Norfolk Vanguard Offshore Wind Farm

Chapter 31

Socio-economics

Environmental Statement

Volume 1

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Environmental Impact Assessment
Environmental Statement

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Glossary

AAS	Assisted Area Status
AONB	Area of Outstanding Natural Beauty
BC	Breckland Council
BEIS	Department for Business, Energy & Industrial Strategy
CBI	Confederation of British Industry
CfD	Contract for Difference
COP	Conference of the Parties
CORE	Centres for Offshore Renewable Engineering
CRS	Cable relay station
dB	Decibels
DCO	Development Consent Order
DECC	Department of Energy and Climate Change
EC	European Commission
EEA	European Economic Area
EIA	Environmental Impact Assessment
EN-1	Overarching National Policy Statement for Energy
EPIC	Engineering Procurement Installation Commissioning
ES	Environmental Statement
EU	European Union
EZ	Enterprise Zone
FTE	Full Time Equivalent
GDP	Gross Domestic Product
GIB	Green Investment Bank
GIS	Geographic Information System
GP	General Practitioner
GROW	Regional Growth Fund for Offshore Wind Supply Chain Growth
GVA	Gross Value Added
HAT	Height Above Tide
HDD	Horizontal Directional Drilling
HM	Her Majesty's (Government)
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IAIA	International Association for Impact Assessment
IOI	Intervention or Investment
IMD	English Indices of Multiple Deprivation
LDO	Local Development Order
LEP	Local Enterprise Partnership
LSOA	Lower Super Output Area
MSOA	Middle Super Output Area
MW	Megawatt
NGET	National Grid Electricity Transmission
NOMIS	ONS service providing Official Labour Market Statistics
NPPF	National Planning Policy Framework
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Projects

NUTS	Nomenclature of Territorial Units for Statistics
O&M	Operations and Maintenance
ONS	Office for National Statistics
OWF	Offshore Wind Farm
PEIR	Preliminary Environmental Information Report
PRoW	Public Right of Way
PSEG	Productive Seas Evidence Group
R&D	Research and Development
SAC	Special Area of Conservation
SEAI	Sustainable Energy Authority of Ireland
SIA	Social Impact Assessment
SPL	Sound Pressure Level
SoS	Secretary of State
STEM	Science, technology, engineering and maths
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
UK	United Kingdom
UKTI	UK Trade & Investment

Terminology

Array cables	Cables which link the wind turbine generators and the offshore substation platform.
Cable Relay Station	Primarily comprised of an outdoor compound containing reactors (also called inductors, or coils) and switchgear to increase the power transfer capability of the cables under the HVAC technology scenario as considered in the PEIR. This is no longer required for the project as the HVDC technology has been selected.
Gross Domestic Product (GDP)	A measure of the total value of market goods produced and services provided in country in one year. It should be noted that GDP was developed to measure the market production of a nation and, as such, does not capture the value from non-market goods such as services provided by nature and non-salaried services provided by households.
Gross Value Added (GVA)	A measure of the value of goods and services produced in an area, industry or sector of an economy. It is a component of GDP growth and, similarly, does not capture value added from non-market goods such as services provided by nature and non-salaried services provided by households.
Landfall	Where the offshore cables come ashore at Happisburgh South.
Link boxes	Underground chambers or above ground cabinets next to the cable trench housing low voltage electrical earthing links.
Local Enterprise Partnerships (LEPs)	Voluntary partnerships between local authorities and businesses set up in 2011 by the Department for Business, Innovation and Skills to help determine local economic priorities and lead economic growth and job creation within the local area.
Lower Super Output Areas (LSOAs) and Middle Super Output Areas (MSOAs)	LSOAs and MSOAs are a geographic hierarchy designed to improve the reporting of small area statistics in England and Wales following the 2001 Census. These are built from groups of contiguous Output Areas and have been automatically generated by the Office for National Statistics. LSOAs have a population of 1,000 to 3,000 and from 400 to 1,200 households.

	MSOAs have a population of 5,000 to 15,000 and from 2,000 to 6,000 households.
Market Goods	Market goods and services are generally intended to be sold on the market at a price calculated to cover their production cost
Mobilisation area	Areas approx. 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 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 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 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
New Anglia LEP	New Anglia Local Enterprise Partnership works with businesses, local authority partners and education institutions across the counties of Norfolk and Suffolk.
Nomenclature of Territorial Units for Statistics	Nomenclature of Territorial Units for Statistics (NUTS) are statistical divisions of areas of the United Kingdom (UK) based on population. Within the UK, NUTS1 is generally regional. NUTS2 is generally at a county level. NUTS3 is generally at a grouped local authority and district level.
Non-market goods	Most environmental goods and services, such as clean air and water, and healthy fish and wildlife populations, are not traded in markets. Their economic value (i.e. how much people would be willing to pay for them) and societal value (i.e. how much they contribute to society) is not captured in market prices.
Offshore cable corridor	The corridor of seabed from the Norfolk Vanguard OWF sites to the landfall site within which the offshore export cables will be located.
Offshore export cables	The cables which bring electricity from the offshore substation platform to the landfall.
Onshore 400kV cable route	Buried high-voltage cables linking the onshore project substation to the Necton National Grid substation
Onshore cable corridor	200m wide onshore corridor within which the onshore cable route would be located as submitted for PEIR.
Onshore cables	The cables which take the electricity from landfall to the onshore substation.
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. In an HVDC system 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.
Productivity	Productivity is an economic measure of output per unit of input. Inputs include labour and capital, while output is typically measured in revenues and other gross domestic product components such as business inventories.
Productivity gap	A comparison between the productivity of an area and the national average.

Running track	The track along the onshore cable route which the construction traffic would use to access workfronts.
Safety zones	An area around a vessel which should be avoided during offshore construction
The Applicant	Norfolk Vanguard Limited
The OWF sites	The two distinct offshore wind farm areas, Norfolk Vanguard East and Norfolk Vanguard West.
The project	Norfolk Vanguard Offshore Wind Farm, including the onshore and offshore infrastructure.
Trenchless crossing zone (e.g. HDD)	Temporary areas required for trenchless crossing works.

31 SOCIO-ECONOMICS

31.1 Introduction

1. This chapter of the Environmental Statement (ES) presents the socio-economic assessment for the proposed Norfolk Vanguard Offshore Wind Farm (herein 'the project'). The approach to assessment uses the project design as currently defined by chapter 5 Project Description and further described in section 31.7.4 to provide the basis of analysis.

2. The assessment in Chapter 2 Need for the Project highlights the national benefits of the project. In accordance with the Overarching National Policy Statement for Energy (EN-1) (Department of Energy and Climate Change (DECC), 2011), this chapter will describe the potential for socio-economic impacts relating to the creation of jobs and the potential impact on community infrastructure at a regional and local level.

3. The assessment includes the construction, operation and decommissioning phases of the project. The purpose of this is to ensure that local and regional communities are not disadvantaged in the process of providing national benefit.

4. The supply chain for the construction and operation of the project would be developed at the post consent stage. Therefore, at this stage, an assessment of the likely location of supply chain businesses is used to provide a high-level assessment of the potential for direct and indirect regional job creation due to the onshore and offshore construction and operation phases.

5. It is assumed that potential impacts of decommissioning would be broadly similar to construction and will be assessed as such. The decommissioning methodology would need to be finalised nearer to the end of the lifetime of the project so as to be in line with current guidance, policy and legislation at that point. The decommissioning works could be subject to a separate licencing approach.

6. Potential socio-economic impacts are interrelated with other topics. These are referenced within this chapter where relevant and include:

   - Chapter 14 Commercial Fisheries;
   - Chapter 24 Traffic and Transport;
   - Chapter 25 Noise and Vibration;
   - Chapter 27 Human Health;
   - Chapter 29 Landscape and Visual Impact Assessment; and
   - Chapter 30 Tourism and Recreation.

7. This chapter is supported by Appendix 31.1 that shows graphs derived from ONS statistics.

31.2 Legislation and Policy

8. The offshore wind sector in the New Anglia LEP is currently undergoing significant development and growth. An overview of the local and regional policy supporting this sectoral development and an overview of this growth is included in Appendix 31.3.

9. This section describes policy at a national, regional, and local level that has been reviewed to inform the socio-economic impact assessment.

31.2.1 National Legislation

10. Table 31.1 describes the requirements of the Overarching National Policy Statement for Energy (EN-1), Regulation 5(2) and Schedule 4 of The Infrastructure Planning (EIA) Regulations 2017.

Table 31.1 Review of national planning policy with regards socio-economics

Paragraph	Description	Response
National Policy Statements (NPS) for Energy (DECC, 2011)		
5.12.1	The construction, operation and decommissioning of energy infrastructure may have socio-economic impacts at local and regional levels. Parts 2 and 3 of this NPS set out some of the national level socio-economic impacts.	Parts 2 and 3 of NPS EN-1 set out the national level socio-economic impacts therefore these will not be considered further within this assessment.
5.12.2	Where the project is likely to have socio-economic impacts at local or regional levels, the applicant should undertake and include in their application an assessment of these impacts as part of the ES	In combination with Chapter 27 Human Health and Chapter 30 Tourism and Recreation, this chapter responds to this overarching statement. The assessment is found in section 31.7.
5.12.3	This assessment should consider all relevant socio-economic impacts, which may include:	
	the creation of jobs and training opportunities;	Potential job creation is considered in sections 31.7.5.1 and 31.7.6.1.
	the provision of additional local services and improvements to local infrastructure, including the provision of educational and visitor facilities;	Effects on community infrastructure are considered in 31.7.5.2 and 31.7.6.2.
	effects on tourism;	Potential impacts are considered in Chapter 30 Tourism and Recreation
	the impact of a changing influx of workers during the different construction, operation and decommissioning phases of the energy infrastructure	As discussed in Chapter 27 Human Health potential impacts have been scoped out due to the low number of in-migrant workers in comparison to the regional population; that incoming workers are expected to be distributed across the region; and are expected to return to their permanent residence over the weekend.
	cumulative effects	Cumulative impacts, inter-relationships, and interactions are considered in sections 31.8, 31.9, and 31.10.
5.12.4	Applicants should describe the existing socio-economic conditions in the areas	See Table 31.2 for a review of overarching regional and local policy.

Paragraph	Description	Response
	surrounding the proposed development and should also refer to how the development's socio-economic impacts correlate with local planning policies	
The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017		
5(2)(a)	The EIA must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of the proposed development on the following factors— (a) population and human health.	In combination with Chapter 27 Human Health and Chapter 30 Tourism and Recreation, this chapter responds to this overarching statement. The assessment is found in section 31.7.
SCHEDULE 4.4	A description of the factors specified in regulation 5(2) likely to be significantly affected by the development: population, human health….	In combination with Chapter 27 Human Health and Chapter 30 Tourism and Recreation, this chapter responds to this overarching statement. The assessment is found in section 31.7.

31.2.2 Regional and local policy review

11. In response to the requirements under 5.12.3 of EN-1 (DECC, 2011), Table 31.2 describes the regional and local policy context.

Table 31.2 Regional and local policy review

Paragraph	Description	Response
The regional economic strategy for the East of England		
GOAL ONE: A skills base that can support a world-class economy	Increasing employability and participation in the labour market, especially for disadvantaged communities Increasing numbers of young people participating in vocational, mathematics, science, engineering and technology options	Potential job creation is considered in section 31.7. This section details both the work that Norfolk Vanguard Ltd is doing to create an employment pipeline and supply chain plan, as well as the number of FTE jobs likely to be created in the New Anglia LEP region.
GOAL TWO: Growing competitiveness, productivity and entrepreneurship	Levels of new enterprise and business growth comparable to those of a leading global region Regional businesses achieving their potential through support from high quality, accessible and integrated business support, training and development structures Increasing levels of participation in the national and international economy by East of England businesses, with particularly strong relations with a number of other leading global regions	The Norfolk Vanguard project represents a significant investment in to the region that will create a supply chain to support its implementation and operation. This is covered in section 31.7.
GOAL EIGHT: An exemplar for the efficient use of resources	Be a centre for sources of renewable energy with a nationally significant growth and expertise in associated businesses. Have a nationally significant cluster of environmental goods and services businesses.	The Norfolk Vanguard project represents a significant proportion of the region's response to achieving this goal. The potential cumulative employment is considered in section 31.8.

Paragraph	Description	Response
The strategy and the five drivers of productivity	These are outlined as: • Skills • Enterprise • Innovation • Competition • Investment	Section 31.7.3 describes the additional enhancement being undertaken as part of the project to support these drivers of productivity.
New Anglia Strategic Economic Plan		
Chapter 1 Introducing our economy **Paragraph 1.15**	Building on the aims of the UK Industrial Strategy (which has a strong focus on sector prioritisation and support), we have identified five high impact sectors which are highlighted throughout our plan as a particular focus for targeted interventions: • Advanced Manufacturing and Engineering • Agri-tech • Energy • ICT and Digital Creative • Life Sciences	The Norfolk Vanguard project represents a significant contribution to the High Impact sector of 'Energy'
Chapter 2 Sectors **Paragraph 2.30**	So, the New Anglia area is well placed to capitalise on the rapid technological and market growth in renewable and low carbon sectors, along with significant investments in offshore wind and has already undertaken a number of successful steps to promote the sector.	The Norfolk Vanguard project represents a significant proportion of the cumulative regional investment required to capitalise on rapid technological and market growth.
Chapter 3 Green Economy Pathfinder **Paragraph 3.1 and 3.2**	The LEP was selected by Government in 2011 to lead the UK's transition to a green economy across three focus areas: low carbon, natural capital and social capital. Our ambition is to strengthen the New Anglia economy by creating more productive jobs. We will do this by building on our distinctive competitive economic and environmental advantages to ensure our area is home to businesses playing a prime role in driving the sustainable growth of the UK economy.	Due to the fact that the Norfolk Vanguard is a low carbon renewable energy project, between Section 31.7, Chapter 27 Human Health, and Chapter 30 Tourism & Recreation, all three focus areas are considered.
Chapter 5 Skills **Paragraph 5.3**	Our key challenge is that our resident workforce is ageing, low skilled and low paid. As a result, many of the available high value jobs go to an imported workforce. This will continue to happen if we cannot increase our higher and graduate level skills in the workforce. Concurrently, worklessness and a lack of social mobility reduce the prospects for individuals.	Section 31.7.3 describes how the Norfolk Vanguard project is engaging with local supply chains and educational facilities with the aim of enhancing local procurement and the development of a local employment pipeline.
Broadland, Norwich and South Norfolk Joint Core Strategy (2014)		
Paragraph 2.6	The grand challenges that our Strategy has to address between 2008-2026 are: Jobs: securing another 27,000 new jobs of all types and levels in all sectors of the economy and for all the workforce Place making: maximising the high quality of life we currently enjoy and respecting the patterns of living which characterise the area Infrastructure: ensuring that essential infrastructure, services and community facilities are provided	Job creation is considered in 31.7 Section 31.7.5.1 considers the contribution to the construction sector. Section 31.7.6.1 considers long term employment opportunities.

Paragraph	Description	Response
Policy 5: The economy	The local economy will be developed in a sustainable way to support jobs and economic growth both in urban and rural locations. This will: • provide for a rising population and develop its role as an engine of the wider economy; • facilitate its job growth potential with a target of at least 27, 000 additional jobs in the period 2008-2026; and • increase the proportion of higher value, knowledge economy jobs while ensuring that opportunities are available for the development of all types and levels of jobs in all sectors of the economy and for all the workforce	Section 31.7.3 describes how the Norfolk Vanguard project is engaging with local supply chains and educational facilities
Policy 5: The economy	Opportunities for innovation, skills and training will be expanded through: • facilitating the expansion of, and access to, vocational, further and higher education provision; and • encouraging links between training/education provision and relevant business concentrations including co-location where appropriate	Section 31.7.3 describes how the Norfolk Vanguard project is engaging with local supply chains and educational facilities. Section 31.7.6.1 considers long term employment opportunities.
Policy 7: Supporting communities	Provision will be made to ensure equitable access to new and improved community halls, including new provision on major developments. This will provide facilities for use by a wide range of groups, including faith communities. Expanded library provision will be made including through new or expanded facilities in major growth locations.	Sections 31.7.5.2 and 31.7.6.2 considers potential impacts to community infrastructure.
Policy 7: Supporting communities	Integration and cohesion within and between new and existing communities will be promoted including through support for community development workers and the early engagement of existing communities in the design process.	Sections 31.7.5.2 and 31.7.6.2 considers potential impacts to community infrastructure.

31.3 Consultation

12. Consultation is a key driver of the EIA, and is an ongoing process throughout the lifecycle of the project, including post-consent. To date, consultation regarding socio-economics has been conducted through the Scoping Report (Royal HaskoningDHV, 2016), Expert Topic Group (ETG) meetings held in January 2017, and the Preliminary Environmental Information Report (Norfolk Vanguard Limited, 2017). Full details of the project consultation process are presented within Chapter 7 Technical Consultation and within the Consultation Report.

31.3.1 Informal Consultation

13. In line with best practice outlined by the IAIA (Vanclay et al, 2015) and their own Principles of Engagement[1], Norfolk Vanguard Limited conducted informal consultation to inform the development of the project from Autumn 2016 – Q2 2017, ahead of the formal consultation process in November 2017 (described in Chapter 7 Technical Consultation and summarised with regards socio-economics in Table 31.4). Table 31.3 summarises the consultation activities during this period (Norfolk Vanguard Limited, 2017).

Table 31.3 Summary of informal consultation as described in Statement of Community Consultation (Norfolk Vanguard Limited, October 2017)

Period	Newsletter	Adverts in local media	Press releases	Key stakeholder engagement	Consultation events	Participants	Follow-up
Autumn 2016	October: Project introduction & invitation to get involved	Yes	Yes	Yes	7 drop-in exhibitions held within the local area. Exhibition materials & Scoping report published.	788 present 105 provided feedback	Summary & Full reports /letter /FAQ update
Spring 2017	March: Project update & invitation to get involved	Yes	Yes	Yes	9 drop-in exhibitions held within the local area. Exhibition materials published.	884 present 268 provided feedback	Summary & Full reports /letter /FAQ update
Summer 2017	June: Project refinements & next steps	No	Yes	Yes	No	No	FAQ update
	No	No	No	July: local focus groups on siting onshore electrical infrastructure.	4 locally themed workshops	180	Follow-up report & consultation materials published

31.3.2 Community Engagement

[1] Available on the Vattenfall Wind Power Ltd. corporate website at: https://corporate.vattenfall.co.uk/globalassets/uk/communities/principles-of-engagement.pdf

14. Since October 2016 consultation and engagement has been undertaken with local communities, varied organisations and businesses within Norfolk and particularly within the footprint of the onshore cable route. To date this has included:

- Drop in Exhibitions held at locations within and adjacent to the onshore project area;
  - October 2016;
  - March/April 2017; and
  - November 2017.
- Reports of community feedback shared with all registered participants, key local and community stakeholders, and on the project website[2];
  - Hearing your Views, I, II and III;
- Community engagement events;
- Direct discussions with landowners;
- Newsletters distributed throughout the Scoping Area (October 2017), and subsequently provided to those within a more focussed area closer to the onshore project area. These newsletters were distributed on the following dates:
  - October 2016;
  - March 2017;
  - June 2017;
  - October 2017; and
  - February 2018.
- Provision of a dedicated project website.

