objective	Impact descriptor
	R62	13.28	13.82	0.54	1	Negligible
	R63	12.98	13.61	0.63	2	Negligible
	R64	11.84	12.26	0.42	1	Negligible
	R65	14.08	14.50	0.42	1	Negligible
	R66	14.53	14.97	0.44	1	Negligible
	R73	12.09	13.17	1.08	3	Negligible
	R74	9.65	10.24	0.59	1	Negligible
	R78	10.12	10.64	0.52	1	Negligible
	R84	12.35	12.88	0.53	1	Negligible
South Norfolk	R23	14.89	15.32	0.43	1	Negligible
	R24	16.62	16.77	0.15	0	Negligible
	R25	16.60	16.75	0.15	0	Negligible
	R26	14.75	15.34	0.59	1	Negligible
	R27	16.34	17.15	0.81	2	Negligible
	R89	21.92	22.16	0.24	1	Negligible
Waveney	R28	13.96	14.46	0.5	1	Negligible
	R29	15.21	15.75	0.54	1	Negligible
	R30	17.76	19.18	1.42	4	Negligible
	R31	14.78	15.72	0.94	2	Negligible
	R32	17.74	18.95	1.21	3	Negligible

Table 4 Annual mean PM_{10} results at sensitive human receptor locations

Local Authority	Receptor ID	Annual mean PM_{10} concentrations (µg.m^{-3})				
		Without Norfolk Vanguard and Hornsea Project Three	With Norfolk Vanguard and Hornsea Project Three	Change	Change as % of objective	Impact descriptor
Breckland	R3	14.54	14.64	0.10	0	Negligible

Local Authority	Receptor ID	Annual mean PM_{10} concentrations ($\mu g.m^{-3}$)				
		Without Norfolk Vanguard and Hornsea Project Three	With Norfolk Vanguard and Hornsea Project Three	Change	Change as % of objective	Impact descriptor
	R4	15.81	15.93	0.12	0	Negligible
	R9	15.82	15.87	0.05	0	Negligible
	R10	13.20	13.23	0.03	0	Negligible
	R11	13.71	13.75	0.04	0	Negligible
	R12	14.83	14.87	0.04	0	Negligible
	R15	15.41	15.45	0.04	0	Negligible
	R16	16.25	16.37	0.12	0	Negligible
	R22	13.50	13.56	0.06	0	Negligible
	R80	13.93	13.94	0.01	0	Negligible
	R81	14.69	14.70	0.01	0	Negligible
	R82	16.00	16.01	0.01	0	Negligible
	R83	15.50	15.54	0.04	0	Negligible
	R87	15.22	15.25	0.03	0	Negligible
Broadland	R17	14.03	14.11	0.08	0	Negligible
	R18	13.82	13.88	0.06	0	Negligible
	R19	14.76	14.83	0.07	0	Negligible
	R20	15.31	15.44	0.13	0	Negligible
	R21	15.77	15.83	0.06	0	Negligible
	R35	15.21	15.30	0.09	0	Negligible
	R36	17.45	17.53	0.08	0	Negligible
	R42	14.35	14.40	0.05	0	Negligible
	R43	13.51	13.55	0.04	0	Negligible
	R49	15.27	15.36	0.09	0	Negligible
	R69	15.56	15.63	0.07	0	Negligible
	R70	15.10	15.21	0.11	0	Negligible

Local Authority	Receptor ID	Annual mean PM_{10} concentrations ($\mu g.m^{-3}$)				
		Without Norfolk Vanguard and Hornsea Project Three	With Norfolk Vanguard and Hornsea Project Three	Change	Change as % of objective	Impact descriptor
	R71	17.44	17.61	0.17	0	Negligible
	R75	14.10	14.23	0.13	0	Negligible
	R76	15.65	15.84	0.19	0	Negligible
	R77	14.79	14.88	0.09	0	Negligible
	R79	14.97	15.05	0.07	0	Negligible
	R85	15.53	15.63	0.09	0	Negligible
	R86	15.77	15.97	0.20	0	Negligible
	R88	16.72	16.75	0.03	0	Negligible
Great Yarmouth	R33	15.16	15.25	0.10	0	Negligible
	R34	15.58	15.68	0.10	0	Negligible
	R37	13.02	13.07	0.05	0	Negligible
	R38	18.63	18.67	0.04	0	Negligible
	R39	14.12	14.18	0.06	0	Negligible
	R40	13.61	13.64	0.02	0	Negligible
	R41	13.93	13.96	0.03	0	Negligible
	R67	15.98	16.07	0.08	0	Negligible
	R68	14.60	14.67	0.07	0	Negligible
	R72	14.63	14.75	0.12	0	Negligible
King's Lynn	R1	15.96	16.04	0.08	0	Negligible
	R2	14.90	14.96	0.06	0	Negligible
North Norfolk	R5	15.32	15.42	0.10	0	Negligible
	R6	15.00	15.07	0.08	0	Negligible
	R7	15.48	15.61	0.13	0	Negligible
	R8	14.46	14.57	0.11	0	Negligible
	R13	15.18	15.24	0.06	0	Negligible

