Vattenfall Wind Power Ltd

Thanet Extension Offshore Wind Farm

Environmental Statement Volume 1

Chapter 4: Site Selection and Alternatives

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Vattenfall Wind Power Ltd

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Volume 1

Chapter 4: Site Selection and Alternatives

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4 SITE SELECTION AND ALTERNATIVES

4.1 Introduction

4.1.1 This chapter of the Environmental Statement (ES) provides a description of the site selection process and the approach undertaken by VWPL to refine the design of Thanet Extension Offshore Wind Farm (hereafter referred to as Thanet Extension) to identify the various elements of the site, the reasonable alternatives which have been considered as the project has developed, and a summary of how consultation[1] responses received have influenced the final proposal. This chapter provides information on the need for renewable energy, followed by detail regarding the alternatives considered across both the onshore and offshore sections of the project.

4.1.2 This chapter outlines the chronological staged approach to defining the spatial boundaries and constituent parts of Thanet Extension. It also explains and details the reasonable alternatives considered for the project, including location and infrastructure options, as required under the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) (the EIA Regulations); the Conservation of Habitats and Species Regulations 2010 (as amended) (the 'Habitats Regulations'); and the Offshore Marine Conservation (Natural Habitats, & c.) Regulations 2007 (as amended) (the 'Offshore Habitats Regulations').

4.1.3 The Planning Inspectorate (PINS) must be made aware of the main reasons for the choice between alternative options (including for example, relevant environmental, social and economic factors), and The Overarching National Policy Statement for Energy (NPS EN-1) highlights the requirements to be met under applicable Environmental Impact Assessment (EIA) and Habitats Regulations Assessment (HRA) legislation. More detail on the legislative obligations and the information to be provided is set out in the following sections.

4.1.4 The approach taken to the development of Thanet Extension has been based on early engagement with a wide range of stakeholders, landowners and occupiers, together with a range of electrical, engineering, ecological and socio-economic appraisals. Stakeholder engagement has been a key aspect of the project design, each phase of consultation undertaken being designed to provide opportunities for stakeholders to review and provide information to VWPL in the development of Thanet Extension, influencing the relevant spatial and project design decisions that have been taken to date in the process of project development. The ES includes the presentation of relevant consultation information received during the development of the Thanet Extension proposals, particularly with respect to how such feedback has influenced and informed the project design and has been informed by the formal consultation responses received on the Preliminary Environmental Information Report.

4.1.5 It is also of note that the ES includes options that have been brought forward as a result of consultation responses received that may be refined following receipt of Site Investigation data. In addition to the Consultation Report (Document Ref: 5.1) information on the consultation held in the development of the Thanet Extension project is also provided within the Evidence Plan Report (Document Ref: 8.5).

4.1.6 Alternative options for methods of construction, Operations and Maintenance (O&M) and decommissioning have been considered alongside different technologies and materials in this ES in order to assess the likely significant environmental effects.

4.1.7 This chapter is set out in chronological order to describe the stages of the design iteration from inception to the point of the submission of the final application (this document). Accordingly, the following structure is adopted:

- Stage 1 - Identification of the Array area;
- Stage 2 - Identification of proposed grid connection location and high-level Landfall appraisal
    - High level connection options;
    - National Grid Offer for Bilateral Connection Agreement (BCA); and
    - Landfall appraisal.
- Stage 3 - Identification of Project for scoping, and Phase 1.A public consultation;
    - Landfall;
    - Offshore components; and

[1] For full details of the consultation process, consultation responses received, and how the project have had due regard to the consultation please refer to the Consultation Report (Document Ref: 5.1)

- Onshore components.

- Stage 4 - Refinement of Project for Phase 1.B informal community consultation events and EIA preparation (inclusive of EIA evidence plan meetings);
  - Landfall;
  - Offshore components; and
  - Onshore components.
- Stage 5 - Refinement of Project for PEIR; S42, S47 and S48 consultation (Phase 2 Consultation);
  - Landfall;
  - Offshore components; and
  - Onshore components.
- Stage 6 - Further refinement of Project Design following review of S42 and S47 consultation responses and EIA Studies;
  - Refinement of Array Area;
  - Landfall;
  - Offshore components; and
  - Onshore components.
- Stage 7 – Final refinement of Project Design and Red Line Boundary for Development Consent Order (DCO) application; and
- Application - Submission of final preferred option(s) as part of the Development Consent Order (DCO) application.

4.1.8 Thanet Extension is currently at Stage 7 in this iterative process, which is the final stage of the process before formal application. Refinement of the data relating to the project will continue throughout and beyond the application stage having regard to ongoing liaison with stakeholders, and consideration of further Site Investigation data that is being collected to support the detailed design. The Site Investigation increases Thanet Extension's understanding of the environment and engineering feasibility in order to finalise the detailed design, but is not required to characterise the receiving environment for the purposes of EIA. Whilst it is standard practice to undertake this site investigation to inform detailed design at the post-consent stage VWPL have committed to undertaking it at an early stage to provide greater certainty to stakeholders.

4.1.9 The process of site selection, and the associated consultation that has informed the project design is further illustrated in Figure 4-1 below, with the detailed design changes in Table 4.1. It is important to note that whilst the site selection process is illustrated and described as a linear approach in this chapter for ease of presentation, the reality of any project development is that this site selection is a complex, iterative process that does not necessarily follow this linear narrative. Decisions on site selection are required at various stages to enable the project to progress and are based on the best information available at the time.

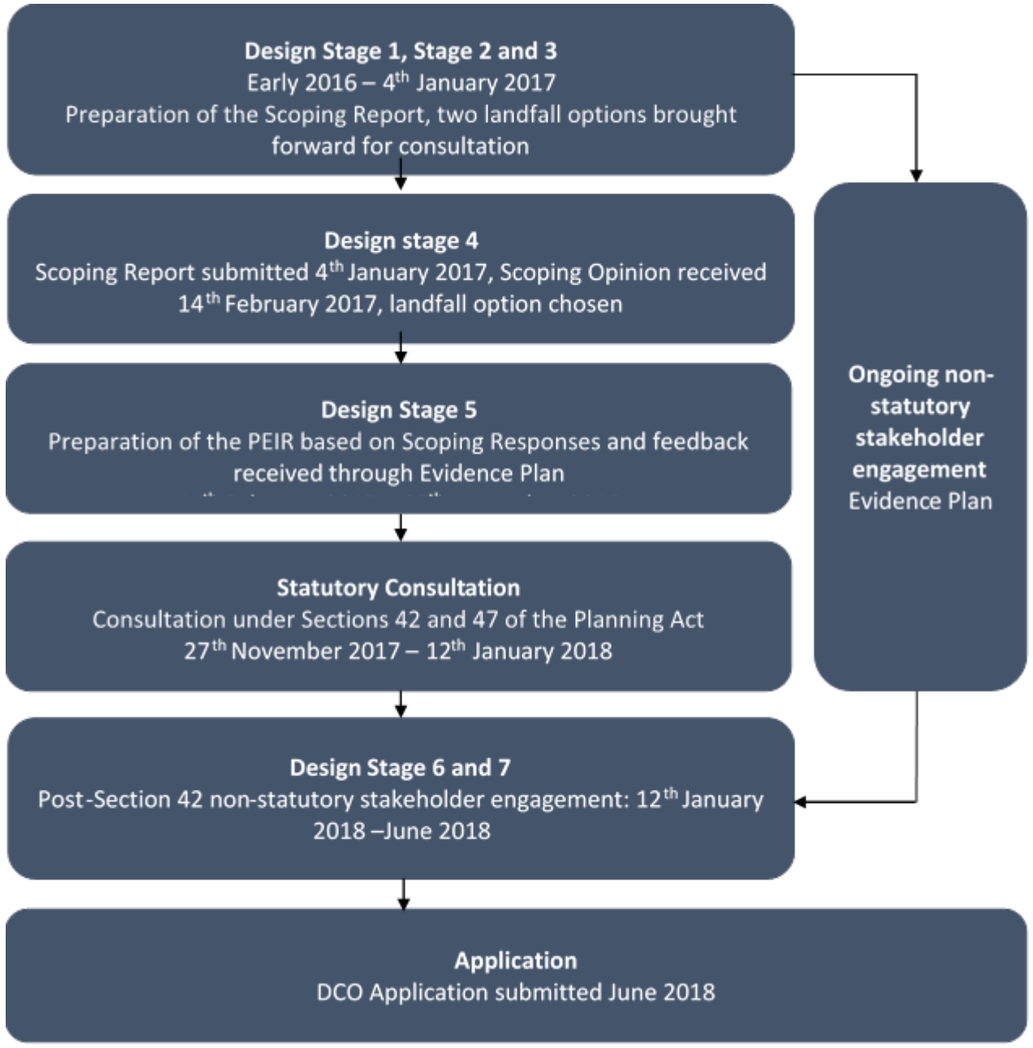


Figure 4-1: Thanet Extension Site Selection, consultation, and design process.

Table 4.1 Summary of site selection, design amendments

Measure	Description	Rationale
Project design refinements of relevance to site selection		
Identification of regional landfall area of search	Identification of wide search area for the project landfall	Identification of area of search to enable characterisation of landfall areas for consultation.
Refinement of landfall areas of search	Refinement from three landfall area options (comprising seven indicative routes) through to two landfall area options brought forward in the scoping report following engineering appraisals and confirmation of the grid connection location.	Refinement of options to be brought forward at the scoping phase of the project. See Section 4.8 *et seq.*
Refinement of landfall options	Refinement from two landfall options (with indicative routes) presented during Scoping and subsequent consultation, through to single landfall location defined following scoping responses and appraisals.	Refinement of options to be brought forward for PEIR and following scoping. See Section 4.9 *et seq.*
Refinement of onshore cable routes	Consideration of multiple onshore cable routes from the chosen landfall option, inclusive of indicative route presented in the scoping report to define final onshore options for PEIR. Expansion from initial indicative route proposed in the scoping report to multiple routes and then further refinement following detailed environmental, social and engineering constraints to final options for consideration at PEIR.	Multiple options brought forward for further consideration as a result of further understanding of onshore constraints within the final landfall option, and change in substation locations as a result of stakeholder and landowner discussions. See Section 4.10 *et seq*.
Refinements of the proposed offshore development boundary (array)	The north-western extent of the proposed array boundary brought forward as part of the PEIR has been reduced in size to limit interaction with the 'North East Spit' pilotage and landing station as well as other shipping and navigation interests.	In response to Section 42 responses. See Section 4.12 *et seq.*
Refinement of the proposed offshore export cable corridor (OECC).	A cable exclusion zone was introduced around the approaches to Ramsgate Harbour to ensure permanent infrastructure was not installed.	
	The nearshore section of the OECC has been tapered towards the landfall location to limit the area potentially affected by works within the intertidal and shallow subtidal areas.	
Refinement of the proposed onshore development boundary (substation)	The land footprint to the south of the proposed substation location was increased in spatial extent to allow for the relocation of local business interests.	
Refinement of the proposed onshore development boundary (landfall)	Long-term access from the Pegwell Bay Country Park through to the proposed landfall location has been removed to reduce interaction with local business interests and visitors arriving by vehicle.	
	The landfall options have been expanded to include the option to install cable ducts under the sea wall forming the boundary of the Pegwell Bay Country Park via Horizontal Directional Drilling to reduce the interaction with the saltmarsh and sea wall. The viability of these options will be informed by Site Investigation and detailed design.	
	The landfall alternative options brought forward as part of the PEIR have been refined to remove the larger of the two sea wall extensions (as proposed in the PEIR) to reduce the extent of the saltmarsh loss.	
	The landfall alternative options brought forward as part of the PEIR have been refined and updated to remove the option to position the TJBs within the saltmarsh, to	

Measure	Description	Rationale
	reduce long-term effects on the saltmarsh habitats.	
	The landfall alternative options brought forward as part of the PEIR have been refined and updated to include clear reference to the use of a cofferdam during any work on the sea wall, to ensure that contaminant pathways are adequately controlled.	
	The onshore cable alternative options brought forward as part of the PEIR have been refined to remove the proposal to cross the Nemo Interconnector cable in order to limit landscape and visual effects on Pegwell Bay Country Park.	
	The section of Sandwich Road formerly included within the proposed development boundary has been removed in light of the removal of the Nemo Interconnector crossing described above and due to further technical assessment of the feasibility of this route.	
Refinement of the proposed onshore cable route options	The onshore cable route installation options have been updated to include the option of installing the cable within trenches within the Pegwell Bay Country Park rather than in above-ground berms, to reduce the long-term effects within the Pegwell Bay Country Park. This option is also dependent on Site Investigation outputs.	
	The onshore red line boundary has been refined in a number of locations to reduce effects within the cable corridor.	
	The potential onshore cable routes in the Richborough Energy Park location have been refined to clearly account for the location(s) of existing and proposed infrastructure in the Richborough Energy Park.	

4.2 Statutory and policy context

4.2.1 Schedule 4 of the EIA Regulations 2017, at paragraph 2, requires that Environmental Statements include "A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects".

4.2.2 Furthermore, under the Habitats Regulations (2017) and Offshore Habitats Regulations (2017), a consideration of alternatives to the proposed project may be required where the development is likely to have a significant effect on a European Site that may adversely affect the integrity of the site.

4.2.3 This chapter of the ES therefore provides a description of the reasonable spatial and geographical alternatives that have been studied by Thanet Extension and, where appropriate, presents a comparison of the environmental effects between different options. In some cases (for example, the array layout) alternatives form part of the assessment and are considered in detail in the relevant chapters of this ES.

4.2.4 From a policy perspective, the National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) does not contain a general requirement to consider alternatives or to establish whether the proposed project represents the best option. Paragraph 4.4.1 of NPS EN-1 however states:

- "As in any planning case the relevance or otherwise to the decision making process of the existence (or alleged existence) of alternatives to the proposed development is in the first instance a matter of law, detailed guidance on which falls outside the scope of this NPS. From a policy perspective this NPS **does not contain any general requirement to consider alternatives or to establish whether the proposed project represents the best option** (emphasis added)".

4.2.5 Paragraph 4.4.2 of the NPS EN-1 highlights requirements under the EIA Regulations, Habitats Regulations and Offshore Habitats Regulations regarding the consideration of alternatives, notably:

- "applicants are obliged to include in their Environmental Statement, as a matter of fact, information about the main alternatives they have studied. This should include an indication of the main reasons for the applicant's choice, taking into account the environmental, social and economic effects and including, where relevant, technical and commercial feasibility"; and
- "in some circumstances, there are specific legislative requirements, notably under the Habitats Directive, for the [Secretary of State] to consider alternatives. These should also be identified in the Environmental Statement by the applicant."

4.2.6 Requirements under the Habitats Regulations and the Offshore Habitats Regulations are addressed in the Report to Inform Appropriate Assessment (Document Ref: 5.1) submitted as part of this ES, and were also detailed in the Habitats Regulations Screening Report, which accompanied both the PEIR for consultation and this final application for development consent.

4.2.7 Where there is a policy or legal requirement to consider alternatives, paragraph 4.4.3 of NPS EN-1 highlights other guiding principles that the Secretary of State should consider when deciding what weight should be given to alternatives, specifically:

- the consideration of alternatives in order to comply with policy requirements should be carried out in a proportionate manner;
- the [Secretary of State] should be guided in considering alternative proposals by whether there is a realistic prospect of the alternative delivering the same infrastructure capacity (including energy security and climate change benefits) in the same timescale as the proposed development;
- where (as in the case of renewables) legislation imposes a specific quantitative target for particular technologies or (as in the case of nuclear) there is reason to suppose that the number of sites suitable for deployment of a technology on the scale and within the period of time envisaged by the relevant NPSs is constrained, the [Secretary of State] should not reject an application for development on one site simply because fewer adverse impacts would result from developing similar infrastructure on another suitable site, and [he] should have regard as appropriate to the possibility that all suitable sites for energy infrastructure of the type proposed may be needed for future proposals;
- alternatives not among the main alternatives (noting that as required under the 2017 EIA Regulations reasonable alternatives are described within this chapter) studied by the applicant (as reflected in the Environmental Statement), should only be considered to the extent that the [Secretary of State] thinks they are both important and relevant to [his] decision;
- as the [Secretary of State] must decide an application in accordance with the relevant NPS (subject to the exceptions set out in the Planning Act 2008), if the [Secretary of State] concludes that a decision to grant consent to a hypothetical alternative proposal would not be in accordance with the policies set out in the relevant NPS, the existence of that alternative is unlikely to be important and relevant to the [Secretary of State's] decision;
- alternative proposals which mean the necessary development could not proceed, for example because the alternative proposals are not commercially viable or alternative proposals for sites would not be physically suitable, can be excluded on the grounds that they are not important and relevant to the [Secretary of State's] decision;
- alternative proposals which are vague or inchoate can be excluded on the grounds that they are not important and relevant to the [Secretary of State's] decision; and
- it is intended that potential alternatives to a proposed development should, wherever possible, be identified before an application is made to the [Secretary of State] in respect of it (so as to allow appropriate consultation and the development of a suitable evidence base in relation to any alternatives which are particularly relevant). Therefore, where an alternative is first put forward by a third party after an application has been made, the [Secretary of State] may place the onus on the person proposing the alternative to provide the evidence for its suitability as such and the [Secretary of State] should not necessarily expect the applicant to have assessed it."