15. The project has employed a Local Liaison Officer and Skills and Education Champion based in Norfolk, as well as procured support from a Norwich based Public Engagement agency. The project has continued to deepen and broaden engagement with organisations that support and represent the interests of people and businesses local to landfall, onshore cable route, onshore project substation and National Grid substation, and in the region.

16. Skills and education work to date has included working with local primary schools and developing a 3D modelling programme. This is aimed at providing an interactive learning experience for older students which provides insights into the considerations, constraints and opportunities associated with assessing the feasibility of offshore wind farm development. These programmes will be built upon and rolled out further to local students, including in partnership with the University

[2] https://corporate.vattenfall.co.uk/norfolkvanguard

of East Anglia during 2018 and in support of the New Anglia Energy Sector Skills Plan discussed in Appendix 31.3.

31.3.3 Formal Consultation

17. A summary of the formal consultation that has been undertaken to date since November 2017 and has driven forward the development of this assessment is provided in Table 31.4.

Table 31.4 Consultation responses

Consultee	Date / document	Comment	Response / where addressed in the ES
Aylsham Town Council (online questionnaire)	PEIR December 2017	The Town Council welcome the potential for employment and training this project should bring and would like to see some assurances that this will be spread to the rural areas and not concentrated in Norwich and Kings Lynn	The worker movement assessment in Chapter 24 Traffic and Transport shows that there is potential for workers to be recruited from across the New Anglia LEP. Norfolk Vanguard Limited is also actively engaging in the development of a local supply chain (section 31.7.2).
Broadland District Council	PEIR December 2017	Broadly supports the development of renewable energy. Requests further identification of opportunities arising for local employment.	Direct and indirect job creation is covered in section 31.7.
East Rushton Parish Council and residents	PEIR December 2017	Concerned that the photo montages of the Cable Relay Station (CRS) proposed at PEIR stage did not capture the true character of the area	Norfolk Vanguard Limited has reviewed consultation received and in light of the feedback, has made a number of decisions in relation to the project design in order to deliver an environmentally sustainable project. One of those decisions is to deploy High Voltage Direct Current (HVDC) cable technology to the UK's National Grid and this removes the need for a Cable Relay Station from the project.
Fransham Parish Council (online questionnaire)	PEIR December 2017	*"We support the group whose aim is to bring a better broadband service to our area. We would encourage Vattenfall to help in this enterprise. We are not alone in these aspirations as we have noted that during previous consultations on the proposed windfarm development, a number*	Norfolk Vanguard Limited are committed to exploring ways to maximise the benefits to the local community, including the opportunity of being able to insert the telecommunication fibre optic cables in the same footprint as the onshore cable route. The installation of such

Consultee	Date / document	Comment	Response / where addressed in the ES
		of people along the length of the identified route have suggested this as a possible opportunity and community benefit."	cabling falls outside the DCO Application process.
Happisburgh Parish Council	PEIR December 2017	The project must not effect properties and the council will not accept an HVAC option for this reason. The council urges Vattenfall to use Long Drill HDD at landfall. Beach road car park is essential for village income and any closure must have a long notice period, preferably with compensation. The council requests a community fund. The council feels that due to the location of CRS option that the area will be immensely effected. The council also urges landfall for both Vanguard and Boreas to be made at the same time.	Norfolk Vanguard Limited has reviewed consultation received and in light of the feedback, has made a number of decisions in relation to the project design in order to deliver an environmentally sustainable project including: • A decision to deploy High Voltage Direct Current (HVDC) cable technology to the UK's National Grid and this removes the need for a Cable Relay Station from the project. • The use of long HDD at landfall
No To Relay Station (N2RS)	PEIR December 2017	Completely objects to Cable Relay Station options.	Norfolk Vanguard Limited has reviewed consultation received and in light of the feedback, has made a number of decisions in relation to the project design in order to deliver an environmentally sustainable project. One of those decisions is to deploy High Voltage Direct Current (HVDC) cable technology to the UK's National Grid and this removes the need for a Cable Relay Station from the project.
National Farmers Union	PEIR December 2017	Requests further information on phasing of construction because some farms will not be able to lose a strip of land for the full 6 year duration of the construction. Would prefer HVDC and would like more information on reinstatement/construction so farmers can put land back to use as quickly as possible.	Following feedback, one of the decisions is to deploy High Voltage Direct Current (HVDC) cable technology to the project and this removes the need for a 100m route from the project. Phasing of the project is covered in section 31.7 and described in detail in Chapter 5 Project Description.
Necton Parish Council	PEIR December 2017	Has received many complaints regarding the siting of the onshore project substation. PEIR	The information provided by Necton Parish Council has been reviewed as part of the

Consultee	Date / document	Comment	Response / where addressed in the ES
		states that Ivy Todd is a small village. The correct designation is a hamlet with 63 residential properties. Para 174 of the same chapter and section states that Necton is a small town. The correct designation is a village. Requests that Norfolk Vanguard Limited provides some form of financial compensation.	ES drafting. A full account of the site selection and assessment of alternatives considered can be seen in chapter 4 of this ES. Norfolk Vanguard ltd will work with our neighbours – those communities hosting our project infrastructure over the long term – to acknowledge appropriately the role they play in accommodating Nationally Significant green energy infrastructure that benefits the global environment and delivers UK policies and strategies. Very preliminary exploration is underway about how best to enter into dialogue about appropriate strategic local investments that could for example contribute to local resilience and sustainability. Such dialogue will follow appropriate guidance and Vattenfall Wind Power Limited's own proven track record of effective delivery in this area, as a separate discussion from the engagement on shaping the project.
NHS England	PEIR December 2017	The development may have an impact on healthcare provision in the area and its implications, if unmitigated, could be unsustainable. The proposed development must therefore, in order to be considered under the 'presumption in favour of sustainable development' advocated in the National Planning Policy Framework, provide appropriate levels of mitigation.	Health care provision is covered in Chapter 27 Human Health.
Norfolk County Council and North Norfolk	PEIR December 2017	County Council officers have had good engagement with Norfolk Vanguard Limited in terms of	Norfolk Vanguard Limited intends to continue its high level of engagement with the

Consultee	Date / document	Comment	Response / where addressed in the ES
District Council		maximising the wider economic benefits from the project. The County and District Councils are working with all energy companies and the New Anglia LEP to promote this sector and develop a Skills Strategy for the types of skills required for young people in schools and colleges. The County Council strongly encourage, on economic development grounds and supporting the Norfolk economy, Vattenfall Wind Power Ltd to use the Port facilities at Great Yarmouth.	council so as to maximise economic benefits and develop an effective skills strategy. Direct and indirect job creation and Additional Benefits are covered in section 31.7.3. Norfolk Vanguard Limited are entering into initial agreements with local Ports to explore opportunities in detail.
Necton Substation Action Group	PEIR December 2017	Strongly opposes the development of the onshore project substation.	A full site selection process has been undertaken to ensure the project avoids community infrastructure, as detailed in Chapter 04 Site Selection and Assessment of Alternatives. Feedback has been considered as part of ongoing consultation and is documented in the Consultation Report.
Ørsted	PEIR December 2017	Hornsea Three would welcome inclusion of socio economic impact assessment in relation to the offshore construction element in respect of national/international and local/regional socio-economic effects. Hornsea Three would welcome consideration of: 1) the amount of GVA supported by construction activity; 2) CIA relating to demand for housing, accommodation and local services in the Local Impact Areas	Socio-economic impact assessment and Cumulative Impact Assessment have been included under section 31.7 and 31.8 respectively. GVA has not been calculated as this would require detailed information about employment in the offshore wind sector that is not available from official sources, such as ONS. Furthermore, Norfolk Vanguard Limited feels that focussing on GVA would not capture the non-market services within the affected communities or the likelihood that employment opportunities would be

Consultee	Date / document	Comment	Response / where addressed in the ES
			realised. Norfolk Vanguard Limited has agreed through stakeholder consultation that demand for housing would be scoped out of assessment. Temporary accommodation demand is covered in Chapter 30 Tourism and Recreation. Impact on local health services is covered in Chapter 27 Human Health.
Suffield Parish Council	PEIR December 2017	Requests the inclusion of broadband with the cable corridor.	Rural Norfolk has some of the slowest broadband speeds in the UK. Norfolk Vanguard Limited has been approached by a local group Broad Band for East Rushton (BB4ER), who requested assistance to improve broadband speeds by including necessary broadband services along the same route of onshore infrastructure as for the wind farms. Whilst this broadband delivery would be a separate process to the obtaining of consent for the offshore wind farms, it potentially affords an excellent opportunity to utilise the same area of land to install much needed services. Norfolk Vanguard Limited is considering the exploratory ideas of Better Broadband for East Ruston.
Suffolk County Council	PEIR December 2017	The County Council also recognises the potential positive benefits Norfolk Vanguard presents and would encourage Norfolk Vanguard Limited to maximise and support the uptake of local socio-economic benefits through targeted enhancement and initiatives.	Norfolk Vanguard Limited welcomes and agrees with the comment from Suffolk County Council. Details of Additional Benefits in this regard are included in section 31.7.3.
Secretary of State	November 2016 Scoping Opinion	The types of jobs generated should be considered in the context of the available workforce in the area; this applies equally to	Considered in section 31.6 and 31.7. Norfolk Vanguard Limited is developing a Skills Strategy and Supply Chain Strategy to

Consultee	Date / document	Comment	Response / where addressed in the ES
		the construction and operational stages.	address gaps where appropriate between the local skills available and skills required.
Norfolk County Council	November 2016 Scoping Opinion	It would be helpful if the EIA/PEIR could provide accurate figures of those likely to be employed both during construction and once the Wind Farm is fully operational.	Included in section 31.7. The ES includes figures for employment during construction and indicative figures for operations.
		There should also be a statement as to whether the labour would be sourced from local firms or if expertise would need to be imported to the region.	Norfolk Vanguard Limited has committed to procuring 50% of their supply chain from the UK. This intention has already been demonstrated by employing local contractors for surveying, ground investigations, and communication work. However, at present some technologies and skillsets relating to offshore wind development are not available in the UK market and must therefore be procured externally.
Necton Parish Council	November 2016 Scoping Opinion	A socio-economic assessment of the 3km site selection area, which identifies the impact on community infrastructure, local businesses and residents. This assessment must include home-workers as a category and the impact on the local house price index.	Considered in section 31.7. At this stage, assessment can only be made using estimates of noise, vibration, or visual impacts. This will be accomplished here by using a buffer zone and identifying the areas that sit within this.
	November 2016 Scoping Opinion	We would welcome a commitment from the applicant to consider a compensation scheme for homeowners who find their sale prices are adversely affected by the presence of substations.	A search of the research Journal of Property Investment & Finance[3] shows little evidence to establish a quantifiable link between house prices and renewable energy infrastructure. As stated in section 10, Part 1,

[3] The most relevant research related to onshore wind farms. This stated that *"The analysis of transaction data found some correlation between distance from a wind farm, and value. However, the data were insufficiently detailed to draw any sound conclusions."* Sally Sims and Peter Dent (2007) "Property stigma: wind farms are just the latest fashion", Journal of Property Investment & Finance, Vol. 25 Issue: 6, pp.626-651, https://doi.org/10.1108/14635780710829315

Consultee	Date / document	Comment	Response / where addressed in the ES
			house price assessments fall outside of the scope of this study.
	November 2016 Scoping Opinion	We would wish to understand the enduring economic legacy this development would provide to the sub-station area.	The enduring economic legacy of the Necton substation area is a result of cumulative effects of multiple pieces of infrastructure. The cumulative effect is considered qualitatively in section 31.8. Therefore, it is not possible to define the exact economic impacts of an individual element of this development. However, the potential adverse impacts can be inferred by considering impact pathways such as how noisy it is in comparison to surrounding infrastructure or whether it will be visible or not. These are considered in Chapter 29 Landscape and Visual Impact Assessment and Chapter 25 Noise and Vibration. Norfolk Vanguard Limited will be willing to explore local interests and needs to determine how the project may be able to facilitate appropriate outcomes.
Fulmodeston Parish Council	November 2016 Scoping Opinion	Although this parish is right on the edge of the scoping area, we feel it appropriate to comment as this parish has the Dudgeon cable corridor running through it and therefore has first-hand experience of the impact of such infrastructure projects. The activities of the offshore wind farms contribute nothing to the districts they cross - employment is very limited as large national construction companies are used, jobs require very specific specialisms and the construction, operation and maintenance bases are located in places such as Great Yarmouth where the	The concern of Fulmodeston Parish is noted. The Mitigation by Design process has an outcome that minimises larger impacts on local communities. Local impacts will need to be managed on an ongoing basis and this EIA forms the start of that process, not the end. However, it should be noted that the project is a Nationally Significant Infrastructure Project with benefits at that scale that include energy security from low carbon sources. These will have an

Consultee	Date / document	Comment	Response / where addressed in the ES
		facilities required to operate such wind farms are located and are nowhere near the cable corridors.	indirect benefit for the Parish as well. Norfolk Vanguard Limited aim to employ the most responsible companies available in the UK. For example, the civil contractor for the Pen y Cymoedd Wind Energy Project in Wales, Jones Bros Balfour Beatty, was awarded a Gold Award at the Considerate Constructors Awards Ceremony in April 2017.

31.4 Assessment Methodology

18. This section describes the approach taken to assessing socio-economic impacts and expands on the process outlined in Chapter 6 EIA Methodology.

31.4.1 Approach

19. This assessment is compliant with the EIA Regulations 2017. As such it aims to follow the EIA approach of defining the receiving environment, and then based on the project information assessing potentially significant impacts.

20. Tourism impacts are included in Chapter 30 Tourism and Recreation. Offshore impacts to commercial fisheries are considered in Chapter 14 Commercial Fisheries. Social change as a determinant of health outcomes are considered in Chapter 27 Human Health.

    General concerns and comments from community engagement events and correspondence have been included as part of the evaluation (as outlined in Table 31.3). However, specific attitudinal survey responses were not included in the method statement, as agreed with Norfolk County Council.

31.4.2 Review of Available Data and Information

21. Two types of data and information have been reviewed; quantitative data from the ONS (Table 31.7) has been used to understand the current socio-economic condition of the study area (as defined in section 31.5.1) and relevant historic trends. National, regional, and local strategy and policy (Table 31.5) has been reviewed to confirm that the project is in line with statutory stakeholder's ambitions. Industry reports and analysis (Table 31.6) have been reviewed to indicate the ambitions and potential within the study area with regards the development of the offshore wind sector.

Table 31.6 also includes relevant guidance on best practice, such the HM Treasury Green Book (2018) and Homes & Communities Agency Additionality Guide (2014) that has been used to inform the assessment methodology.

Table 31.5 Strategy and policy used for this assessment

Geographic scale	Reports, Research, and Strategies
National	Department of Energy & Climate Change, 2011, Overarching National Policy Statement for Energy (EN-1) Department for Business, Energy & Industrial Strategy, 2017, The UK's Industrial Strategy Department for Business, Energy & Industrial Strategy, 2017, Building our Industrial Strategy: green paper Department for Business, Energy & Industrial Strategy, 2017, Low Carbon Innovation Fund – East of England CBI, 2017, Unlocking Regional Growth HM Revenues & Customs, 2016, Apprenticeship Levy Department for Business, Innovation & Skills and Department of Energy & Climate Change, 2013, Offshore wind industrial strategy: business and government action Department of Energy & Climate Change, 2009, UK Low Carbon Transition Plan
Regional and Local Enterprise	New Anglia LEP, 2017a, Strategic Economic Plan New Anglia LEP, 2017b, Norfolk and Suffolk Economic Strategy
District and County Council	Norfolk County Council, 2017, Norfolk Rural Strategy 2017-2020 Suffolk County Council, 2013, Suffolk Coastal District Local Plan - Core Strategy & Development Management Policies Suffolk County Council, East Suffolk Growth Plan 2014 to 2025 Great Yarmouth Borough Council, 2014, The Plan 2015-2020 Department for Business, Innovation & Skills and Department of Energy & Climate Change, 2011, CORE: Centres for Offshore Renewable Engineering

Table 31.6 Research and guidance

Geographic scale	Guidance, research and reports
International	International Association for Impact Assessment, 2015, Social Impact Assessment: Guidance for assessing and managing the social impact of projects Therivel and Wood, 2017, Methods of Environmental and Social Impact Assessment (Natural and Built Environment Series) Fourth Edition. Taylor and Francis. Chapter 13: Glasson J. Socio-economic impacts 1: Economic Impacts Chapter 14: Chadwick A. and Glasson J. Socio-economic impacts 2: Social Impacts
National	BVG Associates, 2016, Strategic review of UK east coast staging and construction facilities BVG Associates, 2015, UK Content of the Offshore Wind Industry Homes & Communities Agency, 2014. Additionality Guide, Fourth Edition. HM Treasury, 2018, The Green Book, Central Government Guidance on Appraisal and Evaluation Office for National Statistics (2017), UK National Accounts, The Blue Book: 2017 Productive Seas Evidence Group, 2015, Social and Economic Assessment Requirements for Development Projects Affecting the Marine Environment RenewableUK, 2017, Offshore Wind Industry Investment in the UK

Geographic scale	Guidance, research and reports
	Roberts A. and Westbrook S. (2017), A new economic impact methodology for offshore wind, BVG Associates and University of Highlands and Islands
Regional	Grant Thornton, 2016, Norfolk Limited Grant Thornton, 2017, Norfolk Limited Miller Research, 2016, Norfolk Vanguard Offshore Wind Farm: Socio-Economic Study

Table 31.7 Sources of statistical data

Source	Link	Data
Office for National Statistics – Open Data	http://geoportal.statistics.gov.uk/ https://census.ukdataservice.ac.uk/	2011 Census data Lower Layer Super Output Area (LSOA) boundaries Middle Layer Super Output Area (MSOA) boundaries Employment and employee types (split by LSOA and MSOA). Type I employment multipliers and effects by SU114 industry and sector (market, government and NPISH)
NOMIS (accessed March 2018)	https://www.nomisweb.co.uk/	Labour Market Profile for New Anglia LEP, Norfolk, Breckland, Broadland, Great Yarmouth, King's Lynn and West Norfolk, Norwich, North Norfolk, and South Norfolk Origin-Destination data (also known as flow data).
English indices of deprivation 2015	https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015	File 1: Index of multiple deprivation File 7: all ranks, deciles and scores for the indices of deprivation, and population denominators File 8: underlying indicators File 10: local authority district summaries File 12: local enterprise partnership summaries.

31.4.3 Existing Environment

22. The data described in Table 31.7 has been used to describe the key socio-economic receptors and context to provide the baseline environment against which impacts can be assessed. These include:

- Business performance and opportunity: the development of the offshore wind sector at a national and regional level has been described;
- Economic: the area has been described using population, employment, and skill level indicators;

- Social: the demographic structure of the area has been examined; and
- Policy Context: planning, economic development and other relevant policy have been reviewed to identify related economic, social and regeneration objectives, which the proposed project may affect.