Local Authority	Receptor ID	Annual mean PM_{10} concentrations (µg.m^{-3})				
		Without Norfolk Vanguard and Hornsea Project Three	With Norfolk Vanguard and Hornsea Project Three	Change	Change as % of objective	Impact descriptor
	R14	15.57	15.68	0.11	0	Negligible
	R44	18.24	18.34	0.10	0	Negligible
	R45	14.89	15.02	0.13	0	Negligible
	R46	13.84	13.93	0.09	0	Negligible
	R47	15.83	15.97	0.13	0	Negligible
	R48	14.62	14.70	0.09	0	Negligible
	R50	15.25	15.31	0.06	0	Negligible
	R51	13.42	13.43	0.01	0	Negligible
	R52	16.38	16.46	0.08	0	Negligible
	R53	15.09	15.16	0.07	0	Negligible
	R54	14.06	14.09	0.03	0	Negligible
	R55	13.99	14.01	0.02	0	Negligible
	R56	13.96	13.99	0.03	0	Negligible
	R57	14.57	14.61	0.04	0	Negligible
	R58	14.83	14.89	0.06	0	Negligible
	R59	14.97	15.04	0.07	0	Negligible
	R60	14.02	14.07	0.05	0	Negligible
	R61	14.02	14.05	0.03	0	Negligible
	R62	14.30	14.36	0.06	0	Negligible
	R63	15.37	15.42	0.05	0	Negligible
	R64	14.99	15.03	0.03	0	Negligible
	R65	13.71	13.75	0.04	0	Negligible
	R66	12.69	12.74	0.05	0	Negligible
	R73	13.96	14.05	0.09	0	Negligible
	R74	13.75	13.80	0.05	0	Negligible

Local Authority	Receptor ID	Annual mean PM_{10} concentrations ($\mu g.m^{-3}$)				
		Without Norfolk Vanguard and Hornsea Project Three	With Norfolk Vanguard and Hornsea Project Three	Change	Change as % of objective	Impact descriptor
	R78	15.51	15.56	0.05	0	Negligible
	R84	15.30	15.35	0.05	0	Negligible
South Norfolk	R23	14.14	14.18	0.05	0	Negligible
	R24	14.34	14.36	0.02	0	Negligible
	R25	14.65	14.67	0.02	0	Negligible
	R26	15.17	15.23	0.06	0	Negligible
	R27	16.35	16.43	0.08	0	Negligible
	R89	14.40	14.43	0.03	0	Negligible
Waveney	R28	14.73	14.77	0.04	0	Negligible
	R29	14.10	14.14	0.04	0	Negligible
	R30	14.79	14.90	0.12	0	Negligible
	R31	14.54	14.62	0.07	0	Negligible
	R32	15.20	15.32	0.12	0	Negligible

Table 5 Annual mean $PM_{2.5}$ results at sensitive human receptor locations

Local Authority	Receptor ID	Annual mean $PM_{2.5}$ concentrations ($\mu g.m^{-3}$)				
		Without Norfolk Vanguard and Hornsea Project Three	With Norfolk Vanguard and Hornsea Project Three	Change	Change as % of objective	Impact descriptor
Breckland	R3	9.51	9.58	0.07	0	Negligible
	R4	10.14	10.21	0.07	0	Negligible
	R9	10.01	10.04	0.03	0	Negligible
	R10	8.78	8.80	0.02	0	Negligible
	R11	9.05	9.07	0.02	0	Negligible
	R12	9.67	9.70	0.03	0	Negligible
	R15	10.30	10.32	0.02	0	Negligible
	R16	10.81	10.89	0.08	0	Negligible