4.2.8 The National Policy Statement for Renewable Energy Infrastructure (NPS EN-3) states at paragraph 2.6.81 that the applicant should include an assessment of the effects of installing cable across the intertidal zone which should include information, where relevant, about:

- "any alternative landfall sites that have been considered by the applicant during the design phase and an explanation for the final choice"; and
- "any alternative cable installation methods that have been considered by the applicant during the design phase and an explanation for the final choice."

4.2.9 The National Policy Statement for Electricity Networks Infrastructure (EN-5) states that alternative technologies should be considered, including consideration of undergrounding cables, as is the case for the proposed project. Specifically, EN-5 identifies that alternatives be considered for overhead lines but that consent should only be refused (for overhead lines) if:

- "the alternative will clearly outweigh any extra economic, social and environmental impacts and the technical difficulties are surmountable";

4.2.10 Vattenfall have considered the alternatives and identified that undergrounded cables are the preferred alternative for the proposed project.

4.3 Need for Renewable Energy

4.3.1 The United Kingdom (UK) requires a range of energy generation infrastructure in order to ensure it has a secure and affordable energy supply and can meet its binding commitments to addressing climate change and to the adoption of renewable technologies as a significant proportion (15% by 2020) of our energy generation mix. Offshore wind, as a source of renewable energy, offers the UK a wide range of benefits from an economic growth, energy security and decarbonisation perspective. Thanet Extension would make a significant contribution to renewable energy supply and consequently help provide these benefits to the UK and globally. The strategic development of Thanet Extension, as well as Norfolk Vanguard and Norfolk Boreas in the wider Southern North Sea region, will increase this contribution to UK energy supply and help fulfil future increasing demand for renewable energy.

4.3.2 The following section presents the importance of offshore wind energy, including Thanet Extension, in meeting global, European Union (EU) and UK policy commitments for renewable energy and wider policy objectives for UK energy security, decarbonisation and economic growth.

4.3.3 The key drivers underpinning the need for renewable energy are:

- The need to reduce greenhouse gas emissions, including increasing energy generation from low carbon sources to replace high carbon energy sources such as burning coal, oil and gas;
- The need for energy security, including:
    - The need to secure safe, affordable, reliable energy, preferably generated in the UK for the UK market;
    - The need to replace existing ageing energy generation infrastructure;
    - The need to meet expected electricity demand whilst meeting climate change commitments; and
    - The need to maximise social and economic opportunities for the UK from energy infrastructure investment

The need to reduce greenhouse gas emissions

4.3.4 In the Overarching National Policy Statement for Energy (Department of Energy and Climate Change (DECC), 2011), predictions are made that a continuation of global emission trends, including emissions of greenhouse gases such as carbon dioxide, could lead average global temperatures to rise by up to 6°C by the end of this century. The potential impacts associated with such a global temperature rise include (DECC, 2014):

- Increased frequency of extreme weather events such as floods and drought;
- Reduced food supplies;
- Impacts on human health;
- Increased poverty; and
- Ecosystem impacts, including species extinction.

4.3.5 National Oceanic and Atmospheric Administration (NOAA, 2016) reported that 2016 was the warmest year on record, which represents the fifth time in the 21st century a new record high annual temperature has been set (along with 2005, 2010, 2014, and 2015).

4.3.6 A commitment by the UK was made during the 21st Conference of the Parties (COP) in Paris in 2015 to pursue efforts to limit the global temperature increase to within 2°C of the pre-industrial average temperature, with an aspiration for an improved limit of 1.5°C.

4.3.7 Power sector emissions fell 17% in 2015 to 50% below 1990 levels. This follows an average annual decrease of 5% in the years between 2009 and 2014. This reduction is largely due to an increase in renewable and nuclear generation, to meeting almost half of the UK's electricity demand in 2015 (Committee on Climate Change, 2016a). In order to achieve necessary ongoing reductions in emissions, the Committee on Climate Change (CCC) (2015a) recommended that the UK government should set out an intention to support 1-2GW of offshore wind per year, provided costs continue to fall, with a view to phasing out subsidies in the 2020s.

4.3.8 The EU and UK legislation that has been put in place to secure a reduction in emissions is further outlined in Chapter 3 Policy and Legislation.

The role of offshore wind

4.3.9 The UK Committee on Climate Change (CCC), in its advice on the Fifth Carbon Budget, identifies the amount of renewable electricity generated in the UK must double by 2030 if we are to meet our legally-binding climate change targets. The role of offshore wind in delivering this additional capacity of low carbon energy is highlighted by the committee reports recognising the sector is now maturing and showing very significant cost reductions.

4.3.10 A dataset produced by the CCC (2016b) calculated cumulative deployment figures (TWh/year) for different forms of electricity generation in the UK from 2015 through to 2030. For offshore wind, the fifth carbon budget target for 2020 is 36.6 TWh/year which doubles in 10 years to 72.4 TWh/year for 2030. Calculations show that Thanet Extension will generate approximately 1.3 TWh/year using the calculation below:

340MW x 8760h/year x 50% capacity factor x 90% availability

4.3.11 Therefore, Thanet Extension alone will meet nearly 2% of the UK cumulative deployment target for 2030.

The need for energy security

4.3.12 The UK has been a net importer of electricity since 2010 and imported around 6% of its electricity in 2016 (DECC, 2016).

4.3.13 Key issues associated with energy security in the UK are:

- The decline in fossil fuel reserves (in particular North Sea oil and gas)
- The required ongoing closure and decommissioning of existing elderly fossil fuel and nuclear electricity generating infrastructure, and
- The need for replacement sources.

4.3.14 Many of the UK's older fossil fuelled and nuclear plants have either reached the end of their operational life span, are no longer economical to run, and/or do not meet legal air quality limits. The UK Energy Security Strategy estimated that around a fifth of the energy capacity available in 2011 will close by 2020 (DECC, 2012).

4.3.15 The UK Carbon Plan (HM Government, 2011) states that as heating, transport and industry become increasingly electrified, the electricity demand is expected to increase (HM Government, 2011). The National Policy Statement for Energy estimates that additional electricity generating infrastructure to ensure adequate supplies will require net new capacity of approximately 59GW by 2025, of which, up to 33GW will need to be from renewable sources (DECC, 2011). UK renewable electricity capacity was 33.4GW at the end of 2016 Q3 (DECC, 2016)

4.3.16 Reliance on global markets for imported energy leaves the UK vulnerable to spikes in world energy market prices, political pressure and potentially, to physical supply disruptions. The DECC (2012) Energy Security Strategy outlines the approach to ensuring that consumers have access to energy to meet their demand, and security requirements at prices which are resilient to volatile prices such as those experienced for fossil fuels (price security).

4.3.17 The CCC identifies the amount of energy capacity that will be needed to fill the future predicted generation gaps, taking into consideration retirement of high-carbon energy sources and some nuclear sources.

4.3.18 If there was no growth in demand during the 2020s, around 25GW of new capacity would be needed, however as demand grows, more capacity will be needed. CCC suggests that if demand growth by 23% (as in the CCC central scenario for demand growth), a total of 40GW of de-rated capacity would be needed (Committee on Climate Change, 2015b).

The need to maximise economic opportunities

4.3.19 The UK is able to continue growth in the offshore wind sector by maximising domestic energy resources and utilising the vast offshore wind resource that the UK has access to. An assessment in June 2017 of Europe's offshore wind resources found that the UK has the greatest potential for offshore wind out of all assessed EU member states in the Atlantic, North Sea and Baltic Sea areas. The assessment looked at gross resource potential, technical resource potential and economically attractive resource potential, and found that the UK topped all other countries in all three categories (Wind Europe, 2017).

4.3.20 A key commitment within the UK's Industrial Strategy (developed by the Department for Business, Energy & Industrial Strategy) is to "lead the world in delivering clean energy technology" and to support innovation in this area. The aim is for "the UK to be a global leader in innovation, science and research and our Industrial Strategy will help us to deliver our ambitious CO2 reduction targets while, creating jobs and opportunities for people across the country" (HM Government, 2017). The energy sector in the UK plays a central role in the economy and renewable energy can play a major part in boosting the economy and providing new jobs and skills.

4.3.21 The Centre for Economics and Business Research (CEBR, 2012) estimates that by 2030, offshore wind could increase the Gross Domestic Product (GDP) value by 0.6% and support 173,000 jobs. In contrast, The Stern Report (Stern, 2006) concludes that if no action is taken to prevent climate change, the economic impacts could be equivalent to losing at least 5% of global GDP each year.

4.3.22 During Greg Clarke's (Secretary of State for Business, Energy and Industrial Strategy) speech at Energy UK in November 2016 he made clear that "the debate about whether to reduce emissions is over" and that there is "huge economic opportunity of climate change action for UK businesses". He particularly referenced the East Coast of England as an area where the offshore wind industry is contributing, and will continue to contribute, to the local economy.

4.3.23 The UK has a strong supply chain for offshore wind. The UK Government has recently issued a Green Paper: Building our Industrial Strategy (UK Government, 2017). This paper focusses on delivering affordable energy and green growth. The offshore wind supply chain, for example the Siemens' factory in Hull, plays a key role in delivering this growth strategy.

4.3.24 According to the 2017 Report on Offshore Wind UK Content (RenewableUK, 2017), 48% of the total expenditure associated with UK offshore wind farms was spent in the UK in 2015. The UK content of expenditure during the development stage and operation of offshore wind projects was 73% and 75%, respectively in 2015, whereas during manufacturing and construction the UK content was 29%. (RenewableUK, 2017).

4.3.25 The offshore wind industry presents an opportunity to utilise and further develop the UK's maritime engineering skills as other industries decline (such as shipbuilding and North Sea oil) in order to secure supply chain and other employment opportunities in the UK. The importance of maximising opportunities for the involvement of local businesses and communities in offshore wind has been highlighted as a key success factor for the sector in the UK (The Crown Estate, 2014).

4.3.26 The replacement of existing infrastructure with new technologies also represents significant investment in the UK economy.

Benefits of Offshore Wind Energy

4.3.27 The UK is well placed to lead the deployment of offshore wind with an estimated 40% of the total 2020 projected European potential offshore wind generation capacity (Green Alliance, 2014; Wind Europe, 2016), and over a third of the total European potential offshore wind resource (Energy Technologies Institute, 2013) making it one of the most globally attractive locations.

4.3.28 The key benefits of offshore wind energy as a contributor to the renewable energy mix are as follows:

- Diversification and security of home grown energy generation capacity making use of an abundant source of energy;
- A technology with potential to make significant and rapid contributions to the national renewable energy targets;
- Economic development and job creation, both within the UK and further afield within the supply chain; and
- Very low lifetime CO_2 emissions per unit of electricity generated.

4.3.29 As of March 2017, there is over 5.1GW of operational offshore wind capacity in UK waters, making the UK a world leader in offshore wind energy (RenewableUK, 2017). In addition, a further 14.2GW of capacity is under construction, has government support or has been consented (The Crown Estate, 2017).

4.3.30 The continued development of offshore wind within the UK is therefore seen as critical to ensuring that the UK and Europe are able to meet their binding energy and climate change targets.

Cost of Offshore Wind

4.3.31 Energy from offshore wind has often been described as being an expensive alternative to more conventional forms of energy generation such as coal, gas and nuclear. However, ORE Catapult (2016) shows that UK projects reaching Final Investment Decision (FID) in 2015/16 achieved an average Levelised Cost of Energy (LCOE) of £97/MWh; a 32% reduction since 2010/11. This means that the industry has beaten its target of £100/MWh by 2020 four years early. There is also high industry confidence of continued rapid cost reduction in LCOE for offshore wind (ORE Catapult, 2016), as is being demonstrated in Europe through projects such as Vattenfall's Kriegers Flak Offshore Wind Farm and Hollandse Kust, the latter of which represents a zero subsidy winning bid in the Netherlands. Offshore wind will be one of the lowest cost sources of new power generation in the 2020s as is demonstrated by the growing number of low or zero subsidy projects.

4.3.32 A strike price of £105/MWh for offshore wind in 2021-22 was announced by the UK Government in 2016 which represents the maximum price that will be paid, however with competitive bidding between developers, the final winning Contract for Difference (CfD) price is expected to be less than that of nuclear power at £92.5/MWh over a longer contract of 35 years versus 15 years for the CfD. As widely expected, the results of the latest Contract for Difference (CFD) auctions announced on the 11th September 2017 showed a dramatic fall in the cost of offshore wind. The cost of offshore wind, as measured by the CFD auction prices, has therefore reduced by almost 50% (from £105 to £57.50/MWh) in 2 years, making offshore wind one of the most attractive and cost-effective methods of generating large quantities of low carbon energy.

4.4 Horlock Rules

4.4.1 The relevance of planning and environmental considerations in the siting of onshore substations was set out by the Central Electricity Generating Board and more recently reviewed and adopted by National Grid in the 'Horlock Rules'. The Horlock Rules are a set of guidelines produced by National Grid to assist those responsible for siting and designing substations to mitigate the environmental effects of such developments (National Grid, 2003). They are still referred to and used by National Grid when undertaking planning studies for new infrastructure although they now have to be considered alongside other guidance in National Policy Statements, the National Planning Policy Framework, Development Plan documents and other sources. National Grid still applies the guidance in the Horlock Rules.

4.4.2 The principles embodied in the Horlock Rules are relevant to the infrastructure at the proposed onshore High Voltage Alternating Current (HVAC) substation. The rules contain principles that have been relied upon over the years in routine planning studies by National Grid, and which have subsequently been endorsed in Ministerial decisions and at Public Inquiries.

4.4.3 In the Horlock Rules, National Grid states that it will encourage generators to adopt the guidelines when working with National Grid on proposals for substations, sealing end compounds or line entries. These guidelines also confirm that consideration must be given to environmental issues at the earliest stage in order to keep adverse effects to a reasonably practical minimum in the planning of new substations.

4.4.4 Table 4.2 below summarises the Horlock Rules, (National Grid, 2003), and Thanet Extension's approach to them.

Table 4.2: Horlock Rules Summary

Overall system options and site selection	Thanet Extension approach (onshore)
In the development of system options including new substations, consideration must be given to environmental issues from the earliest stage to balance the technical benefits and capital cost requirements for new developments against the consequential environmental effects in order to keep adverse effects to a reasonably practicable minimum.	Environmental issues have been considered throughout the development phase to date, from initial desktop research to detailed EIA studies.
Amenity, cultural or scientific value of sites	
The siting of new National Grid Company (NGC) substations, sealing end compounds and line entries should as far as reasonably practicable seek to avoid altogether internationally and nationally designated areas of the highest amenity, cultural or scientific value by the overall planning of the system connections.	All internationally and nationally designated sites have been avoided for the new onshore HVAC substation.
Local context, land use and site planning	
Areas of local amenity value, important existing habitats and landscape features including ancient woodland, historic hedgerows, surface and ground water sources and nature conservation areas should be protected as far as reasonably practicable.	All areas of local amenity value in the location of the new onshore HVAC substation site have been protected as far as reasonably practicable as part of the ongoing site analysis work. In addition, consideration was given to important existing habitats and landscape features including ancient woodland, historic hedgerows, surface and ground water sources and nature conservation areas when considering sites for the onshore HVAC substation. The only possible impact the substation has on habitats is on terrestrial invertebrates on the existing brownfield site which will be protected through various mitigation measures as outlined in the Outline Landscape and Ecological Management Plan (Document Ref: 8.7)
The siting of substations, extensions and associated proposals should take advantage of the screening provided by land form and existing features and the potential use of site layout and levels to keep intrusion into surrounding areas to a reasonably practicable minimum.	The new onshore HVAC substation siting exercise has considered the availability of sites that benefit from existing screening, looking at existing landscaping, landform, and existing built development. The view to the new onshore HVAC substation from surrounding areas will be partly screened by existing vegetation and visual mitigation such as the planting of supplementary trees will assist in this screening over time. Further detail on potential additional planting is provided in Volume 3, Chapter 2: Landscape and Visual Resources (Document Ref: 6.3.2) and secured in the draft DCO (Document Ref: 3.1).
The proposals should keep the visual, noise and other environmental effects to a reasonably practicable minimum.	Visual, noise and other environmental effects have been minimised as far as possible through the selection of the onshore HVAC substation location. For example, consideration was given to existing screening and sites were chosen away from built up areas. In addition, the assessment considers further mitigation of environmental effects as detailed in Volume 3, Chapter 10: Noise and Vibration (Document Ref: 6.3.10) with no significant effects identified.