31.4.4 Socio-Economic Definitions

23. The IAIA published Social Impact Assessment: Guidance for assessing and managing the social impacts of a project (Vanclay, 2015) defines a social impact assessment as "*the processes of analysing, monitoring and managing the intended and unintended social consequences, both positive and negative, of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions."*

24. Glasson and Chadwick (Therivel and Wood, 2017) define social and socio-economic impacts as "the 'people impacts' of development actions. Both social impact assessments and socio-economic impact assessments focus on the human dimension of environments, seeking to identify the impacts on people, including who benefits and who loses."

25. The Homes and Communities Agency (Dancer, 2014) describes economic impacts in terms of business output, Gross Value Added (GVA) to a region, personal income (including wages), or jobs. Any of these measures can be used as an indicator of economic well-being.

26. The Office for National Statistics (ONS) produced a three paper series called Measuring the Economic Impact of an Intervention or Investment (IOI). The purpose of this is to provide, *"independent advice to regional users on the use of ONS and Government Statistical Service (GSS) statistics, including on technical issues, such as the use of statistics in monitoring performance against targets".* (ONS, 2011a)

27. Section 5.1 of Paper One of this series considers the issues with using GVA to evaluate the economic impact of an investment at a company scale, it states that:

28. *"GVA estimates from official sources are volatile at low geographical levels. Any approach to estimating GVA (whether or not using official data) should produce consistently robust estimates at the scale of the IOI. If this issue is ignored any such approach will be unreliable when assessing an IOI."* (ONS, 2011b)

29. Section 3.10 of Paper Two of this series states that, *"The complex calculations and imputations used to produce GDP and regional GVA estimates cannot be applied at the firm level to produce IOI Value Added."* (ONS, 2011c)

30. Section 8.4 of Paper Two states that, *"An alternate, holistic approach to the calculation of GVA estimates could be the use of a scorecard, composite or basket indicator approach combining factors known to affect GVA."* (ONS, 2011c)

31. Based on these definitions the assessment has considered two distinct elements:

- The economic element concerned with the direct and indirect potential for job creation (i.e. the labour demand) and the size of the labour market required to supply this (i.e. the labour supply) during the construction of the onshore cable route. As well as whether it is likely that a supply chain will be present within the New Anglia LEP to provide goods or services to the offshore construction and operation. These aspects are assessed by considering Full Time Equivalent (FTE) jobs and comparing them with a regional baseline. Additional enhancement that could contribute to a basket of indicators to improve GVA (due to pro-active supply chain development or efforts to increase skills locally to enable procurement) are considered qualitatively.
- The social element has direct impacts due to nuisance or disturbance such as increased noise or traffic delays and indirect impacts due to in-migration of labour. In-migration of labour has been considered and consulted upon during the Scoping and due to the low potential impact has been determined not to be significant. Therefore, the assessment will focus on disturbance of community infrastructure as an indicator of community wellbeing, consistent with the approach presented within the PEIR. This impact is created by the construction and operation of the project. Impact pathways are derived from Chapter 24 Traffic and Transport, Chapter 25 Noise and Vibration, Chapter 26 Air Quality, and Chapter 29 Landscape and Visual Impact Assessment. These are compared with a local baseline of assets (defined below) that serve local communities.

31.4.4.1.1 Community infrastructure definition

32. Infrastructure is generally defined as the basic physical and organisational structures and facilities (e.g. buildings, roads, power supplies) needed for the operation of a society or enterprise. A formal definition of community infrastructure does not exist. Therefore, for the purposes of this assessment community infrastructure will be defined as the basic physical and organisational structures and facilities required for the cohesion of a local community. This will include:

- Educational – schools and training facilities serving the local population;
- Health – GP surgeries, dentists, and other facilities serving a local population;
- Community – public houses, town halls, public sports facilities, etc.;
- Financial and logistics – local bank branches, post offices, etc.; and
- General business – clustering of shops, garages, and other services people use on a day to day basis.

33. Recreational facilities, public rights of way (PRoW), and tourism assets such as theatres or theme parks that draw people to an area are assessed in Chapter 30 Tourism and Recreation. Assets of cultural importance such as churches and monuments are included in Chapter 28 Onshore Archaeology and Cultural Heritage.

31.4.5 Impact Assessment Methodology

34. The method generally follows that which is described in Chapter 6 EIA Methodology but has been updated to focus on socio-economic factors.

31.4.5.1 Economic sensitivity

35. As discussed above, the economic impact assessment will focus on onshore labour demand. Impacts here would be due to job creation from the project and labour supply from the regional labour market during the construction of the onshore cable route and more generally with regards the supply chain for the offshore construction and operation.

36. A labour market is considered sensitive if it has a low level of education and a high level of unemployment compared with the rest of the UK, as described in Table 31.8. This would suggest that although employment opportunities may be created the local labour market may not have the capacity to provide the labour unless further investment is made in skills training. Therefore, increased demand for local labour would result in pressure on available labour supply, increased labour and skills shortages, wage inflation, and the import of labour to meet demand. Sensitivity has been assessed using:

- Education and Employment indices from the English Indices of Multiple Deprivation. This is a UK government qualitative study of deprived areas in England. It is a comparative index where a low rank indicates a high level of deprivation in comparison to the rest of the UK; and
- A comparison with Labour Market Profiles sourced online from NOMIS to show the most recent education and unemployment figures in comparison with UK averages.

Table 31.8 Definitions of sensitivity levels for labour market[4]

Sensitivity	Definition
High	The area receives a rank of 0 to 10 with regards Index of Multiple Deprivation with regards Education and Employment. NOMIS data show high levels of unemployment and low level of skills compared to UK.
Medium	The area receives a rank of 10 to 20 with regards Index of Multiple Deprivation with

[4] Legislative guidance to assess the sensitivity of a labour market does not exist. Therefore, a comparative framework has been developed using the English Indices of Deprivation for Education and Employment. This compares the 40 LEPs in England to understand if the skills available in the labour market are low or high in comparison to other English LEPs.

Sensitivity	Definition
	regards Education and Employment. NOMIS data shows equivalent levels of unemployment and skills compared to UK.
Low	The area receives a rank of 20 to 30 with regards Index of Multiple Deprivation with regards Education and Employment. NOMIS data shows low levels of unemployment and higher skills compared to UK.
Negligible	The area receives a rank of 30 to 40 with regards Index of Multiple Deprivation with regards Education and Employment. NOMIS data shows very low levels of unemployment and high skills compared to UK.

31.4.5.2 Community infrastructure sensitivity

37. The assessment considers impacts on community infrastructure to be an indicator of community well-being. Therefore, it defines sensitivity based on the number of assets available to communities (Table 31.9).

Table 31.9 Definitions of sensitivity levels for community infrastructure[5]

Sensitivity	Definition
High	The area lacks alternative community infrastructure locations and people are required to travel significantly further (more than twice as far) to access this.
Medium	The area has a low level of alternative community infrastructure and people have to travel a moderately further (up to twice as far) to access this.
Low	The area has alternative infrastructure but people still have to travel slightly (up to 1.5 times as far) further to access this.
Negligible	The area has abundant alternative infrastructure and people can readily access this by travelling the same distance as before.

31.4.5.3 Value of community infrastructure

38. Following the methodology outlined in Chapter 6 EIA Methodology, the value of community infrastructure would be based on the national significance of the infrastructure. For example, if a local hospital is also a national centre of excellence in a specific field then it would be considered high value.

39. However, a community would likely consider its supporting services to be relatively higher value than their national significance. Therefore, the value used will be based on the likelihood that people could relocate to use an alternative asset (Table 31.10). The assets are defined as follows:

- Educational – schools and training facilities serving the local population;
- Health – GP surgeries, dentists, and other facilities serving a local population;

[5] Legislative guidance to assess the sensitivity of community infrastructure does not exist. Therefore, indicative numeric definitions have been used to create a logical framework for assessment. The core assumption is that if a community cannot access alternative community assets then they would be very sensitive to the change a change in access.

- Community – public houses, town halls, public sports facilities (e.g. swimming pools and publicly accessible sports grounds), etc.;
- Financial and logistics – local bank branches, post offices, etc.; and
- General business – clustering of shops, garages, and other services people use on a day to day basis.

Table 31.10 Definitions of value levels for community infrastructure

Asset type	Sensitivity
Educational	High value because it is very unlikely that people (and especially children or young people) would relocate midway through their education to avoid a project. Education is also the bedrock of continued development of people and, thus, society at large.
Health	Medium to high value because it is unlikely that people would visit a different GP or dentist due to a project. This is because people register at one GP at a time and it is inconvenient to visit a different one.
Community	Medium to low value because there is little reason why people couldn't use other facilities but they may prefer to use their local facilities.
Financial and logistics	Low value because there is technically no reason why people couldn't use any bank or post office but some may prefer to use their local branch.
General businesses	Negligible value because people can easily visit a different shops or businesses if necessary.

31.4.5.4 Magnitude

40. Following the methodology set out in Chapter 6 EIA Methodology, the magnitude levels for employment are set out in Table 31.11 based on levels recommended by Chadwick and Glasson (Therivel and Wood, 2017). Both potential increases and decreases of employment are considered.

41. The magnitude level on community infrastructure will be described qualitatively as in Table 31.12. Due to the fact that the project is not proposing to create community infrastructure, only negative impacts will be considered in this regard.

Table 31.11 Definitions of magnitude levels for employment[6]

Magnitude		Definition
High	Direct Employment	Change of + or – 50% or more of baseline employment in relevant sector
	Indirect Employment	Change of + or – 2% of baseline employment
Medium	Direct Employment	Change of + or – 20 to 50% of baseline employment in relevant sector
	Indirect Employment	Change of + or – 1 to 2% of baseline employment
Low	Direct Employment	Change of + or – 10 to 20% of baseline employment in relevant sector

[6] Direct employment refers to people that are directly employed by the project. Indirect employment refers to people that are employed by businesses that support the project.

Magnitude		Definition
	Indirect Employment	Change of + or – 1% of baseline employment
Negligible	Direct Employment	Change of + or – 10% of baseline employment in relevant sector
	Indirect Employment	No measurable change in local employment

Table 31.12 Definitions of magnitude levels for community infrastructure

Magnitude	Definition
High	Permanent loss or obstruction of community infrastructure e.g. if a village hall had to be demolished, it became a stranded asset without access, or operation creating another impact that rendered it unusable.
Medium	Temporary loss or obstruction of community infrastructure during construction or a permanent physical change to community infrastructure e.g. if access to a village hall was completely blocked during construction, significant noise was created in its vicinity during construction, or part of the village hall was restructured.
Low	Temporary nuisance to community infrastructure due to noise or visual impacts during construction.
Negligible	The construction project is temporarily within the vicinity of the community infrastructure but with negligible to zero impact due to noise, obstruction, or visual impacts.

31.4.5.5 Impact significance

42. Following the identification of receptor value and sensitivity and magnitude of the effect, it is possible to determine the significance of the impact. A matrix is presented in Table 31.13.

Table 31.13 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*

43. As with the definitions of magnitude and sensitivity, the matrix used for a topic is clearly defined within the context of that assessment. The impact significance categories are described as shown in Table 31.14.

Table 31.14 Impact significance definitions

Impact significance	Definition
Major	Very large or large changes in receptor condition, either adverse or beneficial, which are likely to be important considerations at a regional or district level because they contribute to achieving national, regional or local objectives, or, could result in exceedance of statutory objectives and / or breaches of legislation.
Moderate	Intermediate changes in receptor condition, which are likely to be important considerations at a local level.
Minor	Small changes in receptor condition, which may be raised as local issues but are unlikely to be important in the decision-making process.
Negligible	No discernible change in receptor condition.

31.4.6 Cumulative Impact Assessment

44. A cumulative impact assessment has been prepared for the project. This has taken account of the potential positive and negative impacts of constructing the project in the same construction period as other major infrastructure projects in the area.

45. A cumulative assessment for the operational phase has been based on a supply chain assessment undertaken by BVG Associates which draws on their analysis of UK Content undertaken with RenewableUK. A cumulative assessment for the decommissioning phases has not been undertaken at this stage as this assessment would require knowledge of future projects and methodologies which are currently unknown.

31.4.7 Transboundary Impact Assessment

46. The project is required to consider the possibility of significant transboundary impacts on other European Economic Area (EEA) member states under the Espoo Convention (see Chapter 6 EIA Methodology). However, the assessment is undertaken using the Rochdale Envelope approach that accepts certain details of the project will not be available at early stages of development. The Infrastructure Planning Commission's (IPC) Advice note nine: Rochdale Envelope (IPC, 2011) states that:

47. *"In the course of preparing the ES, a developer should seek to identify those aspects that are likely to give rise to significant adverse impacts, such that the maximum potential adverse impacts of a project have been properly assessed and can be taken into account as part of the decision making process."*

48. With regard to the offshore elements, although there is high potential for both infrastructure and labour to be sourced from abroad, until the procurement process is undertaken it is not possible to estimate what the specific non-UK input would be. Furthermore, it is unlikely that employment as a result of international procurement would lead to indirect adverse socio-economic transboundary effects.

49. The onshore elements of the project are entirely present within the UK so it is not anticipated that significant direct adverse socio-economic effects on neighbouring countries will arise.

50. Given the above, transboundary impacts are therefore not considered further within this assessment.

31.5 Scope

51. This section describes the geographic extent and the time period which have been considered. The data sources used for the assessment will be detailed before discussing the assumptions used for assessments and limitations of the assessment.

31.5.1 Topic Scope

52. The following socio-economic impacts are considered between Chapter 27 Human Health, Chapter 30 Tourism and Recreation, and Chapter 31 Socio-economics:

- As detailed in Chapter 27 Human Health, potential impacts due to the influx of workers have been scoped out because the number of in migrant workers are expected to be low in comparison to the regional population, accommodation is expected to be distributed across the region, and workers are expected to return to their permanent residence during the weekend;
- Potential impacts on the tourism sector, in particular availability of accommodation, is considered in Chapter 30 Tourism and Recreation;
- Potential impacts on the regional labour market due to job creation are considered in section 31.7; and
- Effects on Community Infrastructure due potential project impacts such as noise or traffic disturbance are also considered in section 31.7. The potential source-pathway-outcome model used to assess these effects is described in Table 31.15

Table 31.15 Potential sources of impact leading to potential community infrastructure effects

Potential Source	Potential pathway	Potential Receptor	Relevant ES chapter
Construction			
Noise from excavation machinery and associated movements	Temporary nuisance	Community assets within 1km of the onshore cable route.	Chapter 25 Noise and Vibration
Dust generated during construction **Exhaust emissions and particulates from machinery**	Temporary nuisance	Site specific communities within 200m of the onshore cable route and localised populations within Norfolk County.	Chapter 26 Air Quality Chapter 24 Traffic and Transport
Temporary change to the landscape due to construction	Temporary nuisance	Community assets within 1km of the onshore cable route.	Chapter 29 Landscape and Visual Impact
Temporary disturbance or obstruction of roads and	Temporary disruption of access to services and	Site specific populations and localised populations	Chapter 24 Traffic and Transport

Potential Source	Potential pathway	Potential Receptor	Relevant ES chapter
footpaths due to road transportation of materials and equipment, workforce traffic, and construction areas	amenities	within Norfolk County	
Construction and operation			
Increases in employment and commercial opportunity	Increased wealth in populations	Population of New Anglia LEP	Section 31.7
Operation			
Change to the landscape due to the onshore project substation	Long term nuisance	Community assets within 1km of the onshore project substation.	Chapter 29 Landscape and Visual Impact
Noise from the onshore project substation	Long term nuisance	Community assets within 1km of the onshore project substation.	Chapter 25 Noise and Vibration

31.5.2 Study Area

53. The study area has been identified using the project area described in Chapter 5 Project Description.

54. As specified by the Overarching National Policy Statement for Energy (EN-1), Regulation 5(2) and Schedule 4 of The Infrastructure Planning (EIA) Regulations 2017, there are two scales of study area which reflect the two socio-economic elements defined in section 31.4.4.

55. Economic impacts are considered regionally due to the likely commuting distance assessed in Chapter 24 Traffic and Transport. Social impacts are considered locally due to the buffer zones outlined in Table 31.15.

31.5.2.1 Economic impact study area

56. Economic impacts are driven by potential for job creation. As the project cannot dictate where potential employees will be based the assessment must consider the area where they are likely to reside.

57. Chapter 24 Traffic and Transport shows three figures (Figure 24.9, Figure 24.10, and Figure 24.11) for employee distribution based on 45 minute drive to destination for in-migrant workers and a 90 minute drive to destination for resident workers. This indicates that workers are likely to enter the modelled transport network from as far north as Cromer, as far south as Lowestoft and as far inland as Swaffham. This shows that workers will likely be travelling from both Norfolk and Suffolk, therefore the study area for economic impacts will include the entire New Anglia LEP.

31.5.2.2 Social impact scale

58. Direct social impacts are due to nuisance caused by increased disturbances such as construction noise or traffic delays. These would be felt by local communities therefore the study area has been chosen to reflect the onshore cable route and the communities around it. The buffer zone for community infrastructure has been informed by corresponding chapters and chosen based on the parameters below:

- Direct impact – within the construction area of the onshore cable route;
- Noise and visual – within 1km of the onshore cable route red line boundary (see Chapter 25 Noise and Vibration);
- Dust – within 200m of the onshore cable route red line boundary (See Chapter 26 Air Quality); and
- Traffic obstruction – visual assessment of routes and alternatives between settlements either side of the site (see Chapter 24 Traffic and Transport).

31.5.3 Assumptions and Limitations

59. The main assumptions and limitations in using statistics from the ONS are:

- Information at small geographic level is provided using Census Data from 2011. This is reported by the ONS as Lower Super Output Area (LSOA) or Middle Super Output Area (MSOA). Although now six years old this is assumed to still be representative and is the most accurate data available.
- Information provided more recently is at a larger scale, either at Local Authority or Local Enterprise Level. Although this shows general trends in economic development it does not indicate the specific socio-economic levels at a local level.
- At a larger scale, economic indicators can be distorted by areas that are more productive. For example, Norwich has a greater productivity than North Norfolk largely due to its increased density of population. As far as possible this has been accounted for in the assessment but cannot be completely removed from regional statistics.

60. Pathways from project impacts to socio-economic effects have been based on conclusions in other chapters such as Chapter 24 Traffic and Transport, Chapter 25 Noise and Vibration, and Chapter 26 Air Quality. Human health outcomes in Chapter 27 Human Health have been used as an indicator of effect on communities.

31.6 Existing Environment

61. The characterisation of the existing environment has been undertaken using data sources listed in Table 31.7 plus other relevant literature. A review of national and regional development of the offshore wind industry has been included in Appendix 31.3. The baseline focusses on regional socio-economic conditions by drawing on the

conclusions of the socio-economic scoping report (White, 2016) commissioned at a pre-scoping stage by Norfolk Vanguard Limited and updating or adding to that assessment where necessary. The final section describes the socio-economic situation of the areas that are local to the landfall, onshore cable route and onshore project substation.

31.6.1 Regional Socio-Economic Baseline

62. This section discusses the socio-economic factors at the level of the New Anglia Local LEP level. The baseline assessment is primarily based on labour market statistics from NOMIS[7], Gross Value Added (GVA) trends based on ONS data, and English Indices of Deprivation.

63. The project, associated infrastructure, and regional supply chain will predominantly be located within the New Anglia LEP region. This has a population of 1,626,900 and a working age population of 968,700 (59.5%). This is marginally below the East of England average of 61.8% and of the national average of 63.3%.