Local Authority	Receptor ID	Annual mean $PM_{2.5}$ concentrations ($\mu g.m^{-3}$)				
		Without Norfolk Vanguard and Hornsea Project Three	With Norfolk Vanguard and Hornsea Project Three	Change	Change as % of objective	Impact descriptor
	R22	9.09	9.13	0.04	0	Negligible
	R80	9.16	9.16	0.00	0	Negligible
	R81	9.73	9.74	0.01	0	Negligible
	R82	10.35	10.35	0.00	0	Negligible
	R83	9.96	9.98	0.02	0	Negligible
	R87	10.72	10.74	0.02	0	Negligible
Broadland	R17	9.02	9.07	0.05	0	Negligible
	R18	9.08	9.12	0.04	0	Negligible
	R19	9.56	9.60	0.04	0	Negligible
	R20	10.09	10.16	0.08	0	Negligible
	R21	10.17	10.21	0.04	0	Negligible
	R35	10.50	10.55	0.06	0	Negligible
	R36	12.62	12.67	0.05	0	Negligible
	R42	9.58	9.62	0.03	0	Negligible
	R43	9.09	9.11	0.03	0	Negligible
	R49	9.71	9.77	0.06	0	Negligible
	R69	10.28	10.32	0.04	0	Negligible
	R70	10.11	10.18	0.07	0	Negligible
	R71	11.66	11.77	0.11	0	Negligible
	R75	9.50	9.59	0.09	0	Negligible
	R76	10.31	10.43	0.12	0	Negligible
	R77	9.57	9.62	0.06	0	Negligible
	R79	10.03	10.07	0.05	0	Negligible
	R85	10.27	10.33	0.06	0	Negligible
	R86	11.15	11.27	0.12	0	Negligible

Local Authority	Receptor ID	Annual mean $PM_{2.5}$ concentrations ($\mu g.m^{-3}$)				
		Without Norfolk Vanguard and Hornsea Project Three	With Norfolk Vanguard and Hornsea Project Three	Change	Change as % of objective	Impact descriptor
	R88	12.47	12.49	0.02	0	Negligible
Great Yarmouth	R33	9.94	10.00	0.06	0	Negligible
	R34	10.00	10.05	0.06	0	Negligible
	R37	9.06	9.09	0.03	0	Negligible
	R38	13.96	13.98	0.03	0	Negligible
	R39	9.69	9.72	0.04	0	Negligible
	R40	9.17	9.18	0.02	0	Negligible
	R41	9.50	9.52	0.02	0	Negligible
	R67	10.53	10.58	0.05	0	Negligible
	R68	9.53	9.57	0.04	0	Negligible
	R72	9.75	9.83	0.08	0	Negligible
King's Lynn	R1	10.09	10.13	0.04	0	Negligible
	R2	9.66	9.70	0.04	0	Negligible
North Norfolk	R5	9.82	9.88	0.06	0	Negligible
	R6	9.59	9.64	0.05	0	Negligible
	R7	10.11	10.19	0.08	0	Negligible
	R8	9.47	9.53	0.06	0	Negligible
	R13	9.78	9.82	0.04	0	Negligible
	R14	10.16	10.23	0.07	0	Negligible
	R44	13.72	13.79	0.07	0	Negligible
	R45	9.83	9.91	0.08	0	Negligible
	R46	9.10	9.16	0.06	0	Negligible
	R47	10.40	10.48	0.08	0	Negligible
	R48	9.36	9.42	0.06	0	Negligible
	R50	9.71	9.75	0.04	0	Negligible

Local Authority	Receptor ID	Annual mean $PM_{2.5}$ concentrations ($\mu g.m^{-3}$)				
		Without Norfolk Vanguard and Hornsea Project Three	With Norfolk Vanguard and Hornsea Project Three	Change	Change as % of objective	Impact descriptor
	R51	8.76	8.77	0.01	0	Negligible
	R52	10.15	10.20	0.05	0	Negligible
	R53	9.60	9.65	0.05	0	Negligible
	R54	9.16	9.18	0.02	0	Negligible
	R55	9.12	9.13	0.01	0	Negligible
	R56	9.27	9.29	0.02	0	Negligible
	R57	9.66	9.69	0.03	0	Negligible
	R58	9.81	9.85	0.04	0	Negligible
	R59	9.76	9.80	0.04	0	Negligible
	R60	9.24	9.27	0.03	0	Negligible
	R61	9.24	9.26	0.02	0	Negligible
	R62	9.41	9.45	0.04	0	Negligible
	R63	10.93	10.96	0.03	0	Negligible
	R64	10.03	10.05	0.02	0	Negligible
	R65	9.18	9.20	0.02	0	Negligible
	R66	8.65	8.68	0.03	0	Negligible
	R73	9.43	9.49	0.06	0	Negligible
	R74	9.27	9.31	0.04	0	Negligible
	R78	10.41	10.44	0.03	0	Negligible
	R84	9.84	9.88	0.04	0	Negligible
South Norfolk	R23	9.35	9.38	0.03	0	Negligible
	R24	9.45	9.46	0.01	0	Negligible
	R25	9.62	9.63	0.01	0	Negligible
	R26	10.12	10.16	0.04	0	Negligible
	R27	10.66	10.71	0.05	0	Negligible