Overall system options and site selection	Thanet Extension approach (onshore)
The land use effects of the proposal should be considered when planning the siting of substations or extensions.	Existing land use, planning policies and planning history within and adjacent to the potential site locations considered in the options appraisal have been taken into account and forms an integral part of, the selection of the final onshore HVAC substation site. The selected site is characterised by a hardstanding used for general vehicle storage and has a minimal level of effect on land use, agriculture and recreation, and complies with planning policy in the area (see Volume 3, Chapter 6: Ground Conditions, Flood Risk and Land Use; and Volume 3, Chapter 4: Tourism and Recreation, (Document Refs: 6.3.6, and 6.3.4) respectively).
Design	
In the design of new substations or line entries, early consideration should be given to the options available for terminal towers, equipment, buildings and ancillary development appropriate to individual locations, seeking to keep effects to a reasonably practicable minimum.	The effects of likely equipment, building layouts and the cable routes into and out of the site have been taken into account in the development of the site proposals and through the assessment of environmental effects.
Space should be used effectively to limit the area required for development consistent with appropriate mitigation measures and to minimise the adverse effects on existing land use and rights of way, whilst also having regard to future extension of the substation.	The area required for the onshore substation site was determined with reference to past developer experience (Thanet Offshore Wind Farm (TOWF)), an initial assessment of relevant information available from technology suppliers together with VWPL's current expectations regarding land required for access, landscape works and other mitigation for the components required for a 340 MW project substation. The design of the onshore HVAC substation is at a relatively early stage and will be subject to ongoing refinement as the project progresses, as informed though further consultation and project design work, existing land use will be appropriately relocated.
The design of access roads, perimeter fencing, earthshaping, planting and ancillary development should form an integral part of the site layout and design to fit in with the surroundings.	The provision of access roads and the existing road infrastructure in the vicinity, perimeter fencing etc. has been taken into account through the selection and design of the onshore HVAC substation site.
Line entry	
In open landscape especially, high voltage line entries should be kept, as far as possible, visually separate from low voltage lines and other overhead lines so as to avoid a confusing appearance.	Thanet Extension will not employ overhead lines. All cables will be buried underground where practicable, or bunded and landscaped appropriately where burial is not practicable due to underlying ground conditions.
The inter-relationship between towers and substation structures and background and foreground features should be studied to reduce the prominence of structures from main viewpoints. Where practicable the exposure of terminal towers on prominent ridges should be minimised by siting towers against a background of trees rather than open skylines.	The onshore HVAC substation site developments will not include any additional overhead line towers.

4.5 Other considerations

4.5.1 Whilst specific constraints and how these have influenced the site selection process are discussed in more detail within specific sections of this chapter, a number of fundamental principles drawn from the experience of the applicant and technical expertise of consultants supporting the process are inherently applied to the decision-making process throughout, and these comprise:

- Shortest route preference for cable routing to reduce impacts by minimising footprint for the offshore and onshore cable routes as well as considering cost (hence ultimately reducing the cost of energy to the consumer) and minimising transmission losses;
- Avoidance of key sensitive features where possible and where not, seek to mitigate impacts;
- Minimise the disruption to populated areas; and
- The need to accommodate the range of technology sought within the design envelope, and exclude those options outwith the envelope (i.e. ruling out overhead lines).

4.6 Stage 1 - Project site selection process – array area

4.6.1 Further to the Government's confirmed policy (as discussed in Volume 1, Chapter 2: Policy and Legislation) in support of offshore wind, there is a need to identify the best sites around the UK for a rapid increase in offshore wind deployment to occur and renewable energy targets to be met. Given the presence of TOWF the region is identified as a good site for wind resource as is recognised by the operational output of the existing TOWF.

4.6.2 At the end of July 2009, The Crown Estate (TCE) opened a formal bidding process for extension projects to Round 1 and Round 2 sites, a process known informally as "Round 2.5". This licensing round sought applications in respect of extensions to Round 1 and 2 projects which were either consented or had submitted consent applications for determination. Whilst an extension to the TOWF was not brought forward at that time, TCE requirements for Round 2.5 proposals have subsequently been considered in the development of the proposed Thanet Extension project. These included:

- To be of an appropriate scale to the original site;
- Take into consideration environmental parameters and other constraints;
- Share a substantial part of one or more boundaries with the original site;
- Demonstrate synergies with the original site e.g. of construction, operation, improvement of economics and/ or grid connectivity; and
- Not be within 5 km of another wind farm site, except with the express agreement of the tenant of that site and not adversely affect delivery or operation of the original site or any neighbouring site.

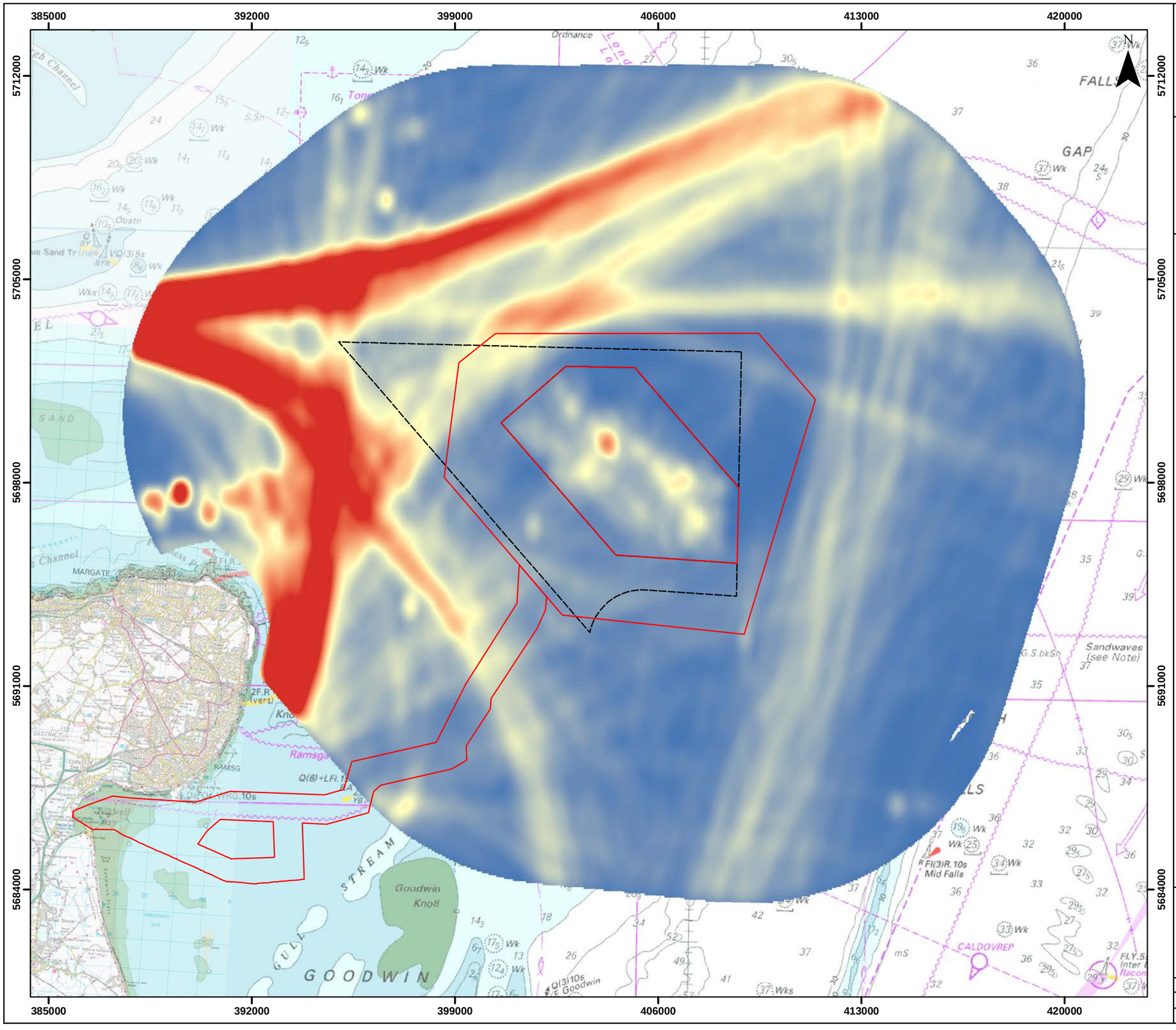
4.6.3 Following the initial consideration of environmental parameters and constraints an area of search was determined as a preliminary offshore boundary to delineate the location of offshore Wind Turbine Generators (WTGs). The initial boundary for Thanet Extension was identified by VWPL through an analysis of engineering, environmental, economic and consenting risks and subject to further feasibility analysis for key areas of concern.

4.6.4 Key feasibility concerns for the array initially included an analysis of shipping and navigation risk, offshore ornithology and seascape/ landscape visual impacts.

4.6.5 In parallel with this, existing environmental 'hard constraints' were considered, based on spatial data and an understanding of the likely constraints, including:

- Military disposal sites;
- Suspended oil and gas wells;
- Completed, drilled, plugged and abandoned wells;
- Active subsurface structures;
- Surface structures with helipads;
- International Maritime Organisation (IMO) shipping routes;
- Bathymetric contours (5 m intervals);
- Consented developments;
- Wrecks;
- Active pipelines; and
- Active cables.

4.6.6 The initial feasibility study considered an extension surrounding the TOWF with a longer extension to the north-west on the basis of availability of wind resource. The proposed area at that stage can be seen below (Figure 4-2) in relation to shipping density data, which was considered at that stage to be the primary constraint of the above list, with other constraints being limited in extent or not present.



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THANET EXTENSION OFFSHORE WIND FARM

Figure 4.2

Initial Thanet Extension array study area in relation to shipping density

Legend

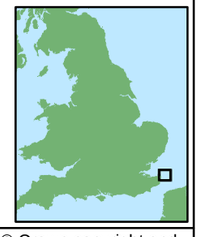
- Offshore Red Line Boundary
- Initial Thanet Extension boundary

Marine traffic survey density

High : 800

Low : 1

Datum: ETRS 1989
Projection: UTM31N



1:130,000

0 1 2 km

0 0.75 1.5 nm

Drg No	Figure_4.2_Marine_Traffic		
Rev	0.1	Date	25/05/2018
By	LS	Layout	N/A

Figure 4.2

4.6.7 The purpose of the shipping and navigation feasibility study was to identify the risks of potential impact arising from the development of Thanet Extension on vessel routeing and navigation safety. As such the existing navigation controls, current shipping activity and relevant guidance have been considered and assessed in order to identify any potential impacts on vessel safety and operation, to understand potential constraints on the Thanet Extension development area. As illustrated above (Figure 4-2) there is a clear constraint apparent to the north-west of the proposed development boundary due to greater shipping density when compared to the wider area under consideration at that stage. The potential overlap with a firing practice area and a disposal site is also considered to represent a constraint to the south-westerly 'point' of the potential development area.

4.6.8 As identified in Volume 2, Chapter 4: Marine Ornithology (Document Ref: 6.2.4), the main ornithological interest features occur at the TOWF/ Thanet Extension area during the winter period, with one species, red-throated diver, being of particular interest as a qualifying feature of the nearby Outer Thames Estuary Special Protected Area (SPA). TOWF and Thanet Extension is considered to have a generally low ornithological sensitivity, including in respect of red-throated divers, for which both the original and proposed Thanet Extension wind farms fall within areas identified by JNCC as 'low-density areas' (and which notably were excluded from the Outer Thames SPA site boundary). Notwithstanding this, the proposed north-west extension would likely increase interaction with the Outer Thames SPA based solely on proximity as illustrated in Figure 4-3.

4.6.9 The review of landscape and visual constraints highlighted that areas of Thanet Extension vary in their suitability for development. The differences in suitability were considered to arise principally as a result of the different visual relationships between the WTGs of the Thanet Extension site, those of the existing TOWF and the London Array Offshore Wind Farm (OWF) and the physical landform of the Isle of Thanet.

4.6.10 The landscape and visual constraints review concluded that the area to the north-west and the south-westerly 'point', are considered to be the least suitable for development due principally to the extent to which they would increase the spread of WTGs along the seaward horizon. The north-westerly area would also be closer to the Isle of Thanet and WTGs within these areas would be seen to overlap with landform in coastal views from the west particularly but also from the south, which was considered to be undesirable from a visual and character perspective. Further consideration was also given to the need to maintain a minimum 8 km distance from the coastline in line with the requirements of the Round 2.5 guidelines.

4.6.11 Through preliminary consultation with key stakeholders, including the Port of London Authority (PLA), and the Maritime and Coastguard Agency (MCA), in the context of the discussions with the Statutory Nature Conservation Body Natural England regarding offshore ornithology survey and data constraints, and feasibility studies undertaken it was concluded that whilst an Extension to the existing TOWF may be appropriate, and would represent cost-effective renewable energy and aid in meeting the relevant renewable energy targets, revisions to the proposed array boundary would also be appropriate to reduce the interactions noted in paragraphs 4.6.1 *et seq* above.

4.6.12 The conclusion of the Stage 1 assessment was therefore a revision to the proposed array boundary which reduced the north-westerly and south-westerly spread of the proposed Thanet Extension. The array boundary was therefore modified as can be seen in Figure 4-4.

360000 375000 390000 405000 420000

5745000 5730000 5715000 5700000 5685000

N

0 3 6 12 18 24 Kilometers

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Figure 4.3

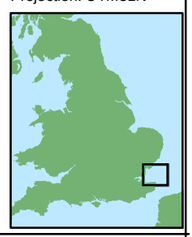
Initial area of search in relation to the Outer Thames Esturary SPA and red-throated diver density

Legend

Diver density (no/sqkm)

- 0.0 - 0.8
- 0.9 - 1.9
- 2.0 - 4.2
- 4.3 - 8.7
- 8.8 - 14.8
- Thanet Existing Turbines
- Thanet Extension Area
- Thanet Extension 2km Buffer
- Special Protection Areas

Datum: ETRS 1989
Projection: UTM31N



1:270,000 0 3 6 km 0 1.5 3 nm

Drg No	Figure_4.3_Diver		
Rev	0.1	Date	25/05/2018
By	LS	Layout	N/A

Figure 4.3

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Figure 4.4

Comparison of the proposed Thanet Extension array boundary with the original proposed boundary

Legend

- Offshore Red Line Boundary
- Initial Proposed Thanet Extension Array Boundary

Datum: ETRS 1989
Projection: UTM31N

1:150,000 0 1.5 3 km 0 0.85 1.7 nm

Drg No	Figure_4.4_Comaprison_Array		
Rev	0.1	Date	25/05/2018
By	LS	Layout	N/A

Figure 4.4

4.7 Stage 2 - Identification of Grid Connection Location and High-Level Landfall Appraisal

4.7.1 The Grid Connection stage comprised a sequence of steps associated with the site selection work preceding and immediately following on from the identification of the connection point to the main National Grid infrastructure at Richborough.

4.7.2 Initial proposals were to make a grid connection at the Richborough Energy Park (REP) which is the site of both the existing TOWF grid connection, and that of the Richborough Connection National Grid works. As explained in Stage 1 (Project Site Selection Process – array area), the proposed extension is located adjacent to (surrounding) the existing TOWF and making a connection at the same primary connection point as the TOWF is both practical and logical, given the previous work in determining a suitable and consentable grid connection.

4.7.3 Thanet Extension began discussions with National Grid Electricity Transmission Limited (NGET) in 2014. This area of the south-east transmission network is particularly complex in terms of its constraints, and various potential points of connection in the Kent area were considered, both to the 400 kV transmission network and the 132 kV distribution network operated by UK Power Networks. In 2016 the preferred grid connection point for a project of up to 340 MW capacity in this location was agreed as the Richborough Grid Supply Point (GSP) 6, and an application for Bilateral Connection Agreement was submitted in July 2016.

Landfall Appraisal

4.7.4 Following on from the National Grid connection offer, an initial Desk-Based Assessment (DBA) of potential landfall options on the Thanet coast was undertaken. This process applied those principles as set out in section 4.5 of this Chapter along with consideration of the following constraints which were defined through discussion with external electrical engineering expertise:

- Avoid high (> 20 m) and/ or geomorphically active coastal cliffs;
- Ensure foreshore access for vehicles during construction;
- Avoid residential property;
- Minimise where practicable land designated for nature conservation;
- Avoid land used for defence purposes;
- Avoid excessive take of Class 1 Agricultural Land;
- Minimise 3rd Party interaction for burial requirements;
- Minimise length of Horizontal Directional Drill (HDD) (or similar technology) to cross the sea defences;
- Suitable working area to allow for drilling operations (if required),
- Feasibility to install jointing bays and cable pull-in;
- Suitable access for inspection and maintenance;
- Limit the amount of private land required;
- Minimise crossings of linear natural features and infrastructure, e.g. rail, road, water and utilities and where possible, aim to cross at 90°;
- Not run adjacent to railway lines;
- Avoid underground or subsea rock/ solid substrates;
- Avoid steep gradients/ banked verges;
- Avoid areas of standing water; and
- Avoid areas of ancient woodland habitats or other areas of woodland likely to have nature conservation interest.

4.7.5 Further engineering feasibility considerations within the initial appraisal were:

- Construction space - corridor width; localised restrictions; Health and Safety (H&S) risks
- Asset space – space for cable trenches; space for transition joint bays (TJBs)
- Obstacles/ crossings – Infrastructure; environmental features
- Ground conditions – Geology (bedrock and superficial); topology
- Access – Distance from major roads; weight or size restrictions; H&S risks

4.7.6 In the early stages of the project, uncertainties regarding the grid connection point and electrical design required a degree of flexibility be maintained in relation to cable routing. Therefore, an Offshore Cable Route Area of Interest was delineated alongside the wind farm boundary, and this incorporated options for cable routing and landfall at various locations along the Kent coast from Joss Bay in the north, to Sandwich Bay in the south.

4.7.7 The overall consideration of landfall options at this stage culminated in identification of three core areas of search for further consideration and analysis.

4.8 Stage 3 – Identification of Project for Scoping and Phase 1.A public consultation

4.8.1 During Stage 3 of the route design work, existing infrastructure such as railways, roads, the port, recreational areas and built-up areas were considered in an appraisal of the initial area of search identified at Stage 2. As identified above the initial search region encompassed an area stretch from north-east Kent (Thanet district) to the area between Pegwell Bay and Sandwich (South Thanet district/ North Dover district). This initial search area for the landfall extended in total from Kingsgate Bay in the north to the town of Deal in the south (Figure 4-5).

4.8.2 Following the initial technical appraisal undertaken by Vattenfall and external electrical engineering support which considered amongst other things potential grid connection points, the high-level area of search was refined to three primary landfall area options, with seven indicative routes for the purposes of initial appraisal. These were brought forward for further internal qualitative appraisal which was undertaken by external engineering and consenting experts.