64. Of the working age population, between October 2016 to September 2017, 79.6%% were economically active, 76.7% were in employment (65% as employees and 11.1% self-employed), and 3.5% were unemployed. This compares favourably to averages in the East of England and nationally, as shown in Appendix 31.1 Plate 31.2. Time series show a slight increase over average employment levels when compared to the rest of the UK up to 2004 (74%-75%), with a rise from mid-2014.

65. Across New Anglia LEP in 2016, the single highest employment category was 'professional occupations' (17.9%) which is below the national average (20.3%). Following this people in skilled trades (12.2%) and elementary occupations (12.8%) were the highest employment categories.

66. The job density in 2015 in New Anglia was 0.83 which is marginally below the national average of 0.84 but the same as the East of England average and an increase on 0.81 reported at time of PEIR (Q4 2017).

67. In 2016, NOMIS figures show that the largest employment sector within New Anglia LEP is 'Wholesale and retail trade; repair of motor vehicles and motorcycles' employing 16.8% (a slight reduction since PEIR at 17.4%) of the local population, followed by 'Human health and social work activities' at 14%. In relation to the skills the project will probably need; 5.2% work in construction (down from 5.8% at PEIR); 9.8% in manufacturing (up from 9.5% at PEIR); 5.7% in professional, scientific, and technical services (up from 5.2% at PEIR); 7.6% in accommodation; and 8.4% in education.

[7] Accessed on 16 June 2017

68. Skills levels in the LEP have been increasing in line with national trends from 2006 to 2016 (from GCSE up to Higher Degree level). However, skill levels are consistently below both national and East of England averages. This is probably due to the generally rural nature of the LEP. East of England figures may also be skewed due to the high skill level in Cambridgeshire.

69. The exception to this is in Other Qualifications (such as Professional Qualifications) which has been fluctuating around a constant average. In recent years, these levels have increased above both national and East of England levels. This is potentially due to the tendency for the Oil, Gas & Energy sector to employ a larger proportion of foreign nationals or individuals with professional rather than academic qualifications (see section 31.6.2.1).

70. Currently 31.3% of the working age population in the LEP hold Higher National Diploma (HND) to Higher Degree level qualifications, 53.5% hold A-levels or similar, 72.4% hold more than 5 GCSEs or similar, and 85.9% hold fewer than 5 GCSEs or similar.

71. The gross weekly pay for the New Anglia LEP is £492.20. This is below the East of England average of £528.80 and the national average of £540.20.

31.6.1.1.1 Gross Value Added

72. The Gross Value Added (GVA) is a measure of the goods and services produced in an area, industry, or sector of the economy. Appendix 31.1 Plate 31.4 shows the growth in GVA in New Anglia since 1997. The main growth markets have been in the retail and finance sector followed by agriculture. However, Appendix 31.1 Plate 31.5 shows growth in both manufacturing and construction, with an expected dip during the recession in 2008.

31.6.1.1.2 Deprivation

73. With regard to deprivation, the New Anglia LEP is ranked 18 out of 39 local enterprise partnerships in the UK. A low rank (e.g. 5 of 39) indicates a high level of deprivation for a given indicator. The lowest ranked LEP (Liverpool City Region ranked 1) is most deprived compared to the highest ranked LEP (Buckinghamshire Thames Valley ranked 39).

74. Appendix 31.1 Plate 31.3 presents the New Anglia LEP rankings for deprivation indicators for all of the local enterprise partnerships in the UK. Thus, it can be seen that education indicators show a relatively low level of education (i.e. ranked 3rd of 39 for education deprivation in comparison to the rest of the UK) across New Anglia

LEP, but all other indicators are moderate with crime levels relatively low[8] (ranked 35 of 39).

31.6.2 County Socio-Economic Baseline

75. The section defines the Norfolk County Council baseline.

76. The county has seven districts: Breckland, Broadland, Great Yarmouth, King's Lynn and West Norfolk, North Norfolk, Norwich, and South Norfolk. In 2015 Norfolk had a resident population of 885,000 people. This is 14.56% of the population of the East of England (6,076,500 people) and 1.39% of the total population of Great Britain (63,258,400) with a population distribution as shown in Plate 31.1.

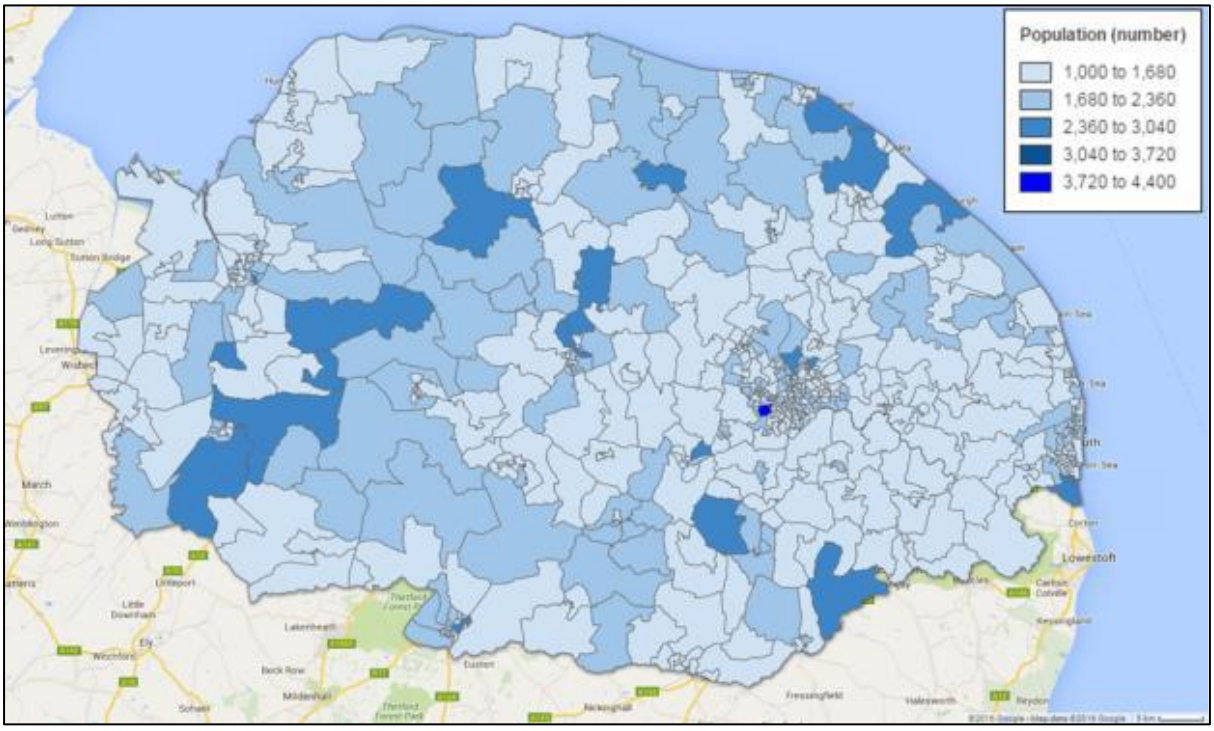

Plate 31.1 Population distribution in Norfolk - 2011 census by LSOA (Miller Research, 2016)

77. In 2016 the working population (aged 16-64) in Norfolk is 59.6% compared to 61.8% in East of England and 63.3% in the UK. However, 80.3% of people in Norfolk are economically active compared to 80.1% in the New Anglia LEP, 79.9% in the East of England Region and 77.8% in the UK. This County and LEP increase over National and Regional averages is primarily due to 75.3% of females being economically active compared to the regional (74.4%) and national (72.6%) averages.

[8] Note that a low rank indicates a high level of deprivation in comparison to the rest of the UK. Therefore, the crime ranking of 35 out of 39 shows that New Anglia LEP has the 35th lowest rank for crime rates out of 39 LEPs.

78. In 2016, 76.9% of people were in employment with 65.7% being employed and 10.9% being self-employed. Time series show that employment in the region was around 73-74% on average since the 1980s and has recently increased since 2015.

79. Of those employed, the distribution of professions across Norfolk in 2016 is shown in Appendix 31.1 Plate 31.6. This shows that the largest employment sector is in professional occupations. This shows that in comparison to the East of England there is a marginally greater proportion of people employed in skilled trades and elementary occupations. As a higher proportion of the population of the East of England are employed in Professional Technical occupation than in Norfolk, this suggests that professional and technical personnel may be likely to commute in from outside of Norfolk to meet demand.

31.6.2.1 Norfolk business review

80. The Norfolk Limited report has been used to indicate the performance of the business sector in Norfolk. Conducted by Grant Thornton UK LLP, *Norfolk Limited* (Wilson et al. 2017) is "*an annual business survey of the most recently available financial accounts of the top 100 independent companies in Norfolk, based on turnover. The aim is to present an in-depth picture of how the county is fairing based on the combined performance of those companies, which are subjectively assessed as fundamentally Norfolk businesses.*"

81. This found that "*the top line results of Norfolk Limited 2017 indicate that the performance of the county has been mixed.*" (Wilson et al. 2017) Due in a large part to the downturn in the Oil, Gas & Energy sector, which represents 9% of *Norfolk Limited*'s companies. Whereas "*strong performances were reported in the Services and Manufacturing & Construction sectors*. *All sectors with the exception of Oil, Gas & Energy have increased turnover by 6.8% and operating profit by an exceptional 25.7%.*"

82. In 2017 *Norfolk Limited* (Wilson et al. 2017) reported an increase of 2.8% in turnover since 2016. However, if the Oil, Gas & Energy sector is removed then the annual growth increases to 6.8%. Similarly, operating profit fell by 11% and profit before tax fell by 26.4%. But when the Oil, Gas & Energy sector is removed then operating profits increase by 25.7% and profit before tax by 18.2%.

83. With regards employment, in 2017 *Norfolk Limited* stated that *"Norfolk Limited grew its workforce by 3.5% to 43,813, which continues a trend which has been seen in every year since Norfolk Limited returned to the business calendar in 2014. Five of the seven sectors, and 58 of the 91 companies outside the Oil, Gas & Energy sector have increased their headcount. The continued infrastructure improvements have made attracting and retaining talent an easier task."* (Wilson et al. 2017).

84. With regards regional comparisons, in the East of England *"the combined figures show a turnover of turnover of £28.9bn, of which Norfolk Limited is just under 19%. Cambridgeshire Limited leads the way with 35%. Operating profits are weighted even more heavily towards Cambridgeshire, who contribute 55%."* (Wilson et al. 2017) The county with the closest profile to Norfolk is Suffolk Limited, although it had less reliance on the Oil, Gas & Energy sector.

85. *Norfolk Limited's* (Wilson et al. 2017) analysis shows a clear opportunity to further diversify and replace the Oil and Gas sector supply chain. Fortunately, many of the businesses and skills required are transferrable to the offshore renewable energy sector.

31.6.2.2 Norfolk district indices of deprivation

86. Appendix 31.1 Plate 31.11 shows relative levels of deprivation in comparison to other non-metropolitan districts in the UK. The rank goes from 1 for the most deprived region (Manchester) up to 326 for the least deprived (Wokingham). This shows that comparative to the regions around it, Great Yarmouth is particularly deprived across almost all indicators.

87. As with the LEP levels of deprivation, 'Education, Skills, and Training' is rated poorly across Breckland, King's Lynn and West Norfolk, Great Yarmouth, Norwich, and North Norfolk.

31.6.2.3 Daily movement of people for work

88. The Office for Labour Market Statistics provides information for the movement of people between Districts. This shows that a large proportion of people in Norfolk travel to Norwich for work; 26,967 per day. On the other hand, areas such as Breckland (-10,839), Broadland (-14,369), Great Yarmouth (-1,285), and North Norfolk (-3,550) lose people on a daily basis.

89. Many areas have the highest movement towards Norwich, except Great Yarmouth where people move to Waveney, presumably to work at Lowestoft. This parallels the growth in GVA and suggests that many people are living in areas such as Broadland and working in professional positions in Norwich.

31.6.3 Local Socio-Economic Baseline

90. The onshore cable route makes landfall at Happisburgh South in the district of North Norfolk and passes through the Middle Super Output Areas (MSOAs) and Lower Super Output Areas (LSOAs) listed in Table 31.16. It should be noted that both of

these are geographic identifications[9] used by the ONS and that LSOAs are a sub-division of MSOAs.

Table 31.16 MSOAs and LSOAs affected onshore

Infrastructure	MSOA	LSOA
Onshore project substation and National Grid substation extension	Breckland 004, 005, 002, 007, 008	Breckland 004A, 004C, 008B, 008D
Onshore cable route	N Norfolk 012, 006, 007, 010. Broadland 001, 002, 003, 004. Breckland, 004, 006, 001, 003	N Norfolk 006D, 007A, 007D, 010A to 010I, 012A, 012D, 013D. Broadland 001A to 001E 002B 002D 002E 002F Breckland 001A, 001C, 001F, 003A to D, 004B to A
Landfall	North Norfolk 012, 013, 007, 010	North Norfolk 007D, 012A, 013A

31.6.3.1 Employment distribution

91. In 2015 the total population along the onshore cable route was 57,146 people which is weighted towards people above 45 years old (Appendix 31.1 Plate 31.12). Of these 31,958 are of working age (16-64). Based on 2011 Census data, 25,402 were employed. This leaves approximately 21% (6,556 people) of the local population not in some form of employment which approximately correlates with the wider Norfolk percentage (19.7%) of people who are economically inactive.

92. The data would suggest that 1,376 people along the onshore cable route may be actively searching for employment. This correlates to 4% of the working age population.

93. Approximately 9% of people along the onshore cable route were employed in construction during the most recent, 2011 Census; the most direct employment generated from the project is expected to be in construction. Manufacturing employed another 9% which may also be positively impacted by the wider Norfolk Vanguard project. The majority of those employed in manufacturing work in 'Technology', 'Food & Drink', or 'Other' sectors.

31.6.4 Community Infrastructure

94. A search for community infrastructure (as defined in section 31.4.4) within 1km of landfall, onshore cable route, and onshore project substation was conducted. This provides an assessment of all assets that have the potential to be affected by noise and visual impacts from the project (as defined in section 31.5).

[9] Middle Layer Super Output Areas (MSOA) and Lower Super Output Areas are part of a geographic hierarchy designed to improve the reporting of small area statistics in England and Wales. MSOAs are given as a three-digit number following the District name, e.g. Breckland 002. LSOAs are given by the MSOA name followed by a letter, e.g. Breckland 002A.

95. Within this search area there are 173 community infrastructures assets assessed using the following categories, as shown in Table 31.17:

- Educational – schools and training facilities serving the local population;
- Health – GP surgeries, dentists, and other facilities serving a local population;
- Community – public houses, town halls, public sports facilities (e.g. swimming pools and publicly accessible sports grounds), etc.;
- Financial and logistics – local bank branches, post offices, etc.; and
- General business – clustering of shops, garages, and other services people use on a day to day basis.

Table 31.17 Review of community infrastructure within search boundary

Location	Education	Health	Community	Finance and logistics	General business	Total
East of Necton	1		2		1	4
Little Fransham			1		2	3
Scarning		1	1		4	6
Norther periphery of Dereham	1	4	1		8	14
Southern part of Swanton Morley		2	2		2	6
Woodgate						
Mill Street			6		4	10
North west part of Sparham			2		2	4
Northern part of Reepham		1	5	1	11	18
Southgate					1	1
Northern part of Cawston	1		1	1	7	10
Salle Park			2		2	4
Northern part of Aylsham	2	2	9	1	41	55
Northern part of North Walsham			2		1	3
Swafield			1		1	2
Happisburgh and Whimpwell Green			12	1	15	28
Eccles on Sea		1	1		3	5
Total	5	11	48	4	105	173

96. Impacts on these community infrastructure assets are considered below in section 31.7.5.2.

31.6.5 Anticipated Trends in Baseline Conditions

97. The baseline review of socio-economics in section 31.6 and the industry review in Appendix 31.3 provides a clear indication that there the New Anglia LEP have strong ambitions to grow the offshore wind sector in the area. Provided that this

development is undertaken sensitively with regards the character of Norfolk evidence shows that County and District councils support this position. Therefore, it is likely that this trend will be maintained.

98. Analysis of *Norfolk Ltd* (Wilson et al. 2017) shows that the business sector is gradually growing but that the dependence of one sector on offshore oil and gas has reduced the overall growth rate. Due to offshore sectors having transferable skills it is reasonable to assume that the development of the offshore wind sector would offset this decline and provide suitable employment for people that were employed in the oil and gas sector.

99. However, productivity in New Anglia is currently lower than the UK average. As with the rest of the UK, there is a challenge in matching growth in productivity with growth in other economic areas such as GDP and employment. It may be that the productivity statistics lag others but in general it anticipated that the development of productive sectors such as renewable energy development and the manufacturing supply chain behind this would increase the local productivity levels.

100. This will only be achievable with appropriately skilled people. Due to the focus on training, transferable skills, and apprenticeships in order to support the growth of the offshore wind sector it is possible that younger people will move to the New Anglia LEP. This would reduce the proportion of the local population that are above retirement age in general. However, it is assumed that the majority of people would move to urban areas rather than the rural districts around the onshore cable route.

101. In conclusion, the trend in growing the offshore wind sector is anticipated to continue and that this would contribute to the growth of the New Anglia LEP region. Although this may lead to an increase in younger people migrating to the area it is not expected that these people would settle in the communities next to the onshore cable route therefore the baseline conditions in these areas would be reasonably consistent.

31.7 Potential Impacts

102. This section describes the potential impacts relating the worst-case scenario for the project. Factors that may cause impacts will be considered with regards:

- The absolute scale of the factor causing the impact;
- The temporal nature of the factors, whether it is temporary, long term, immediate, or developing; and
- The geographic nature of the factor, whether it is localised or spread across an area.

103. The factors that may create impacts will be developed using information provided in Chapter 5 Project Description and then compared against the baseline described in section 31.6.

104. The impact methodology is discussed in full section 31.4 and summarised below:

- Economic impacts will be assessed with regards to job creation by the project (direct) and the associated jobs created due to people enabling the project but not directly delivering it (indirect). This is compared against the size of the labour market in the New Anglia LEP region where people have been identified (by NOMIS) as working in construction. Due to the significant contribution of the tourism sector to the economy of Norfolk, rather than also including this impact within this chapter, impacts to the tourism sector have been considered in detail in Chapter 30 Tourism and Recreation.
- Social impacts are assessed with regards to the direct impacts on community infrastructure. These impacts are derived from the assessments in Chapter 20 Water Resources and Flood Risk, Chapter 24 Traffic and Transport, Chapter 25 Noise and Vibration, and Chapter 26 Air Quality. Impacts on the local populations that make up these communities are assessed in Chapter 27 Human Health and used to inform the assessment here.

31.7.1 Embedded Mitigation

105. Norfolk Vanguard Ltd has committed to a number of techniques and engineering designs/modifications inherent as part of the project, during the pre-application phase, in order to avoid a number of impacts or reduce impacts as far as possible. Embedding mitigation into the project design is a type of primary mitigation and is an inherent aspect of the EIA process.