Local Authority	Receptor ID	Annual mean $PM_{2.5}$ concentrations ($\mu g.m^{-3}$)				
		Without Norfolk Vanguard and Hornsea Project Three	With Norfolk Vanguard and Hornsea Project Three	Change	Change as % of objective	Impact descriptor
	R89	10.07	10.09	0.02	0	Negligible
Waveney	R28	9.59	9.62	0.03	0	Negligible
	R29	9.17	9.20	0.03	0	Negligible
	R30	9.83	9.91	0.08	0	Negligible
	R31	9.49	9.54	0.05	0	Negligible
	R32	10.07	10.15	0.08	0	Negligible

11. The results of the construction phase cumulative road traffic emissions assessment indicate that annual mean concentrations of NO_2, PM_{10} and $PM_{2.5}$ are predicted to be below the respective air quality Objectives (as detailed in Table 1) in the year of peak construction at all receptors, both 'without' and 'with' the concurrent construction of Norfolk Vanguard and Hornsea Project Three.

12. The maximum change in NO_2 concentrations was 5% of the Objective ($1.84\mu g.m^{-3}$), which was experienced at receptor R76. However, this still represents a 'negligible' impact in accordance with IAQM and EPUK guidance (IAQM and EPUK 2017) due to low total NO_2 concentrations. Receptor R71 is assessed as experiencing a 3% change in concentrations ($1.05\mu g.m^{-3}$), which represents a 'slight adverse' impact, in accordance with IAQM and EPUK guidance, as the total concentration is above $30\mu g.m^{-3}$. This is due to the proximity of this receptor to the Norwich Northern Distributor Road, which has a high traffic flow and a large number of additional HGVs as a result of the cumulative projects (693 HGVs per day).

13. The impact significance assessed at each receptor location for cumulative construction traffic remains unchanged to that assessed for Norfolk Vanguard alone.

14. All predicted NO_2 concentrations were well below $60\mu g.m^{-3}$ and therefore, in accordance with Defra guidance in LAQM.TG (16) (Defra 2016), the 1-hour mean objective is unlikely to be exceeded. Based on the calculation provided by Defra, the short-term PM_{10} objective was predicted to be met at all modelled locations with less than 35 exceedances of the daily mean objective of $50\mu g.m^{-3}$. Using the Defra calculation, there was no change in the number of days exceeding the daily mean objective between the 'without' and 'with' cumulative project scenarios.

15. This assessment concludes that cumulative traffic impacts upon local air quality are not significant based upon:

- A predicted negligible impact at all receptor locations except one, which is predicted to experience a 'slight adverse' impact;
- Predicted pollutant concentrations are below the relevant air quality objectives at all considered receptor locations;
- Cumulative traffic flows are not predicted to cause a breach of any of the air quality objectives at any identified sensitive receptor location; and
- A conservative approach to the cumulative assessment has been taken, with the use of 2015 emission factors, background concentrations and NO_x to NO_2 conversion rates in the future year assessment scenarios.

3.2 Ecological Receptors

16. The results of the assessment of nutrient nitrogen deposition on designated ecological sites (as detailed in Table 2) are detailed in Table 6.

Table 6 Nutrient Nitrogen Deposition Results

Designated ecological site	Transect ID	Nutrient nitrogen deposition (kgN.ha.y^{-1})		Change (kgN.ha.y^{-1})	Change as % of lowest Critical Load
		Without Norfolk Vanguard and Hornsea Project Three	With Norfolk Vanguard and Hornsea Project Three		
Felbrigg Woods Site of Special Scientific Interest (SSSI)	T1-1	0.65	0.98	0.33	3
	T1-2	0.20	0.29	0.08	1
	T1-3	0.13	0.17	0.04	0
	T1-4	0.09	0.13	0.03	0
	T1-5	0.08	0.10	0.02	0
	T1-6	0.07	0.10	0.02	0
Broadland Special Protection Area (SPA)	T2-1	0.08	0.09	0.01	0
	T2-2	0.06	0.07	0.01	0
	T2-3	0.06	0.07	0.01	0
The Broads Special Area of Conservation (SAC)	T3-1	0.50	0.59	0.09	0
	T3-2	0.13	0.15	0.02	0
	T3-3	0.09	0.10	0.01	0