4.8.3 The three primary landfall areas of search provided in more detail in Table 4.3 identified were:

- Joss Bay;
- Pegwell Bay; and
- Sandwich Flats North/ Sandwich Bay.

4.8.4 With a primary focus on engineering feasibility and environmental designations each landfall area of search was considered against a set of criteria as detailed in Table 4.4. The qualitative appraisal against these criteria was undertaken by Vattenfall with the support of external engineering (XERO Energy) and environmental expertise. The results of the appraisal are presented in paragraph 4.8.5 et seq and the rationale for discounting or accepting the route provided in (Table 4.6).

Table 4.3: Cable route options for initial appraisal

Landfall area of search	Indicative route option	Cable route description
Joss Bay	1	From Joss Bay, following public roads south through Broadstairs and Ramsgate to Sandwich Road, then south along Sandwich Road and the A256 to the substation.
	2	From Joss Bay, following agricultural fields (likely private land) south to Sandwich Road, then south along Sandwich Road and the A256 to the substation.
Pegwell Bay	3	From the north part of Pegwell Bay, then south along Sandwich Road and the A256 to the substation.
	4	From the lower middle part of Pegwell Bay, through Pegwell Bay Country Park, then south along Sandwich Road and the A256 to the substation.
Sandwich Flats North/ Sandwich Bay	5	From north of Prince's Golf Club, east across terrain, crossing the River Stour to Richborough Port, then north along the A256 to the substation.
	6	From Sandwich Bay Estate, east across terrain, crossing the River Stour to Richborough Port, then north along the A256 to the substation.
	7	From Sandwich Bay Estate, through public roads in Sandwich, then north along Ramsgate Road and the A256 to the substation.

Table 4.4: Initial appraisal criteria

Category	Description	Appraisal criteria
Construction space	This category accounts for space available for cable construction works for each route, based on the installation requirements detailed within the Project Description Chapters.	• Corridor width; • Localised restrictions; and • H&S risks.
Asset space	This category accounts for space available for the cables themselves and the transition joint bays	• Cable trench or trenches; and • Transition joint bays.
Obstacles	Obstacles pertain to localised constraints which the cable route would need to cross via open cut trenching, or in some instances more specialised methods, such as cable bridges, auger boring or by HDD.	• Infrastructure; and • Environmental features.
Ground conditions	Geology and topography has been assessed based on publicly available BGS datasets, OS maps and through any evidence on aerial photography to review potential risks to installation.	• Geology; and • Topology.
Access	Access pertains to ease of access for construction, such as distances for parts of the cable route from major transportation arteries such as A or B roads, freight lines, ports or through roads with significant weight, width or height restrictions.	• Distance from major roads; • Weight or size restrictions; and • H&S Risks.
Route length	The overall cable route length for each of the landfall and onshore cable route options has been assessed, based on the distance from the landfall point to the nearest part of the Thanet Extension zone, assuming a reasonable offshore route.	• Route length and cost; and • Overall disturbance.
Consents/ environment	Account taken of land use (i.e. private or public land and if used for recreation) and any environmental or historical designations.	• Land use; and • Natural environment, historic environment and landscape designations.

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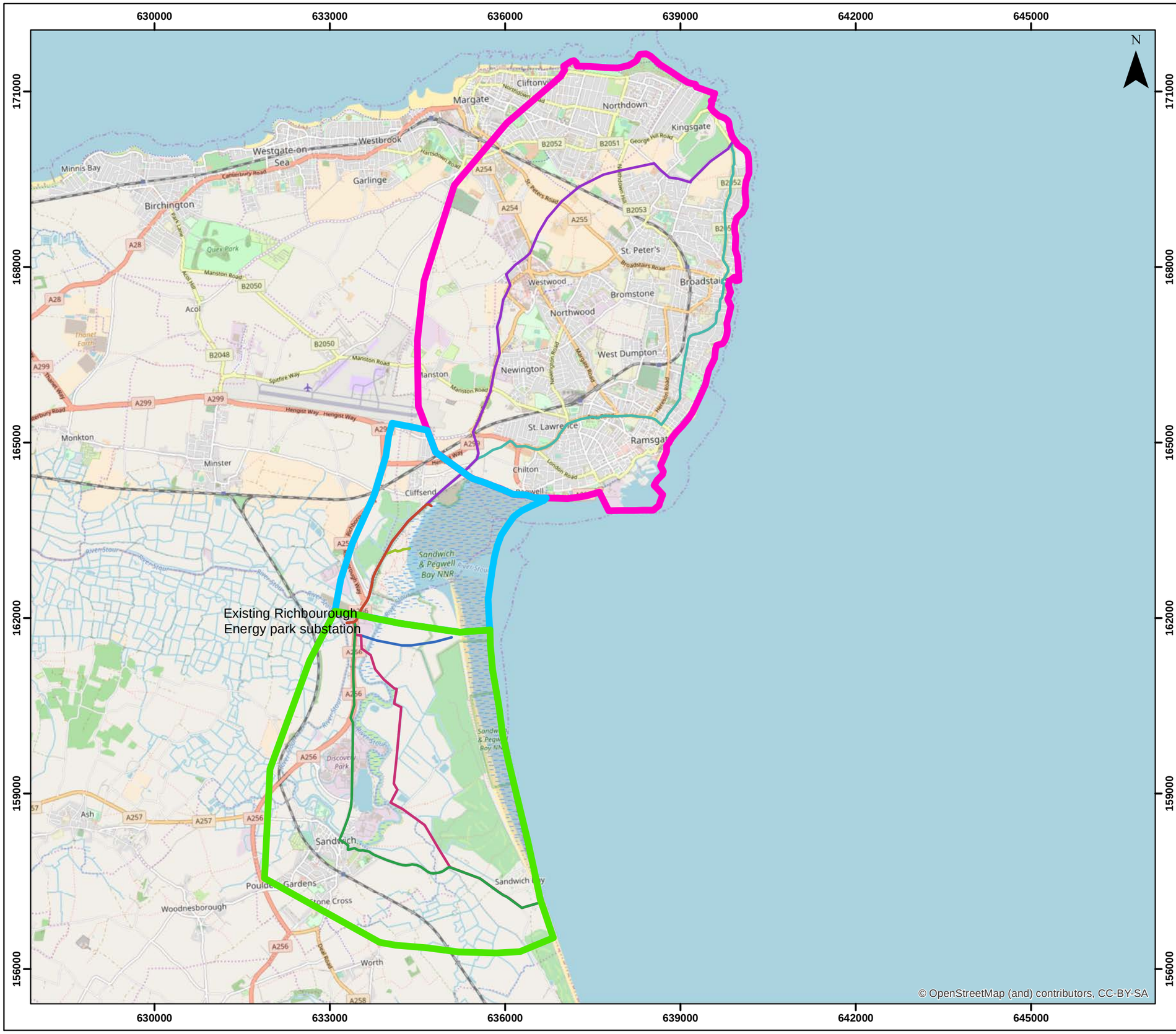
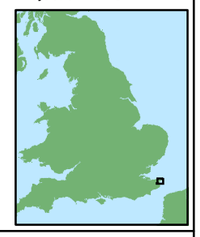
Figure 4.5
Overview of Areas of Search with Indicative routes.



Legend

- Indicative Route 1
- Indicative Route 2
- Indicative Route(s) 3
- Indicative Route(s) 4
- Indicative Route 5
- Indicative Route 6
- Indicative Route 7
- Joss Bay Area of Search
- Pegwell Bay Area of Search
- Sandwich Flats North/ Sandwich Bay Area of Search

Datum: OSGB 1936
Projection: BNG



1:65,000

0 1.5 3 km

Drg No	Figure_4.5_Initial_Onshore_Routes		
Rev	0.1	Date	15/06/2018
By	LS	Layout	N/A

Figure 4.5

Construction space, asset space, obstacles

4.8.5 With regards construction space, asset space, obstacles, route length and cost, the built-up areas of Kingsgate, Broadstairs, Ramsgate, Pegwell, Richborough and Sandwich were considered to affect all of the indicative cable route options within the three areas of search. The Joss Bay area of search (indicative routes 1 and 2) performed least well on those criteria relating to land use/ built up areas and infrastructure. Indicative routes 1 and 2, as with any route in the Joss Bay area of search, would need to pass through the roads through Broadstairs and Ramsgate which ara narrow in places, particularly due to on-street parking and restricted with residences and businesses. The indicative routes follow the road for many kilometres and the installation would therefore result in a number of interactions with well used roads. A Health and Safety risk was also identified with most of the indicative routes through high traffic and narrow built-up areas. Space for trenches was considered to be likely to be limited in the roads through Broadstairs and Ramsgate due to existing services.

4.8.6 Overall the Sandwich Flats North/ Sandwich Bay area of search (indicative routes 5 and 6) was considered to be best in terms of space for construction as these routes were considered to pass mostly through open terrain, rather than roads which are likely to contain other infrastructure. The next most preferable route to indicative routes 5 and 6 was indicative route 3 in the Pegwell Bay area of search, which was considered to have space but was also identified as requiring burial within a road (Sandwich Road) within which there is existing export cable infrastructure (TOWF). Indicative route 4, also in the Pegwell Bay area of search, was considered to be similar to indicative route 3 in terms of its favourability but was identified as also being subject to the constraints within the Pegwell Bay Country Park.

4.8.7 Indicative routes 1, 2 and 7, associated with the Joss Bay area of search, and part of the Sandwich Flats North/ Sandwich Bay area of search were considered likely to have major restrictions on construction not only because of proximity to built-up areas but also because their onshore routes are longer than the other options, and therefore more likely to have multiple issues with construction space along various parts of the route.

4.8.8 With regards obstacles, other infrastructure, including the south-eastern railway which passes through Ramsgate and loops around the north-east quadrant of Kent to the north coast to Margate, were also investigated due to the risk represented by undertaking rail crossings. Rail crossings require significant planning and negotiation with Network Rail with recognition that crossings need to ideally occur perpendicular to the track and at an agreed time so Network Rail can monitor the work, and that train schedules would likely be affected by any construction work. It was recognised that it is possible to avoid the railway with landfall options closer to Pegwell Bay and Sandwich Flats. For landfall at Joss Bay or Kingsgate Bay, the route would need to cross the railway line twice unless alternatively routed through Broadstairs, Ramsgate and Pegwell. Additionally, five golf courses (Royal St George's Links Golf Course, Prince's Golf Club, North Foreland Golf Course, St Augustine's Golf Course and Stonelees Golf Centre) are located either along or adjacent to some of the options available.

Ground conditions

4.8.9 From a preliminary desk based review of British Geological Society data, it was identified that all route options pass through areas of clay and silt. The southern part of the search area showed areas of sand, tidal deposits and some chalk. There was no indication of large scale rock formations identified at that stage. At this stage it was identified that some options may require HDD to avoid interactions with designated features and/or other assets, but recognised that HDD through soft geology may not be feasible or may require special techniques because of the risk of borehole collapse.

4.8.10 Beyond the need to consider the soft geological features in the south of the study area further (i.e. indicative routes 3-7) geology did not therefore provide an option that was considered notably more favourable than the others. Similarly, the topography over the area near Richborough and Sandwich was noted to be very flat, with only the area near Broadstairs noted as having greater changes in elevation. The exception to this is the elevation change along the Broadstairs coast which results in a gradient in the access road to Joss Bay. The regional topography for all options did not however appear to present a problem for cable installation.

Access

4.8.11 With regards to access more specifically, the Sandwich Flats North/ Sandwich Bay area of search (indicative route 5) was recognised as requiring significant temporary access tracks to ensure access from the primary arteries (such as the A256), in addition to access through small roads in Sandwich and Worth resulting in the need for access through the Sandwich Estate and Prince's Golf Club/ Prince's Road. It was recognised that extensive additional access tracks would be required for the Sandwich Flats North/ Sandwich Bay area of search, whilst this risk was reduced for the other areas of search.

Route length

4.8.12 Route length is an important consideration, greater length increases not only the associated costs but also uncertainty with regard to unforeseen ground or other environmental conditions, as well as generally leading to greater disturbance. Table 4.5 provides the overall indicative cable route length for each area of search.

Table 4.5 Indicative route overall lengths

Landfall area of search	Indicative route	Overall route length (km)
Joss Bay	1	24.2
	2	23.6
Pegwell Bay	3	23.7
	4	23
Sandwich Flats North/ Sandwich Bay	5	22.5
	6	28.1
	7	28.9

Consents/ environment

4.8.13 With regards consents/ environment the Joss Bay area of search is recognised as requiring a crossing of a designated Marine Conservation Zone (MCZ), a Special Area of Conservation (SAC), a SPA, a Ramsar site and a Site of Special Scientific Interest (SSSI). A landfall in the Pegwell Bay area of search would require a crossing of a SAC, a SPA, a Ramsar site, an SSSI, a National Nature Reserve (NNR) and also within the boundary of Pegwell Bay Country Park. The Sandwich Flats North/ Sandwich Bay area of search was also found to fall within a SAC, a SPA, a Ramsar site, a NNR and an SSSI.

4.8.14 It is therefore noted that for all three of the areas of search there is a number of designated sites that would have some form of interaction. The number of interactions was not considered to be important in and of itself, but it was recognised for some sites there was a greater risk of potential effects on the designated features within the sites.

4.8.15 Whilst all landfall areas of search would therefore result in the requirement for an assessment of potential effects on designated sites it was recognised that a landfall at Joss Bay would result in direct interactions with the designated features of the MCZ and Thanet Coast SAC, namely the chalk habitats. The offshore export cable corridor to Joss Bay in particular was recognised as interacting with the geogenic chalk reef habitats present within the MCZ, and any cabling would therefore represent long term disturbance to the chalk habitats. The chalk habitats were considered at this stage to likely represent higher quality reef features at this location when compared to the south of the Thanet Coast MCZ which is subject to active maintenance dredging and disposal as part of the management of Ramsgate Harbour.

4.8.16 Whilst Joss Bay would therefore result in a marginally greater number of designated site interactions, the indicative routes within Pegwell Bay and Sandwich Bay areas of search would result in comparable interactions in terms of the number of designated sites and/ or multiple interactions with the same site. As noted above however it is not simply the number of interactions with a designated site that forms the basis for the consideration but the likelihood of interacting with the designated features within the designated site(s). From experience gained across the industry it is also recognised that where avoidance of the site and/or features is not possible the likely success of mitigation measures that are both readily enforceable and associated with a high degree of certainty should be considered.

4.8.17 Indicative routes within the Sandwich Flats North/ Sandwich Bay area of search also resulted in a number of interactions with designated sites, with the features of the SAC, SPA and SSSI all being subject to direct interactions. Furthermore, the more northerly of the routes was recognised as being subject to a level of uncertainty in terms of the exact location of the designated features within the SSSI and SAC, which was not the case with the other areas of search and indicative routes. However, it was noted that the dune features of the SAC would likely have direct interactions that would require mitigation measures such as HDD that may have challenges with regards technical feasibility due to the underlying ground conditions (which form the basis of the geological sand dune features).

Table 4.6 Summary of initial appraisal

Option	Landfall area	Summary of appraisal
1	Joss Bay	Landfall through hard ground present representing significant challenge to offshore burial that it was not considered could be overcome with appropriate engineering solutions. Onshore route generally acceptable with land use considerations/agricultural land being primary issue. Area of search is considered high risk due to technical feasibility and should not be considered further.
2	Joss Bay	Landfall through hard ground present representing significant challenge to offshore burial that it was not considered could be overcome with appropriate engineering solutions. Onshore route through Broadstairs and Ramsgate very challenging, combined with potential proximity issues with existing cables in Sandwich Rd. Area of search is considered high risk due to technical feasibility and should not be considered further.
3	Pegwell Bay	Landfall location and route similar to existing TOWF most favourable from desk study due to likely success of any required mitigation and certainty over ground conditions. Main issue identified as corridor width and space for cable trenches in the road. Road and proximity to the existing TOWF onshore cable route or NEMO Link cables is an important issue which requires detailed examination and design. Area of search is considered appropriate for further consideration.
4	Pegwell Bay	Challenge for available corridor width, straightforward access from adjacent roads, environmental constraints to be considered further through existing information available from site specific experience. Area of search is considered appropriate for further consideration.
5	Sandwich Flats North	Challenge for available corridor width, geology considered to result in risk of HDD failure due to ground conditions (sand), environmental constraints to be considered further. Area of search considered appropriate for further consideration, but indicative route 5 considered high risk due to technical feasibility and therefore not carried forward for further consideration.
6	Sandwich Bay	Challenge for available corridor width, access issues considered likely, environmental constraints to be considered further to review likely interaction with designated features associated with this area of search.
7	Sandwich Bay	Route through town of Sandwich utilising existing roads and several pinch points which results in access and installation issues. Area of search considered appropriate for further consideration, but indicative route 7 considered high risk due to technical feasibility and therefore not carried forward for further consideration.

4.8.18 As a result of the reasons detailed above and summarised in Table 4.6 the Joss Bay area of search was not taken forward for further consideration and consultation. The Sandwich Flats North option was also not taken forward due to the reasons summarised in Table 4.6.

4.8.19 Both the Sandwich Bay and Pegwell Bay options were considered to be feasible, subject to further technical analysis and consultation. Therefore, both Pegwell Bay and a second option for landfall at Sandwich Bay were maintained during the scoping phase and brought forward for consultation within the scoping report. The cable routing work summarised above determined the Sandwich Bay area of search as the second preference in terms of landfall technical feasibility. Of the indicative routes considered in the landfall areas of search a single indicative route was brought forward for each of Pegwell Bay and Sandwich Bay and used to define the broad landfall area of search which would be brought forward for scoping.