106. A range of different information sources has been considered as part of embedding mitigation into the design of the project (for further details see Chapter 5 Project Description, Chapter 4 Site Selection and Assessment of Alternatives and the Consultation Report (5.1) including engineering requirement, feedback from community and landowners, ongoing discussions with stakeholders and regulators, commercial considerations and environmental best practice.

107. The following sections outline the key embedded mitigation measures relevant for this assessment. These measures are presented in Table 31.18.

Table 31.18 Embedded mitigation

Parameter	Mitigation measures embedded into the project design	Notes
Strategic approach to delivering Norfolk Vanguard and Norfolk Boreas	Subject to both Norfolk Vanguard and Norfolk Boreas receiving development consent and progressing to construction, onshore ducts will be installed for both projects at the same time, as part of the Norfolk Vanguard construction works. This would allow the main civil works for the cable route to be completed in one construction period and in advance of cable delivery, preventing the requirement to reopen the land in order to minimise disruption. Onshore cables would then be pulled through the pre-installed ducts in a phased approach at later stages. In accordance with the Horlock Rules, the co-location of Norfolk Vanguard and Norfolk Boreas onshore project substations will keep these developments contained within a localised area and, in so doing, will contain the extent of potential impacts.	The strategic approach to delivering Norfolk Vanguard and Norfolk Boreas has been a consideration from the outset.
Commitment to HVDC technology	Commitment to HVDC technology minimises environmental impacts through the following design considerations; • HVDC requires fewer cables than the HVAC solution. During the duct installation phase this reduces the cable route working width (for Norfolk Vanguard and Norfolk Boreas combined) to 45m from the previously identified worst case of 100m. As a result, the overall footprint of the onshore cable route required for the duct installation phase is reduced from approx. 600ha to 270ha; • The width of permanent cable easement is also reduced from 54m to 20m; • Removes the requirement for a CRS; • Reduces the maximum duration of the cable pull phase from three years down to two years; • Reduces the total number of jointing bays for Norfolk Vanguard from 450 to 150; and • Reduces the number of drills needed at trenchless crossings (including landfall).	Norfolk Vanguard Limited has reviewed consultation received and in light of the feedback, has made a number of decisions in relation to the project design. One of these decisions is to deploy HVDC technology as the export system.
Site Selection	The project has undergone an extensive site selection process which has involved incorporating environmental considerations in collaboration with the engineering design requirements. Considerations include (but are not limited to) adhering to the Horlock Rules for onshore project substations and National Grid infrastructure, a preference for the shortest route length (where practical) and developing construction methodologies to minimise potential impacts. Key design principles from the outset were followed (wherever practical) and further refined during the	Constraints mapping and sensitive site selection to avoid a number of impacts, or to reduce impacts as far as possible, is a type of primary mitigation and is an inherent aspect of the EIA process. Norfolk Vanguard Limited has reviewed consultation received to inform the site selection

Parameter	Mitigation measures embedded into the project design	Notes
	EIA process, including; • Avoiding proximity to residential dwellings; • Avoiding proximity to historic buildings; • Avoiding designated sites; • Minimising impacts to local residents in relation to access to services and road usage, including footpath closures; • Utilising open agricultural land, therefore reducing road carriageway works; • Minimising requirement for complex crossing arrangements, e.g. road, river and rail crossings; • Avoiding areas of important habitat, trees, ponds and agricultural ditches; • Installing cables in flat terrain maintaining a straight route where possible for ease of pulling cables through ducts; • Avoiding other services (e.g. gas pipelines) but aiming to cross at close to right angles where crossings are required; • Minimising the number of hedgerow crossings, utilising existing gaps in field boundaries; • Avoiding rendering parcels of agricultural land inaccessible; and • Utilising and upgrading existing accesses where possible to avoid impacting undisturbed ground.	process (including local communities, landowners and regulators) and in response to feedback, has made a number of decisions in relation to the siting of project infrastructure. The site selection process is set out in Chapter 4 Site Selection and Assessment of Alternatives.
Duct Installation Strategy	The onshore cable duct installation strategy is proposed to be conducted in a sectionalised approach in order to minimise impacts. Construction teams would work on a short length (approximately 150m section) and once the cable ducts have been installed, the section would be back filled and the top soil replaced before moving onto the next section. This would minimise the amount of land being worked on at any one time and would also minimise the duration of works on any given section of the route.	This has been a project commitment from the outset in response to lessons learnt on other similar NSIPs. Chapter 5 Project Description provides a detailed description of the process.
Long HDD at landfall	Use of long HDD at landfall to avoid restrictions or closures to Happisburgh beach and retain open access to the beach during construction. Norfolk Vanguard Limited have also agreed to not use the beach car park at Happisburgh South.	Norfolk Vanguard Limited has reviewed consultation received and in response to feedback, has made a number of decisions in relation to the project design. One of those decisions is to use long HDD at landfall.
Trenchless Crossings	Commitment to trenchless crossing techniques to minimise impacts to the following specific features;	A commitment to a number of trenchless crossings at certain

Parameter	Mitigation measures embedded into the project design	Notes
	• Wendling Carr County Wildlife Site; • Little Wood County Wildlife Site; • Land South of Dillington Carr County Wildlife Site; • Kerdiston proposed County Wildlife Site; • Marriott's Way County Wildlife Site / Public Right of Way (PRoW); • Paston Way and Knapton Cutting County Wildlife Site; • Norfolk Coast Path; • Witton Hall Plantation along Old Hall Road; • King's Beck; • River Wensum; • River Bure; • Wendling Beck; • Wendling Carr; • North Walsham and Dilham Canal; • Network Rail line at North Walsham that runs from Norwich to Cromer; • Mid-Norfolk Railway line at Dereham that runs from Wymondham to North Elmham; and • Trunk Roads including A47, A140, A149.	sensitive locations was identified at the outset. However, Norfolk Vanguard Limited has committed to certain additional trenchless crossings as a direct response to stakeholder requests.

31.7.2 Monitoring

108. The development of the detailed design and final CoCP (DCO requirement 19) will refine the worst-case impacts assessed in this EIA. It is recognised that monitoring is an important element in the management and verification of the actual project impacts. The requirement for and appropriate design and scope of monitoring will be agreed with the appropriate stakeholders and included within the final CoCP and the Construction Method Statement (CMS) commitments prior to construction works commencing.

31.7.3 Additional enhancements and commitments by Norfolk Vanguard Limited

109. Whilst these are not part of the project and therefore the application for the DCO, Norfolk Vanguard Limited has committed to a number of additional aspects. These aim to ensure that socio-economic benefits due to potential employment are realised within the New Anglia LEP region as far as practicable.

31.7.3.1 Promoting a local supply chain for existing businesses

110. Assessment by BVG Associates (Appendix 31.2) shows that the skills and infrastructure required for the construction phase of an offshore wind farm are predominantly situated outside of the New Anglia LEP region. However, employment from secondary expenditure following direct employment, supply chain employment, and support services are more likely to be employed in the local and regional area, depending upon specialisation and skill levels. Evidence shows that the

average proportion of UK content is substantially higher during operation than construction and this provides the greatest long-term benefit for the region (RenewableUK, 2017).

111. To promote the use of local supply chain and support services, where applicable, Norfolk Vanguard Limited is committed to developing a Supply Chain Strategy. The aim of this Supply Chain Strategy is to produce opportunities for local companies to engage with the development and to encourage larger international companies to sub-contract locally.

112. As part of both the Norfolk Vanguard and Norfolk Boreas projects, Vattenfall Wind Power Limited launched their Supply Chain Information Pack[10] at Norwich City Football Club in March 2018.

113. At present these strategies are at a formative stage thus the direct benefit they will bring has not been quantified. This process is ongoing and would form part of the project's development.

31.7.3.2 Developing opportunities for young people

114. The project is part of a much larger development of the Offshore Wind Industry within the East of England Energy Zone. This is leading to the East of England area becoming a leading resource for offshore wind power resources, and technologies. With recent estimates of Full Time Equivalent jobs in the sector in the East of England growing from 10,000 to 21,000 by 2032 (Cambridge Econometrics, 2017). Clearly, supporting the development of young people to engage with the growing sector will create significant increases in employment. As highlighted by the CBI (March 2017), there is a strong correlation between businesses offering work experience placements or work inspiration (through site visits, mentoring, mock interviews and enterprise competitions) and the growth in GVA per hour of a Local Enterprise Partnership.

115. To promote the development of long term local employment for both Norfolk Vanguard and Norfolk Boreas, Vattenfall Wind Power Limited are developing a Skills Strategy to engage schools, colleges, and universities. The aim of this is to produce a pipeline of training and employment opportunities linked to the Offshore Wind Industry.

116. Although it is too early in the development process to assess the impact of Norfolk Vanguard Limited's Skills Strategy and procurement methodology, the project has

[10] Further information can be found on Vattenfall Wind Power Ltd.'s website here - https://corporate.vattenfall.co.uk/projects/wind-energy-projects/vattenfall-in-norfolk/norfolkvanguard/supply-chain/

already started to employ local contractors wherever possible. The following local contractors/suppliers have already been used as part of the project (pre-consent):

- Norfolk Wildlife Services have conducted ecological surveys to inform the Impact Assessment;
- SI Drilling have undertaken investigatory ground works for engineering feasibility;
- Remarkable Pendragon are a communications company who have set up a local Norwich office and are growing their staff numbers based out of this office; and
- Cefas are a Lowestoft based company undertaking the metocean campaign.

117. To date, Norfolk Vanguard Limited have developed or been involved with the following programmes:

- University Technical College Norwich, Vattenfall Wind Power Limited and wind farm developer's partnership to pilot a six session wind development programme highlighting employability, leadership and team skills;
- Work Experience pilot enabling diverse opportunities for a student from Dereham 6th Form. This demonstrated the importance of developing a coherent work experience offer;
- Innovative, transferable Key Stage 4&5, 3D Virtual Reality offshore wind development programme pilot, created in partnership with 3DW and with the potential to be used across Vattenfall Wind Power Limited and the UK (October 2017);
- Trial Masters student thesis focused on consultation process; and
- Other skills development as part of various early benefits and opportunities explorations; Broadband/Fibre (and cable splicing); Windmills in the Broads; River Hun skills opportunity; STEP into TECH (young Tech initiative); Institute of Physics lecture links; Beacon East - Business and Skills development links focused on Career opportunities and the Professional Development of local teachers.

31.7.4 Worst Case

118. Chapter 5 Project Description details the parameters of the project using the Rochdale Envelope approach. This section identifies those parameters during construction, operation and decommissioning relevant to potential impacts on tourism and recreation.

119. It is anticipated that the Norfolk offshore zone will be further developed by Norfolk Boreas Limited to accommodate the sister project Norfolk Boreas Offshore Wind Farm. Consideration has been made in the assessment such that the onshore cable route for Norfolk Vanguard accommodates ducts for the future Norfolk Boreas Offshore Wind Farm (with the exception of the landfall and the onshore 400kV cable route at the onshore project substation). This concept avoids reopening cable

trenches, and also allows for the re-use of some shared infrastructure (such as mobilisation areas) and enabling works, thereby minimising overall impacts and disruption.

120. The worst case scenarios with regard to the socio-economics are presented in Table 31.20.

121. Through consultation it has been agreed that the socio-economic assessment will consider:

- Construction impacts due to employment for both onshore and offshore works; and
- Impacts due to Community Infrastructure for onshore works only.

122. It is expected that the onshore cable route will be constructed through 2022 and 2023 with peak employment of between 250 and 420 people during the summer months of these years. Indicative employee requirements at different parts of the onshore cable route are as shown in Table 31.19 below.

Table 31.19 Assumed number of employees at different locations of cable route

Location	Indicative number of employees
National Grid extension	50
Vanguard substation	50
Each route section being worked for duct installation	20
Each trenchless crossing site setup and strip down	10
Each trenchless crossing during the drilling operation	5

123. The maximum and minimum number of employees required is therefore a function of the assumed level of parallel working of all of the activities in Table 31.19. There may be several work fronts along the cable route so several activities are likely to be concurrent. As a worst-case scenario on the labour market, a peak of 420 people will be employed. Although on first consideration it would appear that the highest number of job opportunities would be a benefit, the assessment is considering whether the local labour market could supply this demand.

124. During the construction of the offshore elements of the project, there will be a requirement for a dockside marshalling facility, where components for the offshore infrastructure will be held and in some cases assembled prior to loading onto construction barges or vessels. This facility will be chosen with regard to the location of fabricators and original equipment manufacturers (to minimise transportation requirements) and availability of suitable dockside space.

125. The primary base for the operations and maintenance (O&M) facility for Norfolk Vanguard would likely be a suitable port facility on the coast of East Anglia. Options currently under consideration include ports at Great Yarmouth and Lowestoft, see

section 5.4.18.5 in Chapter 5 Project Description. Effects due to the O&M facility have not been considered in this assessment because they would be included in their own DCO application.

126. The worst case assumptions with regard to the topic are presented by element of the project in Table 31.20.

127. A full description of the project and embedded mitigation can be found in Chapter 5 Project Description.

Table 31.20 Worst case assumptions

Worst case assumptions Element	Worst case criteria	Worst case definition	Notes
Offshore wind farm sites			
Construction	Location	47km (closest point) from the coast	This is beyond the visual range of people on the shore.
Offshore cable corridor			
Construction	Maximum number of export cables Maximum export cable corridor length Duration Minimum safe passing distance around cable installation vessels	4 (laid as pairs in 2 trenches) 85km NV West 100km NV East 14 months 500m construction vessel safety	Chapter 5 Project Description shows either a one or two phase programme. Both add up to 14 months and this has been used to calculate job creation due to offshore construction.
Landfall			
Construction	Maximum temporary works duration Working hours Expected noise level	30 weeks 24 hour working may be required for duct installation See Chapter 25 Noise and Vibration	It is expected that drilling will be undertaken for Norfolk Vanguard and Norfolk Boreas in the same works period.
Onshore cable route			
Construction	Length Width Peak onshore construction employment Total ducting duration	60km 45m 420 personnel at any one time. 70% of workers from outside the Norfolk / Suffolk area 2 years	It is expected that during most construction works the onshore workforce will be 70-90 people. Peak employment will depend upon the scheduling of the actual construction. Scheduling as used in Chapter 24 Traffic and Transport has been used.

Worst case assumptions Element	Worst case criteria	Worst case definition	Notes
	Total cable pull, joint and commission duration Total	2 years 6 years	On average, a 70% in migration rate has been assumed but this will vary depending on the type of skills required.
Permanent joint pits	Maximum number and required dimensions Access	Assume 150 at 90m^2 and 2m deep each Periodic access to installed link boxes / test pits may be required for inspection, estimated to be annually.	Norfolk Vanguard only, spaced approximately one per circuit per 800m cable. 1 link box per circuit per 5km (24)
Onshore project substation			
Construction	Peak onshore construction employment Maximum land take for temporary works area Maximum duration	420 personnel at any one time. 100% from outside the Norfolk / Suffolk area 20,000m^2 (200m x 100m) 30 months	It is expected that during most construction works the onshore workforce will be 70-90 people. Peak employment refers to both cable route and onshore project substation. It is not expected that there will be 420 at one location at one time. Indicative construction timing 24 months.
Operation	Maximum land take for permanent footprint Maximum height Access Expected noise level	75,000m^2 19m building with 25m lightning protection masts, fences 3.4m high, 1 visit per week, site lighting required during maintenance visits only See Chapter 25 Noise and Vibration.	No illumination at night The same dimensions have been used to inform Chapter 29 Landscape and Visual Impact Assessment.
National Grid extension and overhead line modification			
Construction	Maximum land take for temporary works area – substation extension Maximum land take for temporary works area –	67,500m^2 174,264m^2	The busbar would be extended in a westerly direction with seven additional Air Insulation Switchgear (AIS) bays for Norfolk Vanguard.

Worst case assumptions Element	Worst case criteria	Worst case definition	Notes
	overhead line Works hours and maximum duration Maximum height of temporary towers Fencing	 12 hour working day, 5 to 7 days a week, for 30 months 45m 4m high	 The same dimensions have been used to inform Chapter 29 Landscape and Visual Impact Assessment. Indicative construction timing 24 months.
Operation	Maximum land take for substation extension permanent footprint Maximum land take for overhead line permanent footprint Maximum height of permanent towers Access	49,300m^2 9,250m^2 55m 1 visit per month, site lighting required during maintenance visits only	Includes existing Necton National Grid substation area. Not normally illuminated other than infrequent inspection and maintenance activities (during working hours only). No illumination required at night

31.7.4.1 Assessment scenarios

128. As outlined in Chapter 5 Project Description, Norfolk Vanguard Limited is currently considering constructing the project in a single phase of up to 1800MW or a two-phased approach with up to 900MW phases. Whichever scenario is selected the main elements of the onshore construction would be unchanged with the exception of cable pull, jointing, and commissioning (see Table 5.37 of Chapter 5 Project Description).

129. Construction of the project under either approach would be anticipated to commence between 2020 and 2021 for the onshore works, and around 2024 for the offshore works. Chapter 5 Project Description outlines the indicative onshore construction programme scenarios which is summaries in Table 31.21.

Table 31.21 Main programme activities

Activities	Description
Pre-construction (2020 to 2021)	The pre-construction works would also consider the requirements of Norfolk Boreas to minimise future disruption and would therefore cover a cable route width of up to 45m. Main activities would include: • Road Modifications; • Hedge and Tree Netting / Removal; • Ecological preparations;

Activities	Description
	• Archaeological preparations; and • Pre-construction drainage.
Landfall (from 2022)	For a drill length of 500m, it is anticipated that site establishment, drilling of six ducts and demobilisation will take approximately 30 weeks when considering 12 hour (7am to 7pm), 7 day shifts. 24 hour operation may be employed for drilling activities, subject to planning and environmental restrictions, and could reduce the installation to approximately 20 weeks. Cable pulling will be undertaken subsequent to the main duct installation.
Main duct installation works (2022 to 2023)	The main duct installation works would be broadly broken into the following work packages: • Enabling works; • Duct installation and • Reinstatement works.
Workforce	It is proposed that a five day working week limited to the hours of 7am to 7pm would be employed with an average installation productivity of approximately 150m per week (with a worst case of 150m in up to two weeks). Seven day working could be required during specific periods of the installation, such as following periods of poor weather, but would be reserved where programme acceleration is required. Seven day and 24 hour working would be employed for any trenchless crossings, subject to specific requirements.
Onshore project substation construction (2022 to 2025)	The main works for the final onshore project substation infrastructure, such as drainage, foundations and buildings would be constructed within a 24-30 month period, in parallel with the duct installation programme. Onshore project substation plant (such as transformers and switchgear) would subsequently be supplied and installed in up to two phases of 2024 and 2025 in parallel with the commissioning of the two phases of offshore wind turbine planting.

31.7.4.2 Assumption per potential impact

130. Due to the interrelated nature of socio-economic impacts it is important to be clear about how the scenarios and assumptions outlined above influence the potential impacts that are assessed. This is outlined in Table 31.22.