Designated ecological site	Transect ID	Nutrient nitrogen deposition (kgN.ha.y^{-1})		Change (kgN.ha.y^{-1})	Change as % of lowest Critical Load
		Without Norfolk Vanguard and Hornsea Project Three	With Norfolk Vanguard and Hornsea Project Three		
	T3-4	0.07	0.08	0.01	0
	T3-5	0.07	0.08	0.01	0
	T4-1	1.33	1.59	0.26	1
	T4-2	0.20	0.23	0.04	0
	T4-3	0.13	0.15	0.02	0
	T4-4	0.10	0.12	0.02	0
	T4-5	0.09	0.10	0.01	0
Breydon Water SSSI	T5-1	0.61	0.67	0.06	0
	T5-2	0.29	0.32	0.03	0
	T5-3	0.21	0.23	0.02	0
	T5-4	0.17	0.18	0.02	0
	T5-5	0.16	0.17	0.02	0
	T6-1	3.25	3.55	0.30	1
	T6-2	0.49	0.54	0.05	0
	T6-3	0.31	0.34	0.03	0
	T6-4	0.23	0.26	0.03	0
	T6-5	0.20	0.22	0.02	0
Broadland SPA	T7-1	0.19	0.21	0.02	0
	T7-2	0.11	0.13	0.02	0
	T7-3	0.09	0.10	0.01	0
	T7-4	0.07	0.08	0.01	0
	T8-1	2.21	2.42	0.21	2
	T8-2	0.37	0.40	0.03	0
	T8-3	0.23	0.25	0.02	0

Designated ecological site	Transect ID	Nutrient nitrogen deposition (kgN.ha.y^{-1})		Change (kgN.ha.y^{-1})	Change as % of lowest Critical Load
		Without Norfolk Vanguard and Hornsea Project Three	With Norfolk Vanguard and Hornsea Project Three		
	T8-4	0.18	0.19	0.02	0
	T8-5	0.15	0.16	0.01	0
Cawston and Marsham Levels SSSI	T9-1	0.14	0.18	0.04	0
	T9-2	0.13	0.17	0.04	0
Buxton Heath SSSI	T10-1	0.28	0.36	0.08	1
	T10-2	0.18	0.22	0.04	0
	T10-3	0.13	0.17	0.03	0
	T10-4	0.11	0.14	0.03	0
Holt Lowes SSSI	T11-1	0.37	0.53	0.16	2
	T11-2	0.09	0.13	0.04	0
	T11-3	0.07	0.09	0.02	0
	T11-4	0.05	0.07	0.02	0
	T11-5	0.05	0.06	0.02	0
Foxley Wood SSSI	T12-1	0.05	0.06	0.01	0
	T12-2	0.05	0.06	0.01	0

17. As detailed in Table 6, increases in nutrient nitrogen deposition were above 1% of the relevant critical load at the transect locations closest to the road network within Felbrigg Woods SSSI, Broadland SPA and Holt Lowes SSSI. At all other locations, increases in nutrient nitrogen deposition were 1% or below of the relevant critical load, and are therefore considered to be not significant, in accordance with Environment Agency guidance[2].

18. Further assessment of the ecological significance of the results of the nutrient nitrogen deposition at Felbrigg Woods SSSI, Broadland SPA and Holt Lowes SSSI is provided below.

[2] Air Emissions Risk Assessment for your Environmental Permit https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

3.2.1 Ecological Impact Evaluation

19. The updated air quality assessment predicts nutrient nitrogen deposition of >1% of the critical load to occur at three sites - Felbrigg Woods SSSI, Broadland SPA and Holt Lowes SSSI.

Table 7 Statutory designated sites subject to nutrient nitrogen deposition >1% of the relevant critical load

Statutory Designated Site	Nutrient nitrogen deposition sensitive habitat or features present within the site	Lowest Critical Load ($kgN.ha^{-1}.y^{-1}$)	Suitable habitat present within 50m of road network?	% of critical load	
				Adjacent to road	50m from road
Felbrigg Woods SSSI	Broadleaved, mixed and yew woodland	10	Yes	3%	1%
Broadland SPA	Eurasian Marsh Harrier Eurasian Wigeon Great Bittern	15	No	2%	0%
Holt Lowes SSSI	Fen, marsh and swamp Dwarf shrub heath	10	No	2%	0%

20. At Felbrigg Woods SSSI, the only habitat type within the study area is broadleaved woodland. At the critical load (10 kgN.ha-1.y-1) for broadleaved woodlands, nutrient nitrogen deposition is anticipated to result in changes in soil processes, nutrient imbalance, altered composition mycorrhiza and ground vegetation[3].