4.8.20 Therefore, the primary landfall areas of search identified for consultation at the end of Stage 3 were:

- Pegwell Bay; and
- Sandwich Bay.

4.9 Stage 4 – Refinement of Project for Phase 1.B community consultation events and EIA preparation

4.9.1 Following the scoping phase further consideration was given to the scoping opinions and a detailed appraisal was undertaken. The following sections present a summary of the detailed appraisal of the northern (Pegwell Bay) and southern (Sandwich Bay) areas of search, referred to as Option 1 and Option 2 respectively and illustrated in Figure 4-8.

4.9.2 It is important to note that the reference to 'Option 1' and 'Option 2' maintains consistency with the scoping report which identified an overall 'Thanet Extension Onshore Area of Interest' which encompassed areas being considered for siting of the onshore substation, plus landfall and Onshore Cable Route Options. As detailed in paragraph 4 of the scoping report two options were maintained to allow more detailed engineering work and responses to the scoping request to inform further refinement of project design for the pre-application consultation stages. The overall Thanet Extension Onshore Area of Interest was chosen in order to maintain flexibility for further design, appraisal, and consultation responses which would be expected to inform refinement of the final area of search and subsequent routeing decisions.

4.9.3 Following this scoping phase and consideration of the scoping opinions provided at that time, each area of search (hereafter referred to as Option 1 and 2 respectively) was subject to a detailed appraisal before further route optioneering on the preferred area of search was undertaken.

Array

4.9.4 Following the scoping phase, the array remained unchanged during initial project refinement and community consultation events held during February 2017 as it was considered appropriate for the purposes of formal consultation.

Offshore Export Cable Corridor

4.9.5 Following the scoping phase, the export cable corridor, including onward routes to both potential landfalls, remained unchanged during initial project refinement and community consultation events held during February 2017.

4.9.6 Subsequent to the consultation events and following the grid connection application and receipt of an offer from National Grid, further onshore cable routing work, site walkover and input from electrical design and construction specialists as detailed in Table 4.6, it was determined that the preferred option for offshore routing would be to follow the existing TOWF cable route to the north and make landfall in Pegwell Bay (this is Option 1). This approach also aligned with the experiences gained during the TOWF project, and the rationale employed during the cable route selection for TOWF, for which consent was granted. It subsequently became apparent that as a result of the introduction of a new project to install new cables for TOWF[2] an offshore crossing of Nemo was unavoidable, irrespective of landfall location. An additional section of corridor for the offshore export cable was brought forward to accommodate this. Further detail regarding the process of incorporating the option to cross the Nemo Interconnector offshore is presented in paragraph 4.10.2 *et seq*.

[2] The Thanet Cable Replacement project was subsequently withdrawn, the implications of which are considered further in section 4.12.

634500 636000 637500 639000 640500

169500 168000 166500 165000

N

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Figure 4.6

Initial routes in Joss Bay area considered for scoping

Legend

- Indicative Route 1
- Indicative Route 2
- Indicative Route(s) 3

Datum: OSGB 1936
Projection: BNG

1:25,000 0 0.65 1.3 km

Drg No	Figure_4.6_Joss_Bay_Routes			**Figure 4.6**
Rev	0.1	Date	25/05/2018	
By	LS	Layout	N/A	

631500 633000 634500 636000 637500

163500 162000 160500 159000 157500

N

Existing Richbourough Energy park substation

Sandwich & Pegwell Bay NNR

Sandwich & Pegwell Bay NNR

Discovery Park

Sandwich

Sandwich Bay

Poulders Gardens

Stone Cross

Ash Road

A256 A257

River Stour

Richborough Energy

Depot

Stonar Lake

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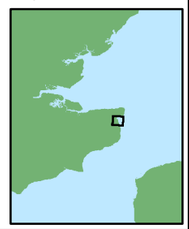
Figure 4.7

Initial routes in Pegwell/ Sandwich Bay area considered for scoping

Legend

- Indicative Route(s) 3
- Indicative Route(s) 4
- Indicative Route 5
- Indicative Route 6
- Indicative Route 7

Datum: OSGB 1936
Projection: BNG



1:28,500 0 0.7 1.4 km

Drg No	Figure_4.7_SandwichPegwell_Routes		
Rev	0.1	Date	25/05/2018
By	LS	Layout	N/A

Figure 4.7

384000 387000 390000 393000

5688000 5685000 5682000 5679000

N

Minster
Ramsgate
St. Lawrence
Nethercourt
Chilton
Cliffsend
Pegwell
Sandwich
Roulders Gardens
Stone Cross
Worth
Discovery Park
Sandwich & Pegwell Bay NNR
Sandwich Bay
Foxborough Lane
The Lanes
Grinsell Hill
Hengist Way
Canterbury Road West
Ashford to Ramsgate
Manston Road
Park Road
High Street
Victoria Road
Chilton Lane
Loudon Road
Pegwell Road
West Cliff Road
Royal Parade
Cottington Road
Sandwich Road
Richborough Port Road
Richborough Port Container and Vehicle Park
Depot
Ramsgate Road
Ash Road
Sandown Road
St. Bart's Road
The Street
Dover Road
Sandwich Road
Fesderland Lane
Jubilee Road
River Stour
Mower's Way
A256
A299
A254
A255
B2050
B2054
A258

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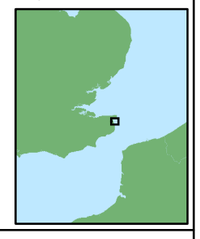
Figure 4.8

Option 1 and Option 2 landfall locations associated with study areas and initial substation location

Legend

- Option 1 onshore cable route
- Option 2 onshore cable route
- Scoping offshore cable corridor
- Onshore substation area of search
- 1000m buffer around 25m corridor
- 500m buffer around 25m corridor

Datum: ETRS 1989
Projection: UTM31N



1:40,000 0 1 2 km

Drg No	Figure_4.8_Option1&2_Landfall		
Rev	0.1	Date	25/05/2018
By	LS	Layout	N/A

Figure 4.8

Landfall and onshore cable area of search

4.9.7 The following expert lead qualitative appraisals were undertaken by the team of qualified professional consultants working on the EIA, as detailed within Volume 1, Chapter 1, Introduction (Document Ref: 6.1.1). Each appraisal section represents the professional considerations of the team through reference to available sources and the received scoping opinions. The key receptor groups considered are those provided for within Table 4.7.

Table 4.7 Receptor groups and appraisal leads for northern vs southern route appraisal

Receptor group	Appraisal lead	Assessment criteria
Landscape and Visual Impacts	OP-EN	Assessment of the positive and negative effects across a wide range of criteria including environmental, socio-economic, and technical. The process provided a qualitative framework to identify and balance technical, socio-economic and environmental comparisons in selecting corridor options. For each topic area assets were considered and a qualitative appraisal undertaken of potential adverse impacts, beneficial impacts, and potential mitigation and/or residual effects.
Socioeconomics	Regeneris	
Tourism and Recreation	Regeneris	
Onshore Ecology and Onshore & Intertidal Ornithology	Amec Foster Wheeler/GoBe Consultants	
Historic Environment	Amec Foster Wheeler	
Traffic and Transport	Amec Foster Wheeler	
Ground Conditions, Contamination, Land Use, Water and Flood Risk	Amec Foster Wheeler	
Air Quality	Amec Foster Wheeler	
Engineering	XERO Energy	

Landscape Visual Impacts

4.9.8 Option 1 was considered to have the potential to directly and adversely affect physical landscape elements such as the trees and shrubs along Sandwich Road and these direct physical effects have the potential to adversely affect the landscape character of the F1 Pegwell Bay Local Character Area.

4.9.9 However, providing that tree and shrub loss in the periphery of the Pegwell Bay Country Park associated with Option 1 is minimised, and that these trees and shrubs still form a boundary to the Pegwell Bay Country Park, the potential changes to the landscape and visual resource could be minimised. The appraisal concluded that there was not potential for significant residual landscape and visual effects during Construction or O&M phases.

4.9.10 As a result of minimal tree loss in the periphery of the Pegwell Bay Country Park, the associated potential effect to the landscape and visual resource was also concluded to be minimal. The avoidance of trees and shrubs where possible by routeing along existing roads represented a positive design outcome within the context of medium to high sensitivity landscape elements and character areas, and when compared to routeing options that would result in loss of boundary/ periphery trees.

4.9.11 Option 2 has the potential to directly and adversely affect physical landscape elements within Sandwich Bay Estate, Guildford Road on approach to Sandwich Bay Estate, within the curtilage of the Royal St Georges Clubhouse, agricultural land within Sandwich Flats and at Richborough Port. These direct physical effects also have the potential to adversely affect the landscape character and visual receptors in the area.

4.9.12 Given the maturity of the avenue trees within the Sandwich Bay Estate and on approach along Guilford Road, it is unlikely that replacement or compensatory planting could be sufficiently mitigated in the short-term. This would result in potentially significant residual landscape and visual effects during Construction and potentially throughout the O&M phase.

4.9.13 The potentially high level of predicted adverse effect to the landscape and visual resource within and surrounding the Sandwich Bay Estate was considered to be a substantial negative factor against the selection of this option.

4.9.14 Option 1 is located within a less sensitive landscape context than Option 2 and the level of physical landscape disturbance contributing to physical landscape, landscape character and visual effects is much higher and more permanent in nature for Option 2 than it is for Option 1. As a result, Option 1 was considered a preferred option in comparison to Option 2 with respect to LVIA considerations.

Socioeconomics

4.9.15 Option 1 covers an area with a more limited business base, and so the scope for any negative impact on business performance is also limited. The traffic and transport element of the appraisal suggested limited impacts of transport disruption on business performance, and there was no indication that other impacts of cable laying activity would have additional effects. Overall adverse socioeconomic impacts associated with Option 1 were therefore anticipated to be low with a single Country Park present.

4.9.16 The Option 2 route covers an area with a more significant business base, notably around Sandwich Industrial Estate and Discovery Park. The traffic and transport appraisal (summarised in section 4.9.41 *et seq*) indicated more significant transport disruption if this route were to be taken forward. This would potentially result in a temporary adverse impact on business performance.

4.9.17 In conclusion, the appraisal of socioeconomic constraints with regards Option 1 and Option 2 considers that there is a greater risk of adverse socio-economic impacts under Option 2 than Option 1. This is as a result of the Option 2 corridor covering an area with a much greater density of businesses, and also creating a greater risk of disruption to business performance.

Tourism and Recreation

4.9.18 Five golf courses (Royal St George's Links Golf Course, Prince's Golf Club, North Foreland Golf Course, St Augustine's Golf Course and Stonelees Golf Centre) are located either along or adjacent to some of the routes. During the proposed construction period (2019-2021) all golf courses are considered to have a high level of business as a result of the Royal St Georges Golf Course hosting the International Golf Open Tournament in 2020. The greatest interaction would be with the Royal St George Golf Course if roads were subject to construction and/ or periods of construction. It is anticipated that Option 2 would result in High to Medium impacts on the Royal St George Golf Course as a result of transport disruption, noise, and visual effects which could affect the recreational experience. Hosting the International Open could generate over £100 million in the local economy. Any impact from the cable corridor during this period could have significant impacts on local tourism. Furthermore, the likely construction noise during this period would be considered to have a negative interaction on both the Royal St George and Prince's Golf Clubs. Whilst there remains an interaction with the St Augustines and Stonelees Golf Centre as a result of Option 1 the interaction is considered to be of a lesser magnitude, with access to the golf courses considered to be more readily managed through traffic management plans, and effects associated with noise reduced due to the comparative small area of interaction.

4.9.19 A section of the England Coast Path National Trail runs north along Sandwich Bay as far as Princes Beachlands Local Nature Reserve before turning inland and approximately following the Stour upstream to Sandwich. Option 2 would follow the line of the ECP from Flagstaff Reach to Back Sand Point to Bloody Point. There is no alternative for those wishing to use this section of the route and significant effects would be anticipated. Option 1 would also result in an interaction with the ECP at the proposed landfall location. It is considered that this comparatively small section of ECP could be robustly mitigated through employing a short distance deviation during the construction period.

4.9.20 Both Option 1 and Option 2 result in interactions with coastal footpaths, however Option 2 also results in multiple interactions with the Saxon Shore Way which was identified as a valuable asset during consultation with Dover District Council and Thanet District Council during the Thanet Extension EIA Evidence Plan. The Saxon Shore Way is a 160 mile (257km) long route from Gravesend, in North Kent, to Hastings in East Sussex and aligns in the Sandwich area landfall.

4.9.21 Option 1 and Option 2 both result in interactions with Sustrans cycling routes. Option 1 would require mitigation in the form of a short-term minor deviation of Regional Route 15 which runs around the Isle of Thanet and south to Sandwich and Whitfield. Option 2 would result in an interaction with both Regional Route 15 and National Route 1 'Garden of England' which is a long-distance cycle route connecting Dover and the Shetland Islands –– via the east coast of England and Scotland.

4.9.22 It is also of note that Option 1 results in interactions with the Pegwell Bay Country Park within which the Sustrans tracks and ECP referenced above are situated. It is anticipated that appropriate mitigation can be employed to ensure that routes through the Pegwell Bay Country Park can be maintained to ensure continued access and avoid any long-term disadvantage to users of the Pegwell Bay Country Park. These mitigation measures, could include a long-term landscape strategy which could be developed in consultation with the relevant stakeholders to avoid long-term impacts to the Pegwell Bay Country Park.

4.9.23 In summary with regards interactions for tourism and recreation receptors Option 2 would be expected to have a significantly greater impact upon recreation resources than Option 1, in particular when appropriate mitigation strategies are taken into account. Option 2 results in a greater number, and scale, of interactions with national level recreation facilities and a number of regionally important access routes when compared to Option 1.

Onshore Ecology and Onshore & Intertidal Ornithology

4.9.24 Dover District Council identified in their scoping opinion (February, 2017) that further information is needed regarding 'the gap' between the two golf links present on the southern (Option 2) landfall, in particular given the various designations along the coast (Ramsar, SAC, SPA, SSSI). Dover District Council also identified that Option 2 would result in a second encounter of the designated areas again at New Downs Farm and at the River Stour crossing north of Back Sand Point, and potential impacts on densities of golden plover which are known to use inland fields crossed by Option 2 at high tide as illustrated in Figure 4-9.

4.9.25 Both Option 1 and Option 2 routes were recognised as requiring a HRA because of the presence of European designated sites at both landfalls. The consideration of the potential works and the interaction and potential impacts arising from the cable route highlighted the potential for Likely Significant Effect (LSE) to arise on a number of International/ European/ nationally important sites as listed in Table 4.8. Whilst Option 2 was considered as potentially affecting fewer individual high sensitivity sites than Option 1, it was recognised as impacting a larger land-area of these sites, multiple interactions with the same sites, and in particular interactions with the designated features themselves, such as the sand dune features designated in this area and forming designated features of the Sandwich Bay SAC.

4.9.26 The sand dunes stretch from the mouth of the River Stour to Deal and are noted as comprising the most outstanding botanical habitat within the Sandwich Bay to Hacklinge Marshes SSSI, and Sandwich Bay SAC. The dunes and associated dune slacks and coastal grassland support a distinctive flora with species including crown garlic *Allium vineale*, vipers bugloss *Echium vulgare*, sea holly *Eryngium maritimum* and restharrow *Ononis repens*, whilst the nationally rare lizard orchid *Himantoglossum hircinum* and bedstraw broomrape *Orobanche caryophyllacea* also have their largest British colonies here.

4.9.27 The presence of the dune systems and associated botanical diversity has a lower degree of certainty associated with any mitigation measures, and thus results in greater risk of potentially unforeseen effects. The need for HDD entry/ exit pits to facilitate a crossing of the River Stour, in addition to introducing access roads, contribute towards this uncertainty. Not only is it uncertain where a suitable HDD 'entry pit' could be located that did not involve excavation of potential relict dune systems but the underlying geology more generally is considered at risk of collapse during HDD and therefore release of drilling fluid or failure of HDD completely. In general terms it was considered that whilst the areas of search associated with Options 1 and 2 both result in risks to the dune systems and associated flora and fauna, the area in Stonelees was considered to represent a shorter route that could be mitigated (through sidecasting of trenched material) more readily and with a greater level of certainty. Furthermore, the associated access roads for Option 2 were considered to result in a greater level of effect, albeit temporary, than those associated with Stonelees.