Table 31.22 Worst case assumptions per potential impact

Impact	Parameter	Notes
Construction		
Direct job creation	Employment study area	Chapter 24 Traffic and Transport shows that residential staff would be prepared to travel up to 90 minutes for work. This indicates that people from across the New Anglia LEP region may benefit from the development of the project.
	Full Time Equivalent (FTE) jobs	Full Time Equivalent (FTE) is a unit that indicates the workload of an employed person in a way that is comparable. One FTE per unit time is the equivalent of one employee working full time for that unit of time. The unit time used in this assessment is 1 year. Thus, FTE figures are provided as the equivalent of a full time

Impact	Parameter	Notes
		employee in a year. The use of FTE allows employment to be compared whether it is full time or part time. In the construction phase the workers themselves may work full time in their profession but this project will only provide part of their work in a year. For example, if 10 workers work on a project for 6 months this equates to 5 FTE per year.
	Employment leakage[11]	Although the project will create opportunities for employing people who live in the New Anglia LEP region, the proportion that can be supplied by the region will be dependent on the skills and companies available. During construction, a worst case assumption is that 70% of the workforce will temporarily in-migrate from outside of the New Anglia LEP. This assumption has been modulated based on the specificity of skills required for different aspects of the construction as described in Table 31.23.
Effects on community infrastructure	Working hours	The worst case assumes a 12 hour day (7am to 7pm) with associated construction times as described below.
	Landfall	The worst case assumes ducts for Norfolk Boreas will be installed at the same time as Norfolk Vanguard and form part of the Norfolk Vanguard EIA/DCO application (including at landfall). It is anticipated that site establishment, drilling of six ducts and demobilisation will take approximately 30 weeks.
	Onshore cable route (with associated construction compounds and mobilisation areas)	It is proposed that a five day working week limited to the hours of 7am to 7pm would be employed with an average installation productivity of approximately 150m per week and a programme as described in Table 31.21
	HVDC	Since PEIR Norfolk Vanguard Limited have announced that HVDC cable technology will be used for the project.
	Onshore project substation	The main works for the onshore project substation would be constructed within a 24-30 month period, in parallel with the duct installation programme. Onshore project substation plant (such as transformers and switchgear) would subsequently be supplied and installed in up to two phases of 2024 and 2025.
Operation		
Direct and supply	UK Content	A probabilistic assessment of the likely location of the

[11] In this case Employment Leakage refers to the proportion of employment that will benefit people outside of the 90-minute residential employment travel time (defined in Chapter 24 Traffic and Transport)

Impact	Parameter	Notes
chain job creation		supply chain has been conducted by BVG Associates on behalf of Royal HaskoningDHV. This is included in Appendix 31.2 and based on BVG Associates' analysis of UK Content since 2014 for RenewableUK.
Effects on community infrastructure	HVDC	As described in Chapter 27 Human Health, no emissions (of any kind) are anticipated to arise from the onshore cables during operation. It is not anticipated that the onshore project substation will be illuminated under normal operating conditions. Site lighting will be provided during operation and maintenance activities only, which are anticipated to occur on average once per week during operation.
Decommissioning		
Direct and supply chain job creation	It is assumed that these will be similar but to a lower scale than during the construction period.	No decision has been made regarding the final decommissioning for the offshore wind turbines and onshore project substation, as it is recognised that industry best practice, rules and legislation change over time. However, the onshore project substation equipment will likely be removed and reused or recycled. It is expected that the onshore cables will be removed from ducts and recycled, with the joint pits and ducts left in situ. 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 and covered by a separate Development Consent Order prior to decommissioning.
Effects on community infrastructure		
Cumulative		
Direct and supply chain job creation	Employment by other offshore wind projects	Where projects have not been approved for development it is not possible to assess the employment generated by them. If projects are of a similar size to Norfolk Vanguard it is assumed that employment potential would be similar. It is also assumed that the supply chain that may develop to provide goods and services to the offshore wind industry will be shared between projects.
Effects on community infrastructure	Management of impacts by other projects	It is assumed that projects considered under the cumulative assessment would be constructed with the same regards to socio-economic impacts as Norfolk Vanguard Limited. This can be guaranteed for Norfolk Boreas Limited because both projects are being developed by Vattenfall Wind Power Limited. Considering that all projects will be subject to similar levels of scrutiny from statutory stakeholders it is reasonable to assume that other projects would take a similar approach.

31.7.5 Potential Impacts during Construction

31.7.5.1 Impact 1: Direct and indirect job creation

31.7.5.1.1 Onshore construction magnitude

131. The onshore construction magnitude of direct and indirect job creation has been assessed using Average Daily Personnel Requirements and which have also been used for the traffic assessment provided in Chapter 24 Traffic and Transport.

132. It assumes that peak employment will be 420 in Q3 of 2022 and that the demand for labour would be as shown in Plate 31.2. It is estimated that this would lead to a total direct FTE job creation of 509 FTE jobs across the 4 year onshore works programme with the majority of demand in the first two years, as shown in Table 31.23.

133. Assumptions have been made about the proportion of demand that the local labour market may be able to supply as follows:

- Onshore cable route – this would include standard civil construction techniques so it is assumed that this would mainly be procured from within New Anglia region to ensure cost efficiencies;
- Trenchless crossings, landfall HDD, and cable pulling – as these are relatively specialised tasks it is assumed that contractors would operate nationally but employ local sub-contractors for more standard civil and construction tasks;
- A47 Highways - this would include standard civil construction techniques so it is assumed that this would be procured from within New Anglia region to ensure cost efficiencies;
- Onshore project substation and National Grid substation extension - as these are relatively specialised tasks it is assumed that contractors would operate nationally but employ local sub-contractors for more standard construction tasks.

134. These assumptions indicate that approximately 244 FTE jobs may be directly created across the four years of the onshore construction works. This is the sum of FTE jobs per year across the 4 years assessed in Table 31.23. Although the entire construction programme is six years, the labour requirement is confined to the four years shown in Plate 31.2. This correlates with the transport assessment undertaken in Chapter 24 Traffic and Transport.

135. To calculate indirect job creation a Type 1 employment multiplier of 1.9 has been applied to the local portion of the direct job creation. This is based on the latest ONS dataset that uses 2013 as a reference year for input-output data (ONS, 2017). As shown in Table 31.23, this may lead to the indirect creation of 219 FTE jobs across East Anglia. Indirect jobs are those that are not directly employed by the project (such as site managers, labourers, machine operators, or technicians) but are

essential to allow the project to proceed (such as accountants, project managers, environmental consultants, etc).

136. Following the approach outlined in section 31.4.5.4, the potential for direct and indirect job creation by the onshore construction works for the project has the following magnitudes for the New Anglia LEP labour market (Table.31.24):

- Direct job creation has a negligible magnitude on the New Anglia labour market;
- Indirect job creation has an impact of low magnitude.

137. This shows that the labour market within the New Anglia LEP region for people working in the construction industry has the capacity to supply the project with necessary staff. The additional enhancements and commitments made by Norfolk Vanguard Limited (section 31.7.3.1) increase the likelihood that these jobs could benefit the local population, although, as a worst case scenario, this assessment has not assumed that they will be supplied from the New Anglia LEP region.

Table 31.23 Estimates of Full Time Equivalent (FTE) jobs created and supported in each year by the cable route construction

FTE jobs	2022	2023	2024	2025	Direct	Local content	Direct	Indirect	Total
Cable Route	165	55	0	0	220	70%	154	139	293
Trenchless Crossings	14	2	0	0	16	30%	5	4	9
Landfall HDD	19	2	0	0	21	30%	6	6	12
Cable Pulling	0	0	92	0	92	30%	28	25	53
A47 Highways	3	2	0	0	4	100%	4	4	8
Onshore Substation	33	42	3	3	80	30%	24	22	46
NGET Substation	33	42	0	0	75	30%	23	20	43
FTE per year	266	145	95	3	509		244	219	463

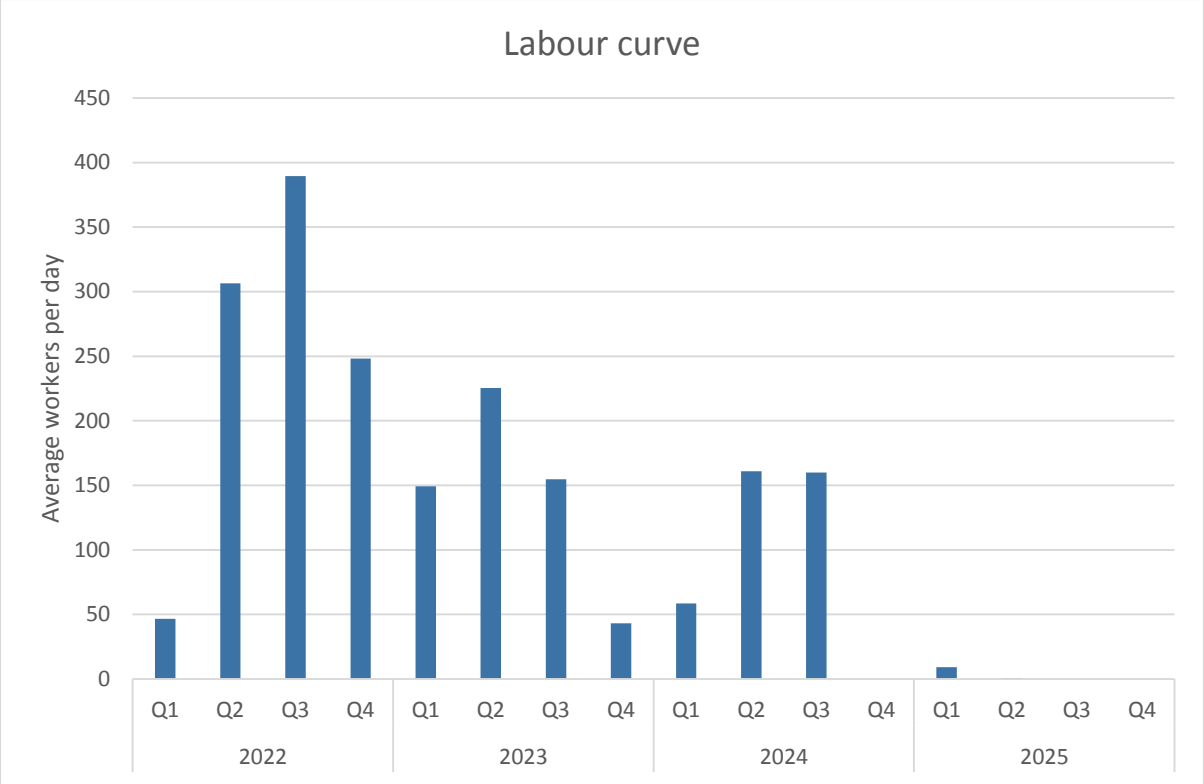

Plate 31.2 Labour Curve for the project showing average workers required per day per quarter[12]

Table.31.24 Magnitude of direct and indirect job creation within the New Anglia LEP region

	Direct	Indirect	Total
Total jobs in New Anglia	244	219	463
New Anglia Construction jobs	35,000	35,000	35,000
% increase labour	0.70	0.63	1.3

31.7.5.1.2 Offshore construction magnitude

138. The largest capital expenditure of the project will be on the offshore construction of the wind turbine array. A significant concern of local stakeholders is how much of this investment is likely to be captured by the New Anglia LEP and lead to job creation.

139. In November 2014, the Offshore Wind Industry Council (OWIC) approved the adoption of an industry-wide methodology to measure the UK content of offshore wind farms. This methodology was published by BVG Associates in May 2015. Industry submits anonymous, aggregated data from all contracts worth over £10m in value that come from UK wind farms to the industry trade body, RenewableUK, for analysis.

[12] Indicative rates based on outline construction programme provided by project engineers June 2017. Estimates given per week to the nearest 10 people.

140. Based on their analysis since 2014, BVG Associates produced the supply chain assessment for the project. This is included in Appendix 31.2 and summarised with regard potential job creation in the construction phase in Table 31.25.

141. To create a worst case scenario, the following multipliers were applied to the sum of Direct and Indirect FTE indicated in Appendix 31.2. This reflects both the likelihood that elements could be procured within New Anglia/the UK markets and the commitment that Norfolk Vanguard Limited is making to 50% UK content where possible:

- Low probability elements were assumed to be procured from outside of the New Anglia or UK markets;
- It was assumed that Medium probability elements have a 50% chance of being procured in New Anglia LEP region or the UK; and
- It was assumed that High probability elements would definitely be procured within East Anglia or the UK.

142. This shows that the likelihood of the New Anglia LEP region benefiting from the construction of the offshore elements of the project is low compared to the job creation potential for the entire offshore construction. This is due to area lacking companies that can provide offshore construction services at this scale or the presence of a manufacturing supply chain.

143. The analysis shows that there may be 1200 FTE years created in the New Anglia LEP during to the two-year period of construction for the offshore elements of the wind farm. This equates to 600 FTE jobs per year.

144. Based on the strategic port assessment in Appendix 31.3 these jobs are most likely to be created in Great Yarmouth but due to potential commuter distances the benefits may be spread across the New Anglia LEP region. The creation of this number of jobs has a significant potential impact in providing training and employment opportunities for job seekers in the New Anglian LEP region during the construction period of the project.

145. This potential job creation during the construction phase would have the following magnitude as shown in Table 31.26:

- Direct offshore job creation may have a negligible magnitude impact on the New Anglia labour market;
- Indirect job creation may have a low magnitude impact on the New Anglia labour market.

146. The supply chain for offshore wind farm components is not something that Norfolk Vanguard Limited can control because it is determined by many factors. If Norfolk Vanguard Limited, along with other offshore wind farm developments of a similar

scale are developed as currently planned, then it is assumed that the local supply chain may develop to provide services. The additional enhancements described in section 31.7.3 are intended to increase the likelihood of this happening.

Table 31.25 Potential for supply chain job creation during construction

Element	Sub element	Probability procured in East Anglia	Probability procured in UK	Direct FTE years	Indirect FTE years	FTE years East Anglia	FTE years UK
Project management	Management and procurement	Medium	High	600	300	450	750
Turbine ex-works	Nacelle and hub	Low	Low	2000	6000	0	0
	Blades	Low	High	2000	1500	0	1500
	Tower	Low	Medium	400	1000	0	500
Balance of plant	Foundations	Low	Medium	1500	800	0	400
	Subsea cables	Low	Medium	2000	1500	0	750
	Transmission electrical	Low	Medium	1000	1500	0	750
	Transmission structural	Low	Low	2000	1500	0	0
Installation and commissioning	Foundation installation	Low	Low	1200	700	0	0
	Cable installation	Low	Medium	2000	1500	0	750
	Turbine installation	Medium	Medium	1000	500	750	625
	Substation installation	Low	Low	200	100	0	0

Table 31.26 Magnitude of direct and indirect job creation for offshore construction works within the New Anglia LEP region

	Direct	Indirect	Total
FTE years in New Anglia LEP region	800	400	1200
FTE jobs per year	400	200	600
New Anglia Construction jobs	35,000	35,000	35,000
% increase labour	1.2	0.6	1.7

31.7.5.1.3 New Anglia labour market sensitivity

147. Appendix 31.1, Figure 31.11, section 31.6.1.1.2 and section 31.6.2.2 describe relative levels of deprivation in New Anglia and Norfolk in comparison to other non-metropolitan districts in the UK as follows:

- Employment deprivation is ranked 18th out of 39; and
- Education deprivation is ranked 3rd out of 39.

148. As described in section 31.6.1, NOMIS data shows that skill levels have increased but are consistently below UK and East of England averages. However, unemployment figures are comparable to East of England and UK levels.

149. *Norfolk Limited* suggests that although the economy is growing the downturn in the oil, gas & energy sector is reducing growth. As the skills required for the oil, gas & energy sector are quite transferable to the offshore wind sector this provides a good opportunity for beneficial enhancement to the local economy.

150. Using travel to work analysis as part of the assessment in Chapter 24 Traffic and Transport, it can be seen that (with regards the onshore construction area) the highest number of people currently employed in construction live near Necton and the lowest number live near Happisburgh (as shown in Plate 31.3). Therefore, there is also an opportunity to increase local benefit.

151. It is considered that the labour market currently has a sensitivity level of medium to high. Therefore, to generate any benefit to the New Anglia region Norfolk Vanguard Limited will need to continue the education and engagement work that is described in section 31.7.3.2.

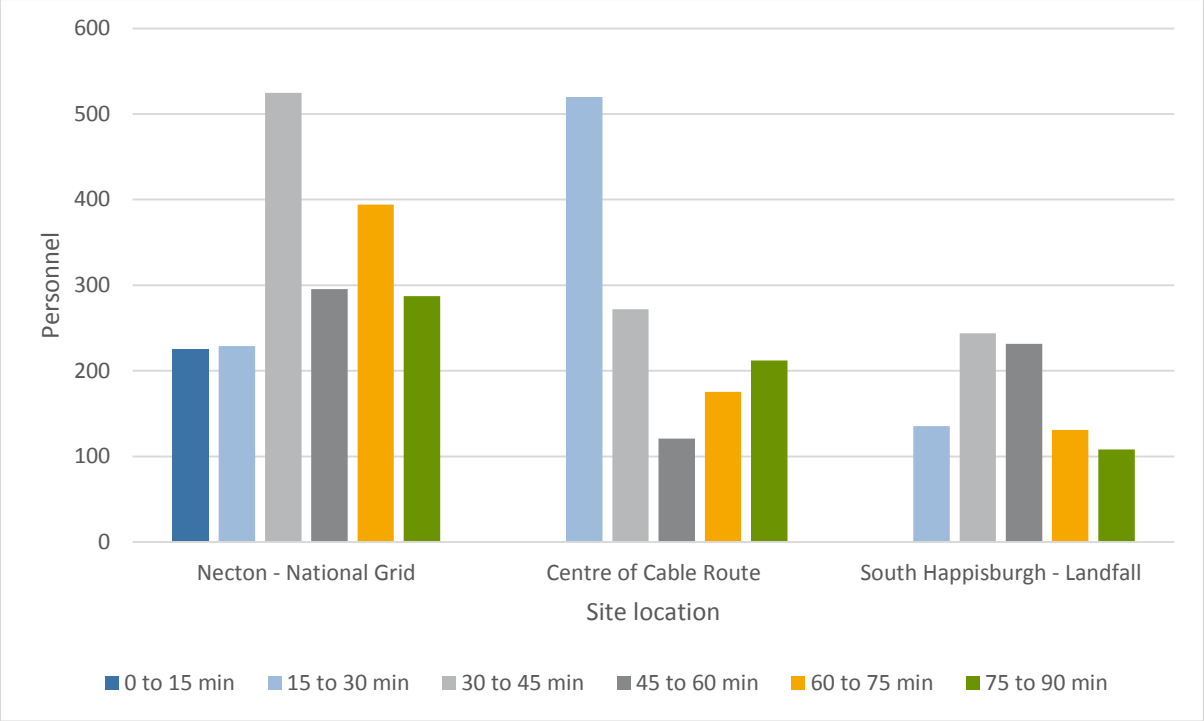

Plate 31.3 People employed in construction in relation to the Necton National Grid substation, the centre of the onshore cable route, and landfall

31.7.5.1.4 Direct and indirect job creation significance

152. The impact assessment has considered onshore and offshore construction individually and found that they create negligible impact to the New Anglia LEP region. When considered together (Table 31.27) the magnitudes are as follows:

- Direct job creation can be expected to have a negligible impact on the New Anglia labour market;
- Indirect job creation can be expected to have a beneficial impact of medium magnitude.