21. As cumulative construction traffic is anticipated to result in a temporary increase in nutrient nitrogen deposition at only 3% of the critical load (0.3 $kgN.ha^{-1}.y^{-1}$) for areas immediately adjacent to the road network only (woodland provides a rough surface which will ensure that nutrient nitrogen deposition rapidly drops off with distance from source) for the duration of the construction period, the localised, temporary effect is not anticipated to change the structure and function of the habitat and is anticipated to be of negligible magnitude.

22. The level of nitrogen deposition predicted at Felbrigg Wood SSSI, under the updated cumulative assessment, is assessed to be the same magnitude of effect identified for Norfolk Vanguard alone (**negligible**). On this basis no mitigation is proposed.

[3] Bobbink, R, Braun, S, Nordin, A, Power, S, Schutz, K, Strengbom, J, Weijters, M, Tomassen, H (2011) Review and revision of empirical critical loads and dose-response relationships. Proceedings of an expert workshop, Noordwijkerhout, 23-25 June 2010

23. For Broadland SPA, no suitable habitats for supporting the nutrient nitrogen deposition sensitive features (i.e. Eurasian marsh harrier, Eurasian wigeon, and great bittern) are present within 50m of the road network. As such, **no change** is anticipated.

24. At Holt Lowes SSSI, nitrogen-sensitive habitats for which the site is designated (fen, marsh and swamp habitats, and dwarf shrub heath (lowland heath)) are not present within 50m of the road network.

25. The nearest habitat, dwarf shrub heath, is located approximately 60m east of the road network. In addition, the nutrient-sensitive invertebrate assemblage (including the Bog Bush Cricket *Metrioptera brachyptera* and the Keeled Skimmer dragonfly *Orthetrum coerulescens*), which is a qualifying feature of the SSSI, is associated with the wet boggy areas of the site, which are located approximately 500m from the road network at their closest point.

26. As all nutrient-sensitive qualifying features, associated with Holt Lowes SSSI, are located outside of the area which exceed 1% of the critical load, **no change** is anticipated.

4 SUMMARY

27. A dispersion modelling assessment was carried out to consider potential air quality impacts at sensitive human and ecological receptors as a result of cumulative traffic flows generated by concurrent works on Norfolk Vanguard and Hornsea Project Three.

28. The following scenarios were therefore considered:

- 2023 background traffic without Norfolk Vanguard or Hornsea Project Three construction traffic without project'; and
- 2023 background traffic with the worst case peak construction traffic for both Norfolk Vanguard and Hornsea Project Three construction traffic 'with project'.

29. This assessment at sensitive human receptors concluded that cumulative traffic impacts upon local air quality are not significant based upon:

- A predicted negligible impact at all receptor locations except one, which is predicted to experience a 'slight adverse' impact;
- Predicted pollutant concentrations are below the relevant air quality objectives at all considered receptor locations; and
- Cumulative traffic flows are not predicted to cause a breach of any of the air quality objectives at any identified sensitive receptor location.

30. This assessment at sensitive ecological receptors concludes nutrient nitrogen deposition of >1% of the critical load to occur at three sites - Felbrigg Woods SSSI, Broadland SPA and Holt Lowes SSSI.

31. At Felbrigg Woods SSSI, the only habitat type within the study area is broadleaved woodland. The level of nitrogen deposition predicted under the updated cumulative assessment is assessed to be the same magnitude of effect assessed for Norfolk Vanguard alone.

32. For Broadland SPA, no suitable habitats for supporting the nutrient nitrogen deposition sensitive features (i.e. Eurasian marsh harrier, Eurasian wigeon, and great bittern) are present within 50m of the road network. As such, **no change** is anticipated.

33. At Holt Lowes SSSI, nitrogen-sensitive habitats for which the site is designated (fen, marsh and swamp habitats, and dwarf shrub heath (lowland heath)) are not present within 50m of the road network. As all nutrient-sensitive qualifying features are located outside of the area which exceed 1% of the critical load, **no change** is anticipated.