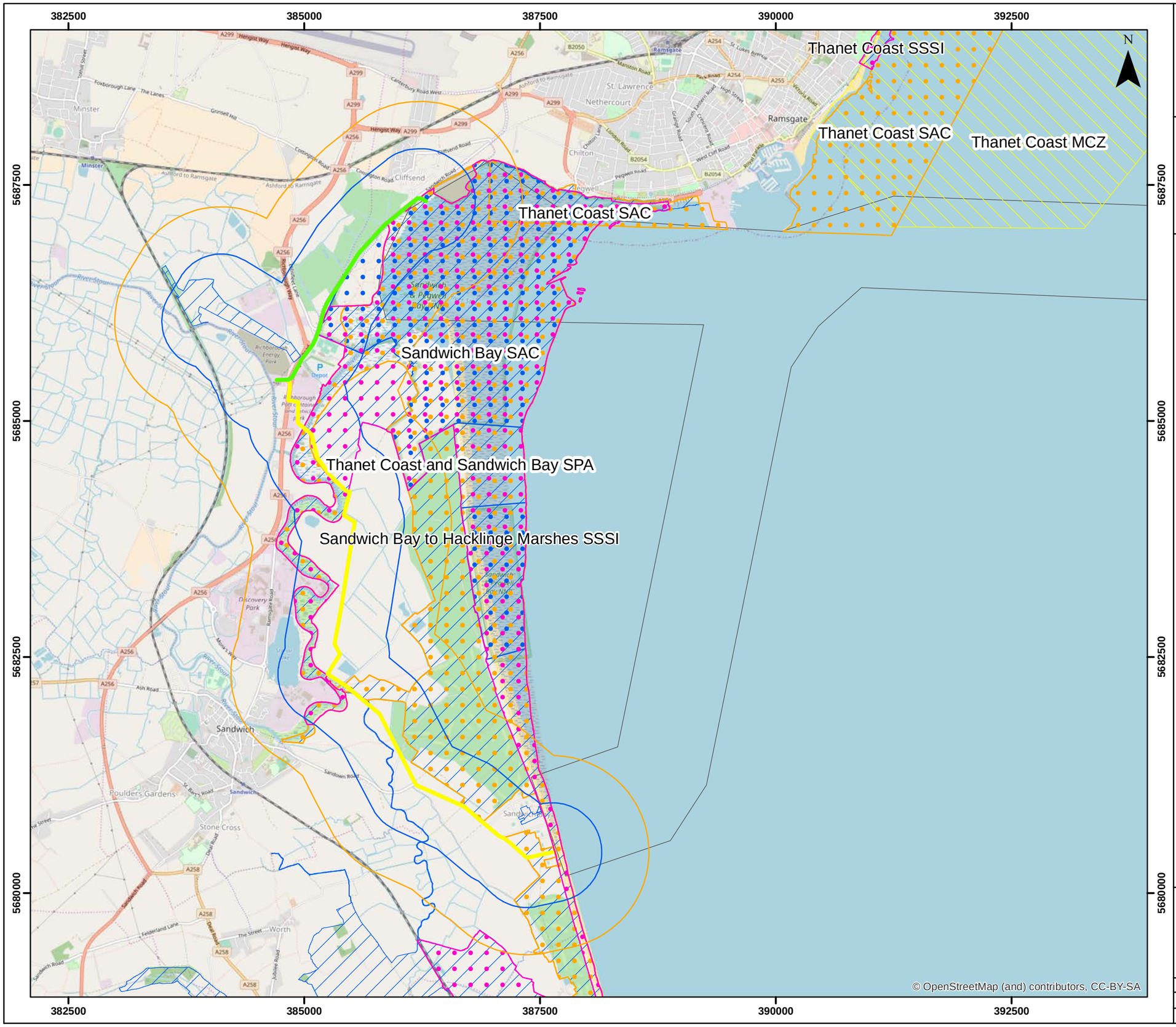


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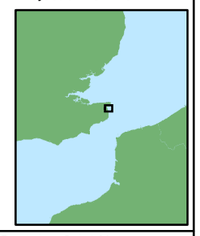
Figure 4.9

Location of designated sites in relation to Options 1 and 2

Legend

- Option 1 onshore cable route
- Option 2 onshore cable route
- 1000m buffer around 25m corridor
- 500m buffer around 25m corridor
- Special Protection Area
- Special Area of Conservation
- Marine Conservation Zone
- Sites of Special Scientific Interest
- National Nature Reserve
- Scoping offshore cable corridor

Datum: ETRS 1989
Projection: UTM31N



1:40,000 0 0.4 0.8 km 0 0.2 0.4 nm

Drg No	Figure_4.9_Designated_Sites		
Rev	0.1	Date	25/05/2018
By	LS	Layout	N/A

Figure 4.9

4.9.28 Option 1 does not interact with any of the designated features of the Sandwich Bay SAC or the areas of botanical interest recorded within the SSSI. Option 1 does however interact with the intertidal mudflats, areas of *Salicornia* saltmarsh, and areas of saltmarsh dominated by the 'rank' cord grass *Spartina* in the upper intertidal. The former, intertidal mudflats, are not a named feature of the site but are recognised as forming an important supporting habitat during the important overwintering period, in particular for golden plover and turnstone which form features of the Thanet Coast and Sandwich Bay Ramsar and SPA. As described in further detail in Volume 3, Chapter 5 Onshore Biodiversity (Document Ref: 6.3.5) this important period is well defined, and there are a number of precedents both at a national and site-specific level which indicate that mitigation in the form of a seasonal restriction is, whilst representing a time and cost risk to the project, a simple and successful form of ecological mitigation. Seasonal restrictions in Morecambe Bay, the Wash, and indeed at Pegwell Bay for the Nemo interconnector project are considered to provide appropriate, enforceable, and successful mitigation.

4.9.29 Furthermore, whilst the installation of other cable infrastructure in Pegwell Bay is not considered to set a precedent, the monitoring of saltmarsh recovery for the existing Thanet Windfarm cables has demonstrated rapid recovery following the installation of two export cables. This therefore gives confidence that where disturbed the saltmarsh will recover rapidly following installation of the Thanet Extension export cables.

Table 4.8: Summary of interactions with designated sites

Option 1	Option 2
Thanet Coast SAC	*No interaction*
Thanet Coast and Sandwich Bay Ramsar Site	Thanet Coast and Sandwich Bay Ramsar Site
Thanet Coast and Sandwich Bay SPA	Thanet Coast and Sandwich Bay SPA
Sandwich Bay SAC	Sandwich Bay SAC
Sandwich Bay to Hacklinge Marshes SSSI	Sandwich Bay to Hacklinge Marshes SSSI
Pegwell and Sandwich Bay NNR	Pegwell and Sandwich Bay NNR
Roadside Nature Reserve (RNR): Stonelees (A256)	*No interaction*
No interaction	Woods and Marshes, Minster Marshes LWS This asset is located within the 500m area of interest buffer.

4.9.30 Due to the nature of the landfall locations there is also the risk of longer term structural changes. For Option 1 or 2 there is the risk of some loss of upper intertidal habitat to accommodate project infrastructure such as the TJBs which house the export cable as it transitions from the offshore to the onshore cable. In the case of Option 1 it is considered that if sensitively sited in areas of lower grade saltmarsh, combined with a contribution towards the wider management of the site such as supporting reinstatement of *Salicornia* in areas dominated by *Spartina* through habitat management it is possible to minimise the effect of the long-term habitat loss. In the case of Option 2 due to the supralittoral shingle bank in addition to the need to house the TJB either within, or just inshore of, the shingle bank the approach to shore would require either HDD or trenching, with trenching always maintained as the 'worst-case' in case of HDD failure. The options available to contribute towards the wider management of this area of beach and biodiversity action plan habitat of supralittoral/vegetated shingle are comparatively limited.

4.9.31 In terms of effects on the key sensitive areas solely within the onshore (terrestrial) environs, the outline appraisal identified Option 1 as potentially having lesser effects as Option 2 results in a greater number of interactions with the features of the Sandwich Bay to Hacklinge Marshes SSSI and Sandwich Bay SAC habitats. Specifically, the dune habitat and associated botanical interest. Option 1 has the potential to adversely affect a number of areas of ecological value including direct effects and indirect effects on qualifying features resulting in the identification of LSE for four Natura 2000 sites (Thanet Coast and Sandwich Bay Ramsar Site and SPA, Sandwich Bay SAC and Thanet Coast SAC). The onshore Option 1 sections cross fewer designated sites than the Option 2 onshore sections, however the key impacts for Option 1 relate also to the intertidal areas, rather than the onshore route in isolation. Effects for Option 1 would be significant in the absence of suitable mitigation, however as described above in paragraph 4.9.28 and summarised below in paragraph 4.9.34 mitigation for Option 1 has a high degree of confidence associated with it. A local non-statutory site (RNR) would also be directly affected by Option 1.

4.9.32 Option 2 has the potential to adversely affect a number of areas of ecological value including direct effects and indirect effects on qualifying features resulting in the identification of LSE for three Natura 2000 sites (Thanet Coast and Sandwich Bay Ramsar Site and SPA and Sandwich Bay SAC). Onshore, Option 2 potentially affects fewer designated sites than Option 1 overall, however onshore, Option 2 crosses these sites in greater extent and frequency when compared with Option 1. Furthermore, the interaction with the designated features is considered important. Of particular note is that Option 1 contains large areas of intertidal mudflat that, whilst forming part of the National Nature Reserve, are not recognised in the international designations and do not form priority habitats, as illustrated in Figure 4-10. Option 2 however is noted as resulting in crossing not only the priority habitat[3] intertidal mudflat, which Option 1 does not, but also the coastal sand dunes and coastal vegetated shingle. The latter as identified in 4.9.30 is an important habitat that is recognised as being sensitive to physical disturbance. The sensitivity in the regional context is identified as an important factor within the Site Improvement Plan for the Dungeness SAC and Dungeness to Pett Level SPA which is identified as important for vegetated shingle, little tern (for which it is recognised the Sandwich Bay SPA does not currently support as noted within the Site Improvement Plan North East Kent (Thanet) (Natural England, 2014)) which utilise the vegetated shingle. Given the sensitivity of the habitat, combined with uncertainty over the success of HDD due to the underlying geological heterogeneity, it was considered that Option 2 performed less favourably in the appraisal for this specific element of ecological constraint.

4.9.33 Option 2 would require interactions with priority habitats, and the designated features within the internationally and nationally important sites. Whilst the NNR in particular is recognised as containing important inter-tidal mudflats, saltmarsh, shingle beach, sand dunes, ancient dune pastures, chalk cliffs, wave cut platform and coastal scrubland it is clear that Option 2 interacts directly with priority mudflats, the shingle beach, sand dunes at multiple and extensive locations, and the ancient dune pastures. Option 1, with the offshore refinements noted in section 4.12, avoids the priority intertidal mudflats, avoids the shingle beach, avoids the sand dune systems, minimises interaction with ancient dune pastures, avoids the chalk cliffs, and avoids the wave cut platforms and chalk reefs that form part of the MCZ complex. It is noted that either option would result in interaction with coastal scrubland.

4.9.34 If intertidal areas are considered further, in the absence of any mitigation and appropriate contribution towards the management of the wider conservation objectives, then Option 2 is preferred to Option 1. However, as a result of the certainty associated with the implementation of effective mitigation (beneficial temporal work scheduling in combination with habitat restoration and enhancement as per the existing Thanet and Nemo landfalls), Option 1 performs better than Option 2. Whilst it was considered that mitigation could be employed to offset or compensate for the effects in Option 2, complete success in restoration of some habitat types cannot be guaranteed and therefore has lower certainty associated with it.

4.9.35 The substation effects apply equally to both options, however there would be a greater cumulative effect on the Sandwich Bay and Hacklinge Marshes SSSI with Option 2 (with both substation and Option 2 route corridor affecting the SSSI directly).

4.9.36 Therefore, in respect of onshore ecology and ornithology and with the implementation of adequate and effective mitigation for effects on intertidal areas and dependent species, it was concluded that Option 1 performed better than Option 2.

4.9.37 This conclusion was drawn on the basis that whilst the NNR and wider nationally and internationally designated sites are clearly important, there is a need to focus not only on the boundaries of the designated sites or the number of designations, but the designated and priority habitats themselves. With the introduction of appropriate and agreed mitigation in the form of a seasonal restriction and habitat reinstatement, the potential impacts on overwintering birds present on the non-designated intertidal mud habitat and saltmarsh habitat can be successfully mitigated.

[3] This is a spatial dataset that describes the geographic extent and location of Natural Environment and Rural Communities Act (2006) Section 41 habitats of principal importance.

631500 633000 634500 636000 637500

163500 162000 160500 159000

Pegwell Bay
Mud & Sand
Cottington Hill
St Augustine's Well
Coastal
st Cliff
inster Marshes
RIVER STOUR
Solar Farm
Sewage Works
Ebbsfleet
(Traditional site of the Landing
of the Saxons & St Augustine 597)
Grid Sta
Stonar Cut
Richborough Fm
Richborough Cas
ROMAN FORT
AMPHITHEATRE
Saxon Shore Way
A 256
Back Sand Point
34
37
38
SANDWICH BAY
Great Stonar
Broad Salts
Sluice
A 257
SANDWICH
Great Poulders Fm
Cemy
Wks
LC
MS
Mus
N

631500 633000 634500 636000 637500

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Figure 4.10
Onshore and Intertidal Priority Habitats

Legend

- Priority Habitat Inventory - Coastal Saltmarsh (England)
- Priority Habitat Inventory - Coastal Sand Dunes (England)
- Priority Habitat Inventory - Coastal Vegetated Shingle (England)
- Priority Habitat Inventory - Maritime Cliffs and Slopes (England)
- Priority Habitat Inventory - Mudflats (England)
- Priority Habitat Inventory - Lowland Fens (England)
- Priority Habitat Inventory - Deciduous Woodland (England)

Datum: OSGB 1936
Projection: BNG

1:25,000 0 0.65 1.3 km

Drg No	Figure_4.10_Priority_Habitats			**Figure 4.10**
Rev	0.1	Date	25/05/2018	
By	LS	Layout	N/A	

Historic Environment

4.9.38 Both options were considered as having the potential to affect designated heritage assets, known archaeological remains, previously unrecorded archaeological remains, and deposits of geoarchaeological significance or deposits potentially containing Palaeolithic material.

4.9.39 In the appraisal of potential effects on archaeological receptors it was considered that Option 1, without mitigation, could potentially affect demonstrably significant archaeological remains. It was however concluded that the relatively lower density of identified archaeological heritage assets in Option 2 was likely to be the result of the absence of prior investigation. Option 2 was considered to have the potential to directly and adversely affect designated heritage assets at Sandwich, Sandwich Bay and Stonar. These effects were considered to be factors in the selection of route options, although they could potentially be avoided through careful design. Any route within Option 2 could affect known archaeological remains and further, previously unrecorded archaeological remains. It is possible that this route corridor option will adversely affect deposits of geoarchaeological significance or deposits with the potential to contain Palaeolithic material.

4.9.40 Overall, the differences between the two options for the historic environment were considered to be marginal. However, due to the likely longer length of route, the potential for and the extent of disturbance was considered likely to be greater for Option 2.

Traffic and Transport

4.9.41 Access via Pegwell Bay was considered to be relatively unconstrained, with very few sensitive receptors affected by the proposed construction access route or the proposed works. There are very few dwellings situated along the route, which would be sensitive to increases in HGV traffic and pedestrian/ cycle facilities are largely segregated reducing the potential for conflict.

4.9.42 Prior to 2012, Sandwich Lane formed part of the A256 and as such, the road has been designed to accommodate relatively high levels of traffic. Given the A256 now routes around the village of Cliffsend and the flows along Sandwich Road have reduced, it is considered that the road would provide the necessary capacity to accommodate temporary construction traffic for Thanet Extension. Access via Pegwell Bay (Option 1) was therefore considered to be excellent, with very few sensitive receptors affected by the proposed construction access route or the proposed works.

4.9.43 Access via Sandwich Bay (Option 2) was considered to be highly problematic due to the high density development within Sandwich (Figure 4-12). The local roads and adjacent footways within the centre are extremely narrow, with direct dwelling access provided along certain roads, most notably Strand Street and Upper Strand Street. To mitigate the impacts of construction, highly controlled working hours would be required so that peak times could be avoided, especially during the tourist season, where visitors to the area who are unfamiliar with the ongoing works may be more susceptible to the associated highway safety issues.

4.9.44 Large vehicles would also need permission to cross the level crossing on Ash Road and would be instructed to park on the road and call ahead prior to crossing, which would increase delays for other road users.

4.9.45 Guildford Road is largely private and access would therefore need to be agreed with road owners, who could dictate working hours, which could in turn affect the construction programme.

4.9.46 The issues of being a private small scale road with associated access challenges on Guildford Road are also applicable to The Royal St George's Golf Club access road, which would be required if Option 2 was progressed.

4.9.47 Option 1 was therefore considered to perform better than Option 2, with regards traffic and transport, due to issues associated with access to Option 2 through Sandwich. Option 2 also has additional issues associated with obtaining permission to use two private roads, Guildford Road and The Royal St George's Golf Club access road, which would need to be agreed. Any access route would also need to cross a level crossing which places additional restriction and controls on traffic.