153. This shows that the region should have the capacity to supply the project through the Local Supply Chain Strategy described in section 31.7.3.

Table 31.27 Combined onshore and offshore FTE job creation potential

	Direct	Indirect	Total
Onshore construction jobs per year	244	219	463
Offshore construction jobs	400	200	600
Total jobs in New Anglia	844	419	1063
New Anglia Construction jobs	35,000	35,000	35,000
% increase labour	2.4	1.2	3.0

154. The sensitivity level of the labour market is considered to be medium to high. Using Table 31.26, the significance of the potential direct and indirect job creation is assessed as follows:

- Direct job creation has a **minor beneficial** impact on the New Anglia labour market;
- Indirect job creation has a **moderate beneficial** impact on the New Anglia labour market.

31.7.5.2 Impact 2: Effects on community infrastructure

31.7.5.2.1 Community infrastructure receptors

155. Community infrastructure provides supporting services to ensure community cohesion. It includes the following types of assets:

- Educational – schools and training facilities serving the local population;
- Health – GP surgeries, dentists, and other facilities serving a local population;
- Community – public houses, town halls, public sports facilities (e.g. swimming pools and publicly accessible sports grounds), etc.;
- Financial and logistics – local bank branches, post offices, etc.; and
- General business – clustering of shops, garages, and other services people use on a day to day basis.

156. The baseline assessment (section 31.6.4) shows that there are 173 community infrastructure assets within 1km of landfall, onshore cable route, and onshore project substation (Table 31.17). Using the definitions for sensitivity and value set out in section 31.4.5.2 and section 31.4.5.3 respectively, the assets are assessed as shown in Table 31.28.

Table 31.28 Community infrastructure receptors

Asset category	Value	Number	Sensitivity	Overall sensitivity
Educational	High	5	High	Very high
Health	Medium to high	11	Medium	Medium
Community	Medium to low	48	Low	Low
Financial and logistics	Low	4	High	Medium
General business	Negligible	105	Negligible	Negligible

157. Table 31.28 shows that communities may perceive larger impacts than actually assessed in corresponding chapters if assets such as schools or colleges, GPs or dentists, and banks or post offices are affected by the project.

31.7.5.2.2 Impacts source pathway

158. First of all, it is important to understand if communities will be directly affected by the project, e.g. does the cable route go directly through a community. The assessment shown in Table 31.29 shows that the site selection process described in Chapter 5 Project Description has been successful in avoiding populated areas.

159. However, there is the potential for some parts of the community to be affected by noise or visual effects as defined in section 31.5.2.2 and there is also the potential for

communities to be affected by transport delays, particularly in relation to attending the sensitive community infrastructure receptors outlined above.

Table 31.29 Potential for direct interaction with communities

Location	Direct Impact	Possible indirect impact
Necton	None	East of Necton within 1 km of site boundary.
Little Fransham	None	All of town within 1 km of site boundary.
Scarning	None	All of town within 1 km of site boundary.
Dereham	None	Northern periphery within 1 km of site boundary.
Swanton Morley	None	South of town is within 1 km and Southern periphery within 200m of site boundary.
Woodgate	None	All of town is within 1 km of site boundary.
Mill Street	None	All of town is within 1 km of site boundary.
Sparham	None	North west of town within 1 km south of site boundary.
Reepham	None	North of town within 1 km south of site boundary. Northern periphery within 200m.
Southgate	None	All of town within 1 km south of site boundary and northern half within 200m.
Cawston	None	North of town within 1 km of site boundary.
Salle Park	None	Within 1 km north of site boundary.
Aylsham	None	North of town within 1 km south of site boundary.
North Walsham	None	North of town within 1 km south and houses around Harvey Drive within 200m of site boundary.
Swafield	None	All of town within 1 km north of site boundary.
Happisburgh and Whimpwell Green	1 business within site boundary	Cross main thoroughfare between towns. All within 1 km of site. Several businesses within 200m of site boundary.
Eccles on Sea	None	All of town within 1km of site boundary.

160. Therefore, indirect impacts are the only remaining source pathway. These can be considered as disturbance to communities whilst accessing community infrastructure during construction and the sources are:

- Traffic (both congestion and noise);
- Temporary obstruction of access to assets due to construction; and
- Temporary noise, dust, vibration, and visual impacts.

161. Noise impacts are discussed in detail in Section 25.8 of Chapter 25 Noise and Vibration.

162. Chapter 25 Noise and Vibration discusses the mitigation relevant to minimising noise and vibration impacts, including adoption of general good practice construction

noise management measures known as Best Practical Means (BPM) and applying the principles of Best Available Technique (BAT) when designing the facility and for any sound emitting mobile and fixed plant.

163. Following the mitigation outlined here and discussed in Chapter 25 Noise and Vibration, the assessment shows the following impacts during construction:

- No impact at landfall;
- Negligible impact along the onshore cable route;
- No impact at the onshore project substation;
- Minor adverse impact due to traffic noise; and
- No impact due to vibration.

164. Dust impacts are discussed in Chapter 26 Air Quality and impacts to human receptors within 350m of construction activities are assessed to be not significant following implementation of the mitigation outlined in the chapter.

165. An Outline Code of Construction Practice (CoCP) (document reference 8.1) has been submitted as part of the DCO. The final CoCP will be agreed in consultation with relevant stakeholders. This Plan would detail methodologies to be used during construction activities, including all environmental mitigation and details on a Construction Liaison Committee (CLC) who would work with local businesses and stakeholders to minimise adverse impacts to an acceptable level.

166. It is assessed that this is highly unlikely to affect community infrastructure receptors due to the proximity outlined above.

167. Impacts on landscape are detailed in Chapter 29 Landscape and Visual Impact Assessment. The assessment summarised the impacts as follows:

- At landfall: “construction would have a not significant effect on the landscape character of the Bacton to Sea Palling Coastal Plains LCU as a whole, however there would be a short term significant effect in the very localised landscape around the landfall. There would also be a significant effect on the views of walkers on short and localised sections of Norfolk Coastal Path and PRoW RB22 and on the views of residents on Lighthouse Lane in the southern extent of Happisburgh. The landfall construction works would be relatively small in scale and this explains the localised extent of the effects. Furthermore, the construction works would last a maximum of 20 weeks, making the effects short term. Reinstatement of the majority of the agricultural land at the end of this period would make the effects largely reversible.”
- Onshore cable route: “The majority of the effects would relate to the construction works and be short to medium term with effects mitigated through reinstatement of the land and hedgerows as far as practicable and permissible.

Residual impacts would occur in the few instances where trees would be removed and not replaced owing to restrictions over cable easements. These effects would be long term but not irreversible as replanting of hedgetrees and trees could take place following decommissioning and the planting of hedgerows in the interim would offset the loss."

- Onshore project substation: "the effect on the agricultural land and the hedgerows and hedgetrees would not be significant. There would be localised significant effects on landscape character in those parts of the Settled Tributary Farmland LCT – River Wissey Tributary Farmland LCU and Plateau Farmland LCT – Beeston Plateau LCU and Pickenham Plateau LCU, close to the project, but not significant effects on the remaining parts and all other LCUs. In respect of the representative viewpoints, significant effects would arise from a section of Lodge Lane to the immediate south of the site, a very localised section of Ivy Todd Road to the south-west and a section of the A47 to the north. These effects would all occur within 1.2km of the onshore project substation, making them localised."

168. This shows that although some significant landscape effects may be felt at very localised areas; the overall impact on community infrastructure would not be significant. This is because to create a significant change for a community, the visual effect would need to be felt by a significant population over a prolonged period of time from an identified community asset, rather than by individuals as they pass certain viewpoints.

169. As detailed in Chapter 29 Landscape and Visual Impact Assessment, a draft Outline Landscape and Environmental Management Strategy (OLEMS) (document reference 8.7) is submitted alongside the ES. This strategic approach to the management of ecology and landscape would ensure that adverse impacts to communities, due to any adverse impacts to nature and wildlife, are minimised.

170. Due to this, Chapter 27 Human Health assesses that health outcomes due to visual impacts would be not be significant. Therefore, it is assessed that impacts whilst accessing or using community infrastructure would not be significant due to visual impacts, following implementation of the mitigation outlined in the chapter and summarised in section 31.7.

171. Impacts due to increased traffic density are discussed in Chapter 24 Traffic and Transport. As detailed in Chapter 24 Traffic and Transport, Traffic Management Plans (document reference 8.8, 8.9 and 8.10) would be prepared prior to construction activities commencing. Traffic Management Plans would be agreed with the relevant Local Planning Authorities to minimise disturbance to local communities, and to avoid serious disruption and indirect impact upon tourism and recreational receptors.

172. Following the mitigation discussed in that chapter, the assessment shows:

- Minor to negligible adverse impact on pedestrian severance[13];
- Negligible to minor adverse impact on pedestrian amenity[14];
- Minor adverse impacts on road safety; and
- Minor adverse impacts on driver delays.

31.7.5.2.3 Impact significance

173. The highest sensitivity receptors are likely to be educational facilities (such as schools) followed by health service providers such as (GPs, care homes or dentists) and financial or logistic businesses (such as banks or post offices). However, the agreed methodology does not capture the level of alternative asset provision outside of the study area which may reduce the overall sensitivity of financial or logistic businesses.

174. The multiple sources of potential impacts on these community infrastructure types has been discussed in the relevant chapters and is assessed as, at most, of minor or negligible significance. No impact is concluded for many parts of the project following mitigation as summarised in section 31.7.

175. As described in the worst case (section 31.7.4) construction impacts will be temporary in nature. Therefore, if any impacts do accumulate around a community or a particularly sensitive community infrastructure asset the effects would not be long lasting and, as described in Chapter 27 Human Health, are unlikely to lead to significant impacts on human health. There are also only a small number of highly sensitive receptors so the likelihood of impact is further reduced.

176. The overall sensitivity of community infrastructure is assessed to be medium and the overall magnitude of effect is assessed to be low to negligible. Using Table 31.13, the impact on community infrastructure is assessed to have **minor significance.**

31.7.6 Potential Impacts during Operation

31.7.6.1 Impact 1: Onshore direct and supply chain job creation

177. The onshore project substation will be unmanned and only periodic maintenance is planned at junction boxes along the onshore cable route. Therefore, the potential direct and supply chain job creation for operation would be related to the offshore elements of the project.

[13] Severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery.
[14] 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.

178. Through analysis of UK Content data, BVG Associates provided a breakdown of the likelihood of procuring operational elements of the project in the New Anglia LEP region. This is detailed in Appendix 31.2 and summarised in Table 31.30. The FTE jobs quoted in Appendix 31.2 are estimated across the design life of the project. As it is expected that the people employed during operation will be full time employees that would move to New Anglia LEP, these figures will be compared as full time jobs per year by dividing the total by 30 years.

179. To create a realistic worst case scenario, the following multipliers were applied to the sum of Direct and Indirect FTE indicated in Appendix 31.2. This reflects both the likelihood that elements could be procured and the commitment that Norfolk Vanguard Limited is making to 50% UK content where possible:

- Low probability elements were assumed to be procured from outside of the New Anglia or UK markets;
- It was assumed that Medium probability elements have a 50% chance of being procured in New Anglia or the UK; and
- It was assumed that High probability elements would definitely be procured within East Anglia or the UK.

180. Impact magnitude has been assessed by comparing the operational direct and indirect job creation figures estimated by BVG Associates with the current employment figures for New Anglia for jobs in Professional, Scientific, and Technical activities. This gives the following magnitude:

- Direct job creation has a low magnitude impact on the New Anglia LEP region labour market; and
- Indirect job creation has an impact of high magnitude New Anglia LEP region labour market.

181. This magnitude is based on the presence of suitable businesses in the New Anglia LEP region and the size of the labour market to supply staff. Considering the work that Norfolk Vanguard Limited are doing to create a pipeline of employment opportunities it is likely that many of the direct roles would be filled from the local labour market. However, Norfolk Vanguard Limited cannot influence where their supply chain procures staff from and the high magnitude of indirect job creation may suggest that people would migrate to the New Anglia LEP during the operational period of the project. This could bring additional benefits as these people would be skilled and employed. It is assumed that the migration would be gradual enough for local services to respond in a sustainable manner.

182. This assessment of potential job creation supports both the strategic development of the New Anglia LEP region as a CORE and Vattenfall Wind Power Limited's own work to actively develop local skills to create an employment pipeline.

183. Furthermore, unlike construction jobs, operational jobs are permanent and would gradually increase the level of employment. Considering this and the level of skills development Norfolk Vanguard Limited are proposing, the assessment concludes that the supply chain could create a beneficial impact on unemployment levels.

Table 31.30 Potential for supply chain job creation during operation

Element	Sub element	Probability procured in East Anglia	Probability procured in UK	Direct FTE	Indirect FTE	FTE East Anglia	FTE UK
Operations, maintenance and service	Wind farm operations	High	High	2500	1000	3500	4500
	Turbine maintenance and service	High	High	2500	1000	3500	4500
	Balance of plant maintenance	Medium	High	500	200	350	550

Table 31.31 Operational FTE job creation potential

	Direct	Indirect	Total
FTE Years in New Anglia during operation	5500	2200	7350
Full time jobs for 30 years	220	88	294
New Anglia Professional, scientific and technical activity jobs	38,000	38,000	38,000
% increase labour	0.6	0.3	0.8

184. As discussed under Construction Impact 1 the New Anglia Labour market currently has a sensitivity level of medium to high. However, the project is due to become operational after 2025 and a number of other offshore wind projects are also in development in the New Anglia LEP region. Considering the focus on local, regional, and industry strategies, it is assumed that the labour market for operational tasks will have a medium sensitivity by the time the project is commissioned.

185. Using Table 31.13 the following impact significances are assessed for operational direct employment and supply chain job creation:

- Direct job creation has a negligible impact on the New Anglia labour market and the labour market is assumed to have a medium sensitivity by the time of commissions. Therefore, direct job creation is assessed to have a **minor beneficial** impact on the labour market;
- Indirect job creation has a beneficial impact of low magnitude New Anglia labour market and the labour market is assumed to have a medium sensitivity by the time of commissions. Therefore, indirect job creation is assessed to have a **minor beneficial** impact on the labour market.

31.7.6.2 Impact 2: Effects on community infrastructure

186. The only area that will have above ground infrastructure during operation will be the onshore project substation and National Grid substation extension.

187. Above ground infrastructure does have the potential to create impacts due to noise and visual disturbances (see Chapter 25 Noise and Vibration and Chapter 29 Landscape and Visual Impact Assessment). However, the lack of community infrastructure in the vicinity of these elements removes this impact pathway.

188. Negligible impacts from traffic disturbances are anticipated during operation (see Chapter 24 Traffic and Transport).

189. Other infrastructure will be buried and therefore the only pathway for impact will be in the event of unscheduled maintenance. Such impacts would be temporary (and for less duration than construction) therefore the magnitude of impact is also assessed as low. Therefore, impacts from the onshore cable route would be **negligible**.

190. During operation, the only other impacts will be due to noise and visual impact from the onshore project substation. As the level of this will be lower during operation than during construction, it can be assumed that operational impacts would be lower than during construction and therefore **negligible**. Chapter 30 Tourism & Recreation includes a more detailed assessment of impacts to recreational receptors during operation.

31.7.7 Potential Impacts during Decommissioning

191. This section describes the potential impacts of the decommissioning of the onshore infrastructure with regards to impacts on onshore receptors. The decommissioning of the project is expected to result in similar impacts to that of the construction phase. The decommissioning of the project would be subject to a separate consent application at the time of decommissioning. The approach provided below provides a high level likely approach which could be taken. Further details are provided in Chapter 5 Project Description.

192. No decision has been made regarding the final decommissioning policy for the onshore cables, as it is recognised that industry best practice, rules and legislation change over time.

193. In relation to the onshore project substation, the programme for decommissioning is expected to be similar in duration to the construction phase. The detailed activities and methodology would be determined later within the project lifetime, but are expected to include:

- Dismantling and removal of outside electrical equipment from site located outside of the onshore project substation buildings;
- Removal of cabling from site;
- Dismantling and removal of electrical equipment from within the onshore project substation buildings;
- Removal of main onshore project substation building and minor services equipment;
- Demolition of the support buildings and removal of fencing;
- Landscaping and reinstatement of the site (including land drainage); and
- Removal of areas of hard standing.

194. Whilst details regarding the decommissioning of the onshore project substation are currently unknown, considering the worst case scenario which would be the removal and reinstatement of the current land use at the site, it is anticipated that the impacts would be similar to those during construction.

195. During decommissioning, it is assumed that the level of employment will be similar (or perhaps slightly lower) than that during construction. It is assumed that leakage could be lower because the sector will be more developed and significantly larger by the time the project undergoes decommissioning.

196. The decommissioning methodology would need to be finalised nearer to the end of the lifetime of the project so as to be in line with current guidance, policy and legislation at that point. Any such methodology would be agreed with the relevant authorities and statutory consultees. The decommissioning works could be subject to a separate licencing approach which may require EIA.

31.8 Cumulative Impacts

197. The assessment of cumulative impact is a two stage process. Firstly, all the impacts from previous sections have been assessed for potential to act cumulatively with other projects. This summary assessment is set out in Table 31.32.

Table 31.32 Potential cumulative impacts

Impact	Potential for cumulative impact	Assessment confidence	Rationale
Construction			
Onshore direct job creation	Yes	Medium	An ongoing succession of onshore construction could provide confidence to the construction market and drive investment.
Onshore supply chain job creation	Yes	Medium	A strategically developed supply chain of Tier 2 and 3 businesses could provide confidence to the fabrication market and drive investment.

Impact	Potential for cumulative impact	Assessment confidence	Rationale
Effects on community infrastructure	Yes	High	All projects considered create construction noise and other disturbances to rural areas of Norfolk on a temporary basis. Increased traffic is considered to be an area that may have significant effect on some community infrastructure and a small number of businesses in two areas of the cable route.
Operation			
Onshore direct employment and supply chain job creation (see below for details)	Yes	Medium	It is estimated that 7,350 direct and indirect FTE jobs will be created as part of regional offshore wind farm development (Table 31.31 and Appendix 31.2). A strategic approach taken between developers and New Anglia LEP could lead to significant investment in to supply chain and human resource development for O&M services to the offshore wind farm sector. Especially as part of a process to re-skill workers from the oil and gas sector.
Effects on community infrastructure	Yes	High	Onshore infrastructure will primarily be underground. However, an increase in industrial infrastructure will have a lasting visual impact for local community assets. Noise impacts may be considerable and this pathway could have a lasting impact on community infrastructure if not properly mitigated.
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 the same as those identified during the construction stage.			

198. The second stage of the CIA is an assessment of whether there is spatial or temporal overlap between the extent of potential effects of the onshore project area and the potential effects of other projects scoped into the CIA upon the same receptors. To identify whether this may occur, the potential nature and extent of effects arising from all projects scoped into the CIA have been identified and any overlaps between these and the effects identified in section 31.7 have also been identified. Where there is an overlap, an assessment of the cumulative magnitude of effect is provided.

199. The projects identified for potential cumulative impacts with Norfolk Vanguard have been discussed during ETG meetings with stakeholders and the full list has been agreed in consultation with local authorities.