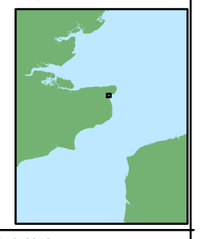
THANET EXTENSION OFFSHORE WIND FARM

Figure 4.11
Option 1 traffic and transport interactions

Legend

- Option 1 onshore cable route

Datum: OSGB 1936
Projection: BNG



1:10,000 0 0.25 0.5 km

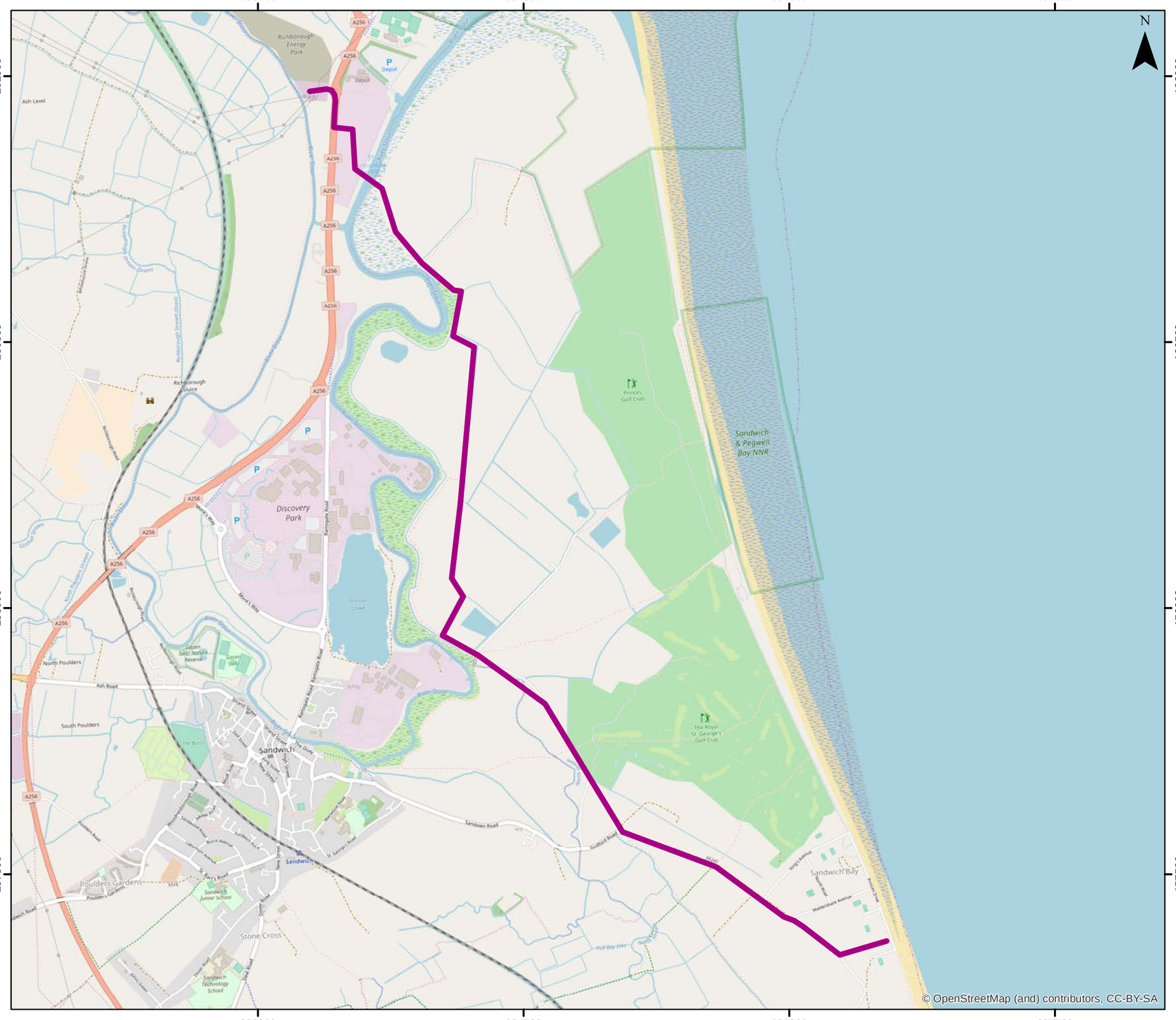
Drg No	Figure_4.11_Traffic_Option1		
Rev	0.1	Date	25/05/2018
By	LS	Layout	N/A

Figure 4.11

633000 634500 636000 637500

162000 160500 159000 157500

N



633000 634500 636000 637500

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Figure 4.12

Option 2 traffic and transport interactions

Legend

Option 2 onshore cable route

Datum: OSGB 1936
Projection: BNG

1:22,000 0 0.55 1.1 km

Drg No	Figure_4.12_Traffic_Option2			**Figure 4.12**
Rev	0.1	Date	25/05/2018	
By	LS	Layout	N/A	

Ground Conditions, Contamination, Land Use, Water and Flood Risk

4.9.48 There was considered to be potential for effects on a number of receptors from the construction of Option 2, including 'more vulnerable' flood risk receptors, water receptors, ground water receptors, and potential contamination sources. As a result of a large part of route being within a floodplain, it was considered difficult to mitigate, where a risk of revised construction methodologies/ techniques would be required.

4.9.49 Option 2 also required substantial additional works to provide suitable access across the route, including water course crossings, additional drainage and with a need to obtain relevant permits and consents. The number of potential water course crossings and water bodies increases the need for extensive and complex mitigation when compared to Option 1.

4.9.50 Option 1 was therefore considered to perform better with regards ground conditions and flood risk due to the majority of Option 2 being within floodplain, with a higher number of receptors and considered likely to be a more complex route with more complex construction techniques.

Air Quality

4.9.51 It was identified that for Option 1 there was the potential for effects on the adjacent Thanet Urban Air Quality Management Area (AQMA), residential receptors in Cliffs End, and ecological receptor sites during the construction phase. It was also considered that with adherence to best practice dust and emissions control measures, it would be possible to avoid any long-term adverse impacts on any residential receptors or ecologically designated sites. Temporary adverse effects could also be mitigated through best practice.

4.9.52 For Option 2 there was an identified potential for effects on adjacent residential receptors in Sandwich and ecological receptor sites from the construction phase. As for Option 1 it was considered that with adherence to best practice dust and emissions control measures, it would be possible to avoid any long-term adverse impacts on any residential receptors or ecologically designated sites. Temporary adverse effects could also can be mitigated through best practice.

4.9.53 In conclusion with regards air quality both routes avoid any long-term direct effects on residential receptors or ecologically designated sites. There is the potential for temporary adverse impacts associated with dust soiling and road traffic emissions in both options but standard mitigation measures are applicable. Option 2 performs slightly better with regards to air quality impacts, due to the proximity of Option 1 to the Thanet Urban AQMA, however neither option is considered to result in potential for significant effects.

Engineering

4.9.54 Whilst both options bring with them equal challenges for engineering, in terms of available construction space and existing assets within the areas of search and indicative routes, Option 1 was considered marginally less favourable initially due to a greater amount of space being available for construction for Option 2. Option 2 would however require a crossing of the River Stour which would entail HDD for each cable circuit or each cable. Option 2 would also need to cross other smaller watercourses and drains, as well as requiring routeing through areas of uncertain geology, that would result in greater uncertainty as to the viability of HDD, and would result in greater access constraints including a requirement for access roads to be constructed and single lane roads to be widened and/or reinforced. This latter point, combined with uncertain ground conditions, resulted in Option 1 being considered on balance to be more favourable.

Summary of Option 1 (North) vs Option 2 (South) Appraisal

4.9.55 Through reference to the limited consultation responses received on the two options presented in the scoping report, combined with the environmental and engineering appraisal, the conclusion of the detailed appraisal of the northern and southern options (as summarised in Table 4.9) was that Option 1 (the northern route) performed better for the vast majority of receptors. The conclusions are set out by receptor group in Table 4.9 and it can be seen that whilst Option 1 performed better in the appraisal for the vast majority of receptors it was generally balanced. The exceptions to this were LVIA and Tourism and Recreation for which it was considered Option 1 performed better due to the reasons already presented in this appraisal.

4.9.56 All receptor groups were considered in reaching this conclusion however the appraisal of potential effects on ecological receptors was of particular importance during this stage. This appraisal was influenced by the need to apply ecological mitigation across both options, with precedents set at the northern route providing greater certainty as to the likely success of the mitigation. Specifically, it has been recognised during EIA Evidence Plan meetings that a seasonal restriction within the intertidal area at Pegwell Bay could successfully mitigate potential effects on over-wintering birds. It is also recognised that whilst areas of saltmarsh will be disturbed, noting that in some areas there will be a permanent loss, disturbed saltmarsh is expected to recover within two years, as recorded within the TOWF saltmarsh monitoring reports (Royal Haskoning, 2011, 2012).

4.9.57 Based on the appraisal of the offshore and onshore constraints associated with the two landfall options it is clear that whilst it may be technically feasible to connect from the Thanet Extension array to the Richborough substation via either landfall option, Option 1 is preferable from a technical, consenting and commercial perspective[4]. Option 1 was therefore taken forward to the next stage of the site and route selection process and formal consultation.

Table 4.9: Summary of option 1 (northern) vs option 2 (southern) route appraisal

Receptor group	Summary
LVIA	Northern route was considered more favourable based on fewer medium to long term effects on treelines, and fewer short term effects on visual receptors.
Socioeconomics	Northern route and southern route were very comparable but the northern route was marginally more favourable based on fewer interactions with road networks and recreation businesses with the associated 'knock on' effects on those businesses, noting that the Pegwell Bay Country Park is considered in the context of a business, a recreational asset, and ecological interest.
Tourism and Recreation	Northern route was considered more favourable based on fewer interactions with nationally important recreational cycle and foot paths, and local recreation businesses.
Onshore Ecology and Onshore & Intertidal Ornithology	Northern route and southern route were very comparable but the northern route was marginally more favourable based on fewer interactions with the designated features within designated sites.
Historic Environment	Northern route and southern route were very comparable but the northern route was marginally more favourable based on increased uncertainty of 'unknown' historic assets.
Traffic and Transport	Northern route was considered more favourable based on fewer effects on road networks with limited capacity.
Ground Conditions, Contamination, Land Use, Water and Flood Risk	Northern route was more favourable on the basis of the majority of the southern rote being within floodplains.
Air Quality	Northern route and southern route were very comparable but the northern route was marginally more favourable based on greater dust spoiling and traffic emissions.
Engineering	The northern route was considered to be more favourable on the basis of simplified road network access, less uncertainty on ground conditions, and avoidance of HDD under a primary river in areas known to have a greater risk of sand soils and the associated rick of drill profile collapse.

4.10 Stage 5 - Refinement of Project for PEIR; S42 and S47 consultation (Phase 2 consultation)

Array

4.10.1 The Proposed Thanet Extension array Red Line Boundary (RLB) remained unchanged for formal consultation and was taken forward within the PEIR.

Offshore Export Cable Corridor

4.10.2 Due to potential concerns with regards 'unidentified contacts[5]' within the area close to Ramsgate Harbour, and a desire to provide for a crossing in deeper water the Thanet Extension Offshore Export Cable Corridor (OECC) was expanded to include the option to cross the existing TOWF (and the then proposed replacement cables for TOWF[2]) as well as Nemo cables further offshore. The option providing a crossing close to Ramsgate Harbour, was considered to have a combination of issues in terms of the number of potential unexploded ordnance represented by the 'unidentified contacts', proximity to Ramsgate Harbour itself (in particular in light of the need at that time to install new cables for the existing TOWF), and implications in terms of reduction of navigable depth in shallower water if cable protection is required.

[4] As noted in the Consultation Report (Document Ref: 5.1) this view was also shared by Dover District Council, and accepted by Thanet District Council

[5] The term 'unidentified contacts' refers to the interpretation of magnetometer survey data in which metallic objects are identified on the seabed. The unidentified contacts can frequently be jetsam, which is to be expected in proximity to a harbour but can also represent unexploded ordnance.

4.10.3 As a result, of these constraints a revised RLB in which the OECC was expanded to include the 'elbow' was brought forward for consultation with the Thanet Extension EIA Evidence Plan. The addition of 'the elbow' was specifically to allow for cables to route either in proximity to Ramsgate Harbour or to cross existing infrastructure further offshore. Following consultation with the Thanet Extension EIA Evidence Plan panel members, and agreement on utilisation of existing Nemo data, the boundary of the OECC was amended to align with the Nemo data coverage and limit gaps in data coverage. that would mean a prohibitively constrained space was available. Furthermore, it was noted that the scoping opinion had raised concerns with regards the potential loss of land at the Sandwich Bay to Hacklinge Marshes SSSI due to the location of the substation.

4.10.4 The proposed development boundary of the OECC route, providing for a crossing of Nemo offshore or onshore, and the array for the purpose of PEIR was therefore as illustrated in Figure 4-13.

Onshore substation

4.10.5 Following the scoping phase and subsequent decision to pursue the northern option it was recognised that the proposed substation location at REP was subject to increasing space constraints that would mean a prohibitively constrained space was available.

4.10.6 VWPL undertook further consultation with regards the proposed substation location at REP, consulting with the REP stakeholders, and undertook an appraisal of potential locations in the close vicinity that would reduce the interaction with the SSSI whilst also providing greater site layout flexibility than the constrained REP site. During this appraisal of the surrounding area within a 1km area of search the Richborough Port area was identified as representing the most reasonable alternative with greater flexibility for layout, existing screening already present, and a reduced interaction with landscapes and important footpaths to the east and north of REP, whilst also representing a reduced interaction with the SSSI. Initial discussions with the landowners suggested that an agreement to utilise the land for the purposes of a substation could be reached.

4.10.7 The decision was therefore made to bring forward the alternative Richborough Port site as the location of the onshore substation. This amendment was notified to the members of the Thanet Extension EIA Evidence Plan technical groups on the 11th July 2017, with confirmation provided that this change in location remained within the study areas as defined within the scoping report.

4.10.8 The final substation location for the purposes of PEIR was therefore altered from the Area of Search associated with REP to the Richborough Port area, as illustrated in Figure 4-14. As can be seen REP remains within the RLB to facilitate the onward 400 kV cable route to the NGET connection point.

4.10.9 It should be noted that prior to the substation changing location a number of onshore cable routes had been brought forward for consideration. The process of changing substation location and onshore cable route was therefore undertaken in parallel. The following sections detail the onshore cable analysis of alternatives in its entirety for completeness.

Onshore cable route

4.10.10 In parallel with the decision to relocate the onshore substation, the area of search comprising Option 1 was subject to further feasibility analysis and a number of route options were considered to refine the landfall and onward route from the wide Option 1 area of search to an option. This appraisal of onshore cable routes was undertaken within the wider area of search defined at scoping and considered ongoing data collection and engineering assessments. Following an initial engineering workshop conducted prior to the substation relocation, review of high level constraints was undertaken and a series of routes were identified for further consideration (see Figure 4-15):

- Option 1A – Landfall in Pegwell Bay Country Park, above ground through Pegwell Bay Country Park, open trench through Stonelees SSSI and Baypoint Club, HDD to REP (HDD03);
- Option 1B – landfall at Jet garage Cliffsend, trench along Sandwich Road (scoping report route);
- Option 1C – HDD landfall through to fields west of the St Augustines golf course, open trench, HDD to REP;
- Option 1D – HDD landfall, open trench, HDD to REP; and
- Option 1E – HDD landfall into Baypoint Club, open trench across playing fields, HDD to REP.

4.10.11 The lengths of each potential route to the Richborough Port substation location, noting that the initial proposal was to connect at the REP, are presented in Table 4.10.

Table 4.10: Potential lengths of onshore cable route options under Option 1 Pegwell Bay

Route/Option	Potential length to Richborough Port
Option 1A	2.3 km
Option 1B	2.4 km
Option 1C	3.1 km
Option 1D	3.2 km
Option 1E	2.0 km

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Figure 4.13

Final offshore export cable corridor for PEIR

Legend

PEIR Offshore Development Boundary

Datum: ETRS 1989
Projection: UTM31N

1:120,000 0 1 2 km 0 0.7 1.4 nm

Drg No	Figure_4.13_OECC		
Rev	0.1	Date	25/05/2018
By	LS	Layout	N/A

Figure 4.13

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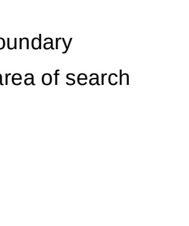
Figure 4.14

Comparison of substation area of search (scoping) with final substation location

Legend

- Onshore Red Line Boundary
- Onshore substation area of search (scoping)