Table 31.33 summarises those projects which have been scoped into the CIA due to their temporal or spatial overlap with the potential effects arising from the project. The remainder of the section details the nature of the cumulative impacts against all those receptors scoped in for cumulative assessment.

Table 31.33 Summary of projects considered for the CIA in relation to socio-economic impacts

Project	Status	Development period	[1]Distance from Norfolk Vanguard site (km)	Project definition	Project data status	Included in CIA	Rationale
National Infrastructure Planning							
Norfolk Boreas Offshore Wind Farm	Pre-application	Expected construction date 2026	0 – projects are co-located	Pre-application outline only	High	Yes	Impacts will relate to job creation and community infrastructure. The scale of impacts will depend on whether Norfolk Boreas onshore cable ducts are laid at the same time as Norfolk Vanguard or whether cable route will need to be partially excavated to install second ducts. It is assumed landfall will be the same place but any secondary infrastructure or extensions may have temporary noise/vibration impacts and long term visual impacts.
Hornsea Project Three Offshore Wind Farm	Pre-application	Expected construction date 2021	0 – cable intersects project	Full PEIR available: http://hornseaproject3.co.uk/Documents-library/PEIR-Documents	High	Yes	It is anticipated that Hornsea's onshore cable route will cross the Norfolk Vanguard cable route. How this interaction of construction is managed will determine the magnitude of impacts on community infrastructure. However, in general the socio-economic impacts of due to construction and operation parallel

[1] Shortest distance between the considered project and Norfolk Vanguard – unless specified otherwise.

Project	Status	Development period	[1]Distance from Norfolk Vanguard site (km)	Project definition	Project data status	Included in CIA	Rationale
							those described in this chapter.
Dudgeon Offshore Wind Farm	Commissioned	Constructed	0	http://dudgeonoffshorewind.co.uk/	High	Yes	The Dudgeon onshore cable route is to the north of Norfolk Vanguard, connecting to the grid at Necton, on the same site as the connection for Norfolk Vanguard. Community comments received during consultation express frustration due to impacts from this project. Therefore, the cumulative impact will probably be felt more through a negative perception relating to communities and community infrastructure.
A47 corridor improvement programme	Pre-application	Expect 2021 to 2022	2.5km at closest point up to 23km at furthest	Current timescales estimate that the DCO will be submitted in Summer 2018	Medium	No	Works due to be completed before the project programme (Plate 31.2) is due to begin.
Norwich Western Link	Pre-application	2022	2.8	https://www.norfolk.gov.uk/roads-and-transport/major-projects-and-improvement-	Medium	No	With regards to the potential for cumulative impacts associated with the potential overlap of construction traffic and impacts on worker numbers, noting the lack of information available at this stage, it is not possible to provide a meaningful assessment of

Project	Status	Development period	[1]Distance from Norfolk Vanguard site (km)	Project definition	Project data status	Included in CIA	Rationale
				plans/norwich/norwich-western-link/timeline			cumulative impacts. It is therefore proposed that, if approved, through the development of the CTMP, Norfolk Vanguard Limited and its Contractors would engage stakeholders to try and establish opportunities to co-ordinate activities and avoid peak traffic impacts.
Third River Crossing (Great Yarmouth)	Pre-application	Expected to start in 2020	28	https://www.norfolk.gov.uk/roads-and-transport/major-projects-and-improvement-plans/great-yarmouth/third-river-crossing	Medium	No	Analysis does show that the port of Great Yarmouth is a strategic port for the offshore wind industry in the East of England and industrial areas have been designated for development. Therefore, there may be some cumulative effect due to this. However, development of the port and associated industrial areas would be considered under a separate DCO and therefore outside the scope of this assessment.
King's Lynn B Power Station amendments	Pre-application	Construction expected 2018	28	https://www.kingslynnbccgt.co.uk/	Medium	No	Works due to be completed before the project programme (Plate 31.2) is due to begin.
North Norfolk District Council							

Project	Status	Development period	[1]Distance from Norfolk Vanguard site (km)	Project definition	Project data status	Included in CIA	Rationale
PF/17/1951 Erection of 43 dwellings and new access with associated landscaping, highways and external works, and amendments to substation)	Awaiting decision	Anticipated Q2 2018	0.7	Application available: https://idoxpa.north-norfolk.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=_NNORF_DCAPR_92323	High	No	Works due to be completed before the project programme (Plate 31.2) is due to begin.
Bacton Gas Terminal Extension	Approved	Approved 20/09/2016. Expires 20/09/2019.	3	Approved PDS available https://idoxpa.north-norfolk.gov.uk/online-applications/applicationDetails.do?activeTab=summary&keyVal=_NNORF_DCAPR_88689	Medium	Yes	Bacton Gas Terminal is situated to the north of Happisburgh and will therefore not have a direct impact on community infrastructure. However, as with other construction projects in this area, negative perceptions of these projects may influence people's perceptions of the Norfolk Vanguard project and how they perceive impacts to community infrastructure.
Bacton Gas Terminal coastal protection	Approved	Approved 18/11/2016. Expires	2.5	Approved PDS available	Medium	Yes	

Project	Status	Development period	[1]Distance from Norfolk Vanguard site (km)	Project definition	Project data status	Included in CIA	Rationale
		18/11/2019.					
Bacton and Walcott Coastal Management Scheme	Approved	Expected construction date 2018	1	Public information leaflets available: https://www.north-norfolk.gov.uk/media/3371/bacton-to-walcott-public-information-booklet-july-2017.pdf	Medium	Yes	
Breckland Council							
21-31 new dwellings in Necton (BLR/2017/0001/PIP)	Awaiting decision	Not known. Application submitted November 2017.	1.0	http://planning.breckland.gov.uk/OcellaWeb/showDocuments?reference=BLR/2017/0001/PIP&module=pl	Medium	No	There are three ways that housing developments could cumulatively effect communities: • Through disturbance due to noise, vibration, or dust; • Through cumulative distortion to the labour market; and • Through traffic delays. Although these developments are within Necton they are far enough from the onshore project substation area for cumulative noise impacts to not be an issue to
4-8 new dwellings in Necton (BLR/2017/0002/P	Awaiting decision	Not known. Application submitted	1.0	http://planning.breckland.gov.uk/Ocell	Medium	No	

Project	Status	Development period	[1]Distance from Norfolk Vanguard site (km)	Project definition	Project data status	Included in CIA	Rationale
IP)		November 2017.		aWeb/showDocuments?reference=BLR/2017/0002/PIP&module=pl			community infrastructure receptors. Construction workers that could transfer between housing and the project would probably be providing general services. The increase in demand of these services due to the project is insignificant in comparison to the size of the labour market therefore this will not be considered. Increased traffic density is considered in Chapter 24 Transport and Traffic. It is not possible to determine if these will culminate in community impacts but it is assumed to be highly unlikely due to the low level of human health outcomes assessed in Chapter 27 Human Health.
70 dwellings (3PL/2016/0298/D) (Phase 2 of 3PL/2012/0576/O)	Approved (21/09/16)	Not known. Application submitted March 2016.	6.4	http://planning.breckland.gov.uk/OcellaWeb/planningDetails?reference=3PL/2016/0298/D	Medium	No	There are three ways that housing developments could cumulatively effect communities: • Through disturbance due to noise, vibration, or dust; • Through cumulative distortion

Project	Status	Development period	[1]Distance from Norfolk Vanguard site (km)	Project definition	Project data status	Included in CIA	Rationale
				&from=planningSearch			to the labour market; and • Through traffic delays. These projects are far enough from the onshore project substation area for cumulative noise impacts to not be an issue to community infrastructure receptors. Construction workers that could transfer between housing and the project would probably be providing general services. The increase in demand of these services due to the project is insignificant in comparison to the size of the labour market therefore this will not be considered. Increased traffic density is considered in Chapter 24 Transport and Traffic. It is not possible to determine if these will culminate in community impacts but it is assumed to be highly unlikely due to the low level of human health outcomes assessed in Chapter 27 Human Health.
98 dwellings at Swans Nest with access from Brandon Road (3PL/2017/1351/F) (Phase 3 of 3PL/2012/0576/O)	Awaiting decision (due 30/03/2018)	Not known. Application submitted Jan 2016.	6.4	http://planning.breckland.gov.uk/OcellaWeb/planningDetails?reference=3PL/2017/1351/F&from=planningSearch	Medium	No	
175 dwellings with access at land to west of Watton Road, Swaffham (3PL/2016/0068/O) (Swans Nest Phase B)	Awaiting decision (due 13/10/2017)	Not known. Application submitted Jan 2016.	6.4	http://planning.breckland.gov.uk/OcellaWeb/planningDetails?reference=3PL/2016/0068/O	Medium	No	

31.8.1 Cumulative Consideration of Job Creation during Construction

200. If it is assumed that the offshore wind farms planned in the New Anglia LEP (Table 31.34) all create similar Direct and Indirect employment then the estimated cumulative potential full time job creation (per year) in New Anglia would be:

- 976 Direct FTE jobs and 876 Indirect FTE jobs due to onshore construction; and
- 2,000 Direct FTE jobs and 1,000 Indirect FTE jobs during offshore construction.

201. This includes Norfolk Vanguard but assumes that the majority of Norfolk Boreas' onshore infrastructure would be prepared as part of Norfolk Vanguard's construction process.

202. It also assumes that the supply chain would receive enough investment to develop so that the offshore elements outlined in Table 31.25 could be provided to all projects from the New Anglia region.

Table 31.34 Offshore wind farms planned in the New Anglia LEP

Wind farms	Owner/Operator	Capacity (MW)
East Anglia 1 North	ScottishPower Renewables	800
East Anglia 3	ScottishPower Renewables	1200
Norfolk Boreas	Vattenfall Wind Power Limited	Up to 1800
Norfolk Vanguard	Vattenfall Wind Power Limited	Up to 1800
Hornsea Project Three	Ørsted	2400

Table 31.35 Magnitude of cumulative job creation during construction within the New Anglia LEP

	Direct	Indirect	Total
Total jobs in New Anglia	2,976	1,876	4,852
New Anglia Construction jobs	35,000	35,000	35,000
% increase labour	9	6	14

203. As shown in Table 31.35 direct and indirect job creation would create low magnitude beneficial impact on the labour market.

204. Assuming that the labour market develops to be medium sensitivity due to investment as a response to the pipeline of projects, this may lead to a cumulative impact on the labour market of **minor beneficial** significance.

205. It is assumed that not all of the unemployed people in the New Anglia region would have the skills required for the construction phase. The New Anglia Energy Sector Skills Plan does suggest that work is underway to increase the opportunities for people in New Anglia. Due to the significant pipeline of works this would also suggest that people may permanently move to the region for these job opportunities and does provide a significant opportunity for the business sector to invest in skills development to ensure that this cumulative opportunity benefits the people of

Norfolk and Suffolk. As a cumulative effect on the New Anglia LEP this could potentially be upgraded to a **moderate beneficial** impact.

31.8.2 Cumulative Consideration of Supply Chain Job Creation during Operation

206. Table 31.1 in Appendix 31.3 shows existing projects and Table 31.34 for those in planning. Based on UK Content assessments by BVG Associates (Appendix 31.2), it estimated that the operation and maintenance of the eleven wind farms in development in New Anglia LEP would create the following direct and indirect full time jobs per year on a permanent basis.

- Project in operation or construction are estimated to provide 426 FTE per year (assuming Dudgeon has 90 full time staff);
- Assuming that the 5 projects listed in Table 31.34 are all consented and employ the same number of full time staff (294 per year) as Norfolk Vanguard (through direct and indirect employment) this would equate to 1,470 full time employees per year over 30 years;
- In total, this would provide 1,896 full time jobs in the New Anglia region; and
- This would lead to a 5% increase on the current labour market for scientific and technical activity jobs.

207. This creates a low magnitude impact in the labour market. As above, assuming that labour market sensitivity reduces to medium, the cumulative direct and indirect potential job creation during operation may create an impact of **minor beneficial** significance**.**

208. However, this impact magnitude should be considered with regards to the additionality of the employment. As these are permanent jobs over the life of the project it creates a hub of offshore operations in the areas which could have an additional multiplier effect and would lead to a low level of leakage. The significance also indicates that this should be able to be fulfilled by a combination of the existing labour market and young people who are coming in to the labour market. In addition, skilled workers are required in the offshore wind sector are relatively well paid thus they create significant induced employment. This would help to improve the productivity gap outlined Appendix 31.3. As a cumulative effect on the New Anglia LEP the impact may range from **minor** to **major beneficial** impact.

209. As described in section 31.7.2, Norfolk Vanguard Limited is aiming to ensure this benefit remains in the New Anglia LEP region by developing a Skills Strategy and Supply Chain Strategy that enables people to gain employment in the Offshore Wind Industry. It is also assumed that many of the people involved in the construction phases of the various planned wind farms may be suitably qualified to gain permanent employment in the operational phase if appropriate training were given.

Especially as the oil and gas sector is declining which may be leaving many people with appropriate skills in need of employment, as described by *Norfolk Limited* (section 31.6.2.1). Based on this it is assumed that has the potential to be a beneficial impact on the New Anglia LEP.

31.8.3 Cumulative Impacts during Decommissioning

210. Decommissioning of the Norfolk Boreas and Hornsea Project Three may potentially to 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. As such, cumulative impacts during the decommissioning stage are assumed to be the same as those identified during the construction stage.

31.9 Inter-relationships

211. Table 31.36 lists out the inter-relationships between this chapter and other chapters within the ES.

Table 31.36 Socio-economics inter-relationships

Topic and description	Related Chapter	Rationale
Land Use and Agriculture	21	Potential impacts on agricultural industry have the potential to relate to socio-economics.
Traffic and Transport	24	Potential impacts on traffic and transport have the potential to impact on community infrastructure as a result of the project.
Noise and Vibration	25	Potential impacts related to noise and vibration has the potential to impact on community infrastructure.
Air Quality	26	Potential impacts on air quality have the potential to impact on community infrastructure.
Human Health	27	Potential impacts on health have the potential to impact community infrastructure.
Tourism and Recreation	30	Potential impacts on tourism and recreational assets have the potential to socio-economics.

31.10 Interactions

212. The impacts identified and assessed in this chapter have the potential to interact with each other, which could give rise to synergistic impacts as a result of that interaction. The worst case impacts assessed within the chapter take these

interactions into account and for the impact assessments are considered conservative and robust. For clarity the areas of interaction between impacts are presented in Table 31.37, along with an indication as to whether the interaction may give rise to synergistic impacts.

213. There is a potential for an influx of workers which may increase pressure on community infrastructure or local services. For example, more people may lead to increased pressure on local hospitals. Due to the local demographic weighting above 60 years old and the fact that incoming workers would be of working age, there may also be an effect due to the interaction between these populations. However, when compared against the size of local population, the level of workers expected in relation to the construction and operation of the project is not expected to have a significant effect on local services or demographic changes.

214. There is a stronger potential for the development of the project in combination with the wider development of the offshore wind sector in the New Anglia LEP to lead to a gradual increase in population and in the socio-economic status of people due to (among other aspects) increased employment. This would have a positive effect on local tax revenues and increase the available funds to provide public services and infrastructure.

Table 31.37 Interactions between impacts

Potential interaction between impacts		
Construction	**1 Direct and indirect job creation**	**2 Effects on community infrastructure**
1 Direct and indirect job creation	-	Yes
2 Effects on community infrastructure	Yes	-
Potential interaction between impacts		
Operation	**1 Onshore direct and supply chain job creation**	**2 Effects on community infrastructure**
1 Onshore direct and supply chain job creation	-	Yes
2 Effects on community infrastructure	Yes	-
Decommissioning		
It is anticipated that the decommissioning impacts will be similar in nature to those of construction.		

31.11 Summary

215. A summary of the impact assessment for socio-economics is presented in Table 31.38 and Table 31.39. In accordance with the methodology for assessment presented in section 31.4 this table should only be used in conjunction with the additional narrative explanations provided in section 31.7.

216. The review of policy, strategy, and business analysis shows that the offshore wind industry in the New Anglia LEP is growing quickly. Vattenfall Wind Power Limited is seen as a significant stakeholder in this growth process.

217. Assessment shows that the project may create 1,063 FTE jobs during construction and 294 FTE jobs during operation. Comparison with the baseline shows that the market may be able to supply this demand. Deprivation statistics suggest the levels of skills and education currently available may need to be improved if the benefits of this potential employment are to be realised across more of the population. Additional enhancements outlined by Norfolk Vanguard Limited indicate that the project is attempting to bridge this gap between the skills required and those available locally.

218. The assessment has reviewed Chapter 24 Traffic and Transport, Chapter 25 Noise and Vibration, Chapter 27 Human Health, and Chapter 29 Landscape and Visual Impact Assessment. This review has found that the proposed embedded mitigation should reduce the significance of these impacts to negligible or minor.

219. The location of communities and the infrastructure that provides services to communities has been reviewed. It was found that there would be no direct impact to community infrastructure. Indirect impacts would be insignificant and managed through the proposed mitigation measures.

220. When considered cumulatively with other projects in the region, it is assessed that due to project sequencing there may be minor temporary adverse impacts felt by communities. In doing so there is the potential for major long term benefits to the region due to increased employment across the supply chain serving the offshore wind industry.

Table 31.38 Potential beneficial impacts identified for socio-economics

Potential Impact	Receptor	Value/ sensitivity	Magnitude	Significance	Enhancement	Residual impact
Construction						
Direct and Indirect job creation	Regional labour market	Medium	Medium	Moderate beneficial	Enable local supply-chain	Moderate beneficial
Supply chain job creation	Businesses in regional supply chain	Medium	Medium	Moderate beneficial	Enable local supply-chain	Major beneficial
Operation						
Direct employment and supply chain job	Regional labour market	Medium	Negligible	Minor beneficial	Local supply chain plan and investment in local human	Minor beneficial

Potential Impact	Receptor	Value/ sensitivity	Magnitude	Significance	Enhancement	Residual impact
creation					resources	
Decommissioning – expected to be similar to construction or lower						
Onshore Direct Employment and Supply Chain Job Creation	Regional labour market	Low	Low	Minor beneficial	Enable local supply-chain	Negligible
Cumulative						
Job creation during construction	Regional labour market	Low	Medium	Minor beneficial	Engagement with sector bodies	Moderate beneficial
Supply chain job creation during operation	Regional labour market	Medium	Medium	Moderate beneficial	Engagement with sector bodies	Major beneficial

Table 31.39 Potential adverse impacts identified for socio-economics

Potential Impact	Receptor	Value/ sensitivity	Magnitude	Significance	Mitigation	Residual impact
Construction						
Effects on community infrastructure	Community infrastructure assets	Low	Low	Minor adverse	Noise and visual management described in other chapters	Minor adverse
Operation						
Effects on community infrastructure	Community infrastructure assets	Low	Negligible	Negligible	Visual impacts outline in Chapter 29 Landscape and Visual Impact Assessment	Negligible
Decommissioning – expected to be similar to construction or lower						
Effects on community infrastructure	Community infrastructure assets	Low	Low	Minor adverse	Noise and visual management described in other chapters	Minor adverse
Cumulative						
Community infrastructure	Community infrastructure assets	Currently unable to assess without further information from interrelated chapters and discussion of programming with Norfolk Vanguard Limited.			Coordination with other projects	Minor adverse

31.12 References

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