Datum: OSGB 1936
Projection: BNG



1:8,000 0 0.2 0.4 km

Drg No	Figure_4.14_Final_Substation		
Rev	0.1	Date	25/05/2018
By	LS	Layout	N/A

Figure 4.14

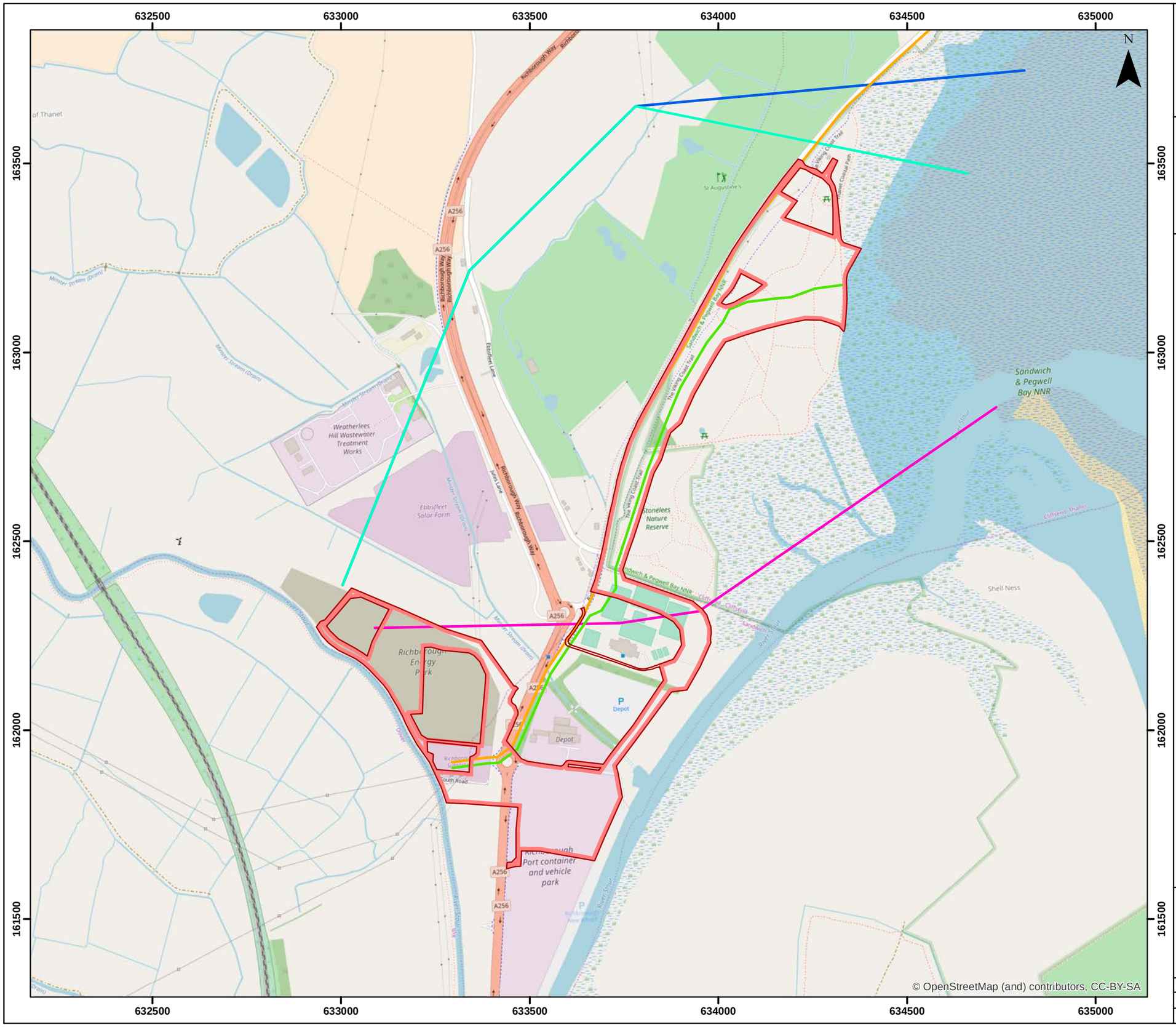


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Figure 4.15

Northern route options compared to final proposed onshore development boundary

Legend

- Onshore Red Line Boundary
- Option 1A
- Option 1B
- Option 1C
- Option 1D
- Option 1E

Datum: OSGB 1936
Projection: BNG

1:10,000 0 0.25 0.5 km

Drg No	Figure_4.15_Northern_Route		
Rev	0.1	Date	25/05/2018
By	LS	Layout	N/A

Figure 4.15

Option 1A – Landfall in Pegwell Bay Country Park, above ground through Pegwell Bay Country Park, open trench through Stonelees SSSI and Baypoint Club, HDD to REP.

4.10.12 Option 1A proposes a landfall at the periphery of the Pegwell Bay Country Park and an adjustment to the sea defence to aid in transitioning from the offshore export cable to the onward onshore export cable. It is also necessary to avoid disturbance of the underlying landfill. The adjustment would require a permanent loss of saltmarsh habitat during the operational lifetime of the project due to the need to avoid the landfill lying under the Pegwell Bay Country Park, and to accommodate the TJB. The area of saltmarsh is a supporting habitat for the wider SPA however the area was identified by the EIA Evidence Plan panel as being of lower biodiversity and habitat value when compared to saltmarsh to the north and south. Other locations along either the sea defence, or further to the north result in an interaction with a small water body, interactions with Nemo and the Thanet cables/ Thanet replacement cables, and further north result in an interaction with more biodiverse areas of saltmarsh (EIA Evidence Plan Panel) or with former hoverport which is recognised to represent a risk of contaminant disturbance. The landfall location at the Pegwell Bay Country Park therefore represents the shortest distance through the saltmarsh area, and interaction with the lowest value habitat.

4.10.13 The option required an above ground bund to be created through Pegwell Bay Country Park before then undergrounding (via trenching) through the Stonelees Nature Reserve/ SSSI and Baypoint Club grounds. The same approach has been adopted by the Nemo cable and the likely success of mitigation measures to minimise effects on the Nature Reserve and/ or appropriate landscape and ecological planting is considered high.

4.10.14 Following initial consultation with Kent Wildlife Trust (KWT) (July 2017) it was also considered that Nemo could be crossed in the Pegwell Bay Country Park and a route taken between Nemo and Sandwich Road. KWT identified at this stage that the area to the west of the Pegwell Bay Country Park was primarily non-native species scrub and a cable route through this area could result in a net gain to the Pegwell Bay Country Park through clearance and appropriate planting (native species) post-installation of the Thanet Extension cable. However, it was noted that a crossing of Nemo, when considered in the context of the potential height necessary to minimise thermal interactions between the cables, had the potential to create significant landscape and visual effects.

4.10.15 Following further constraints analysis, it was considered that whilst this suggested option would reduce interactions with the Stonelees NNR/ SSSI during the construction phase it would also result in larger long-term changes within the Pegwell Bay Country Park due to the need to cross the Nemo Interconnector, as well as potentially increase interactions with second World War archaeological features. At this stage the suggested option was not taken forward and was therefore ruled out.

4.10.16 Option 1A represented a long-term change to the Pegwell Bay Country Park with the introduction of bunds that will be present throughout the operational period however it was considered that the above ground bund, in the absence of a crossing of the Nemo interconnector, could be designed in such a way as to minimise the height and manage potential access and visual impacts. There are also short-term construction impacts to the Stonelees Nature Reserve area, which also forms part of the Pegwell Bay National Nature Reserve, and the Sandwich Bay SPA. Mitigation measures may be required within the Stonelees Nature Reserve area to reduce impacts.

4.10.17 With the introduction of the Richborough Port substation location Option 1A represented the shortest route from landfall to the substation.

Option 1B – landfall at Jet garage Cliffsend, trench along Sandwich Road (scoping report route)

4.10.18 Option 1B was considered an optimal route due to the ability to avoid risks associated with HDD and the ability to bring the cables to landfall in areas of saltmarsh that were recognised as having high recoverability, as identified in the monitoring undertaken for the existing TOWF. Following consultation with the Nemo connector and the operators of the existing TOWF export cable it became apparent that as a result of the Nemo landfall location, the need to replace the existing Thanet export cables, the presence of the petrol station and the residential area of Cliffsend, a number of constraints were present that created a 'pinchpoint' followed by other pinchpoints for cables crossings elsewhere in Sandwich Rd. The latter stages of Option 1B were also considered challenging due to the requirement to pass through the Stonelees Golf Centre, sections of which are a former landfill, and HDD/ use of trenchless techniques under the bypass. In addition, due to a number of other constraints understood to be present within the road, including a potential waste water pipe, and pipe to serve a biomass plant, Option 1B was discounted. Further studies were commissioned in order to establish whether any flexibility was available in other sections of Sandwich Road, south of the petrol station. The outputs of these studies are provided as a cable ratings study (Document Ref: 6.1.4.1).

Option 1C – HDD landfall through to fields west of the St Augustines golf course, open trench, HDD to REP

4.10.19 Option 1C proposed an HDD from the intertidal area east of the petrol station 'punching out' west of the St Augustines golf course, before trenching towards the bypass and REP. A second HDD would then be required underneath the Southern Water treatment plant and Sandwich Bay and Hacklinge Marshes SSSI before entering the REP. This option represented potential risks of HDD failure/ cable pull in issues due to the long initial HDD profile (~ 900 m). The second HDD also brought with it a risk of failure due to uncertain ground conditions, and a risk of significant noise effects on the residential receptors present on Ebbsfleet Lane. Following the transition from the initial substation location at REP to the proposed substation location at Richborough Port, Option 1C was no longer considered appropriate due to the onshore length of cable and the potential risk of HDD failure.

Option 1D – HDD landfall through to fields west of St Augustines, open trench, HDD to REP

4.10.20 Option 1D also proposed an HDD from the intertidal area east of the petrol station 'punching out' west of the St Augustines golf course, before trenching towards the bypass and REP. This option was brought forward in an attempt to reduce the initial length of HDD, however it resulted in a risk of requiring an HDD compound within the saltmarsh area and in close proximity to the Nemo cable. As with Option 1C a second HDD would then be required underneath the Southern Water treatment plant and Sandwich Bay and Hacklinge Marshes SSSI before entering the REP. This option also gave rise to potential risks of HDD failure/cable pull in issues due to the long initial HDD profile (~750m). The second HDD also brought with it a risk of failure due to uncertain ground conditions, and a rick of significant noise effects on the residential receptors present on Ebbsfleet Lane. As with Option 1C following the transition from the proposed substation location being at REP to the final substation location at Richborough Port, Option 1D was no longer considered appropriate due to the onshore length of cable and the potential risk of HDD failure/ cable pull in issues.

Option 1E – HDD landfall into Baypoint Club, open trench across playing fields, HDD to REP

4.10.21 Option 1E was considered as part of an analysis of historic erosion and accretion of the estuary mouth of the River Stour, and whilst potentially feasible to HDD from the intertidal zone to the Baypoint Club the risk of the buried cable assets becoming exposed was high during the O&M phase due to the mobility of the river estuary. There was also considered to be a significant a risk of HDD failure/ cable pull in issues, which would then result in the need to trench through large areas of sensitive habitat, including the saltmarsh and identified seal haul-outs. Therefore, this option represented potential risks of HDD failure/ cable pull in issues due to the long initial HDD profile (~ 900 m) with HDD under areas of saltmarsh being recognised as challenging and therefore requiring a contingency measure, trenching, to also be included within the construction options. Trenching of ~ 900 m through saltmarsh was considered to have potential significant effects, with limited options for successful mitigation. As a result of this initial appraisal Option 1E was discounted.

Pegwell Bay Landfall conclusion

4.10.22 As a result of the understanding of constraints within Sandwich Road (as detailed in the cable ratings study, Document Ref: 6.1.4.1), combined with the alteration in the substation location Option 1B was considered not feasible in the format proposed at that time. As a result of distance and risk of HDD failure/ cable pull in issues, options 1C and 1D were also discounted. Finally, as a result of potential significant effects, HDD failure and long-term challenges in protecting the cable in a mobile seabed environment Option 1E was also discounted.

4.10.23 Option 1A was therefore taken forward as the most viable route for further consultation with the EIA Evidence Plan panel. Following consultation with KWT (August 2017) on the proposed final route KWT re-iterated that the crossing of Nemo and transit either to the west of Nemo or in the Sandwich Road would represent a preferred option when compared to trenching through Stonelees NNR/ SSSI. KWT also considered that a crossing of Nemo could be sensitively landscaped and, subject to appropriate planting, would result in a net gain to the Pegwell Bay Country Park. The preference stated was to employ a similar approach to that employed by the Nemo project and instate chalk grassland planting over the cable bund and area of cable crossing. At the same time, initial results from the Sandwich Road constraints analysis suggested that whilst not optimal from an engineering feasibility perspective due to the presence of services and TOWF export cables within the carriageway, a transit in the southern section of Sandwich Road may potentially be feasible.

4.10.24 Following the consultation with KWT and the initial results of the Sandwich Road feasibility studies referred to in paragraph 4.10.18 it was concluded that subject to final technical constraints analysis both the option to cross Nemo as requested during consultation, and the option to run to the east of Nemo (Option 1A) were feasible. VWPL therefore made a decision at this stage to consult on two onshore export cable routes as part of the S42 and S47 statutory consultation phase.

4.10.25 As noted below in section 4.12.4*et seq* the final reporting on the constraints within Sandwich Rd have revealed that the thermal interaction between TOWF cables and the proposed Thanet Extension cable within Sandwich Rd represents a significant risk to both the existing infrastructure and that of the proposed project to the extent that this is not a viable option. Figure 4-16 illustrates the additional area added to the RLB during this phase to accommodate the crossing of Nemo. The two routes taken forward for formal consultation were:

- PEIR Option 1: Nemo Crossing, transit down Sandwich Road; and
- PEIR Option 2: East of Nemo, through the country park and Stonelees

4.10.26 The proposed development boundary taken forward for formal consultation is illustrated in Figure 4-17.

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THANET EXTENSION OFFSHORE WIND FARM

Figure 4.16
Comparison between RLBs as defined during consultation

Legend

- Onshore Red Line Boundary
- Proposed onshore development boundary during consultation with KWT

633000 633500 634000 634500

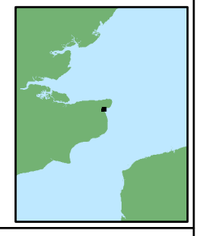
163500 163000 162500 162000

N

A256 Richborough Way Ebbsfleet Lane Jutes Lane The Viking Coast Trail Saxon Shore Way Minster Stream (Drain) River Stour Dover Sandwich & Peowell Bay NNR Cliffsend Sandwich

St Augustine's Weatherlees Hill Wastewater Treatment Works Ebbsfleet Solar Farm Stonelees Nature Reserve Richborough Energy Park Depot Richborough Substation South Road Richborough Port container and vehicle park Shell Ness

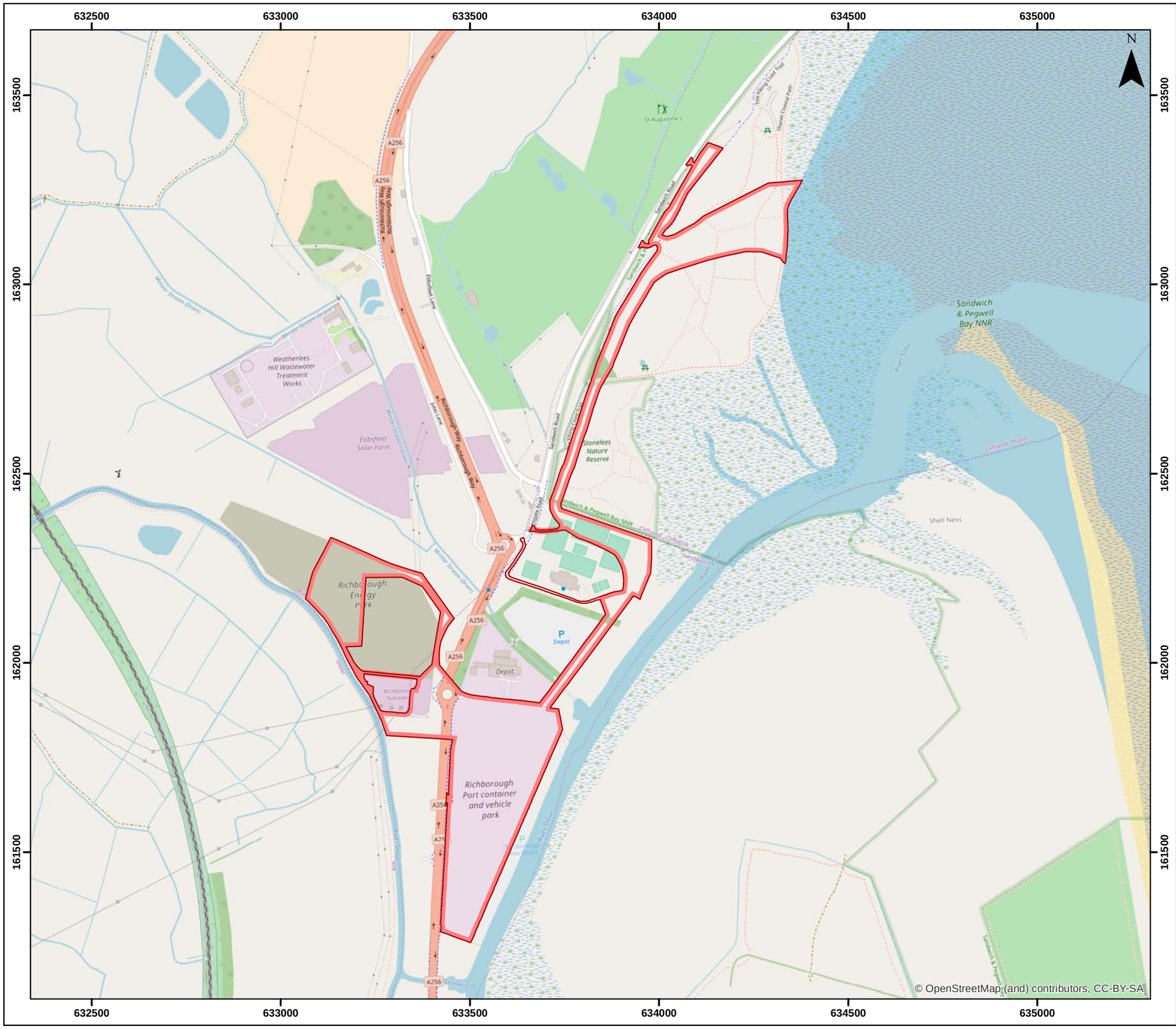
Datum: OSGB 1936
Projection: BNG



1:8,000 0 0.2 0.4 km

Drg No	Figure_4.16.RLB_Comparisons		
Rev	0.1	Date	25/05/2018
By	LS	Layout	N/A

Figure 4.16



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THANET EXTENSION OFFSHORE WIND FARM

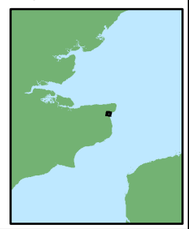
Figure 4.17

Final onshore RLB for formal consultation.

Legend

Onshore PEIR boundary

Datum: OSGB 1936
Projection: BNG



1:10,000 0 0.25 0.5 km

Drg No	Figure_4.17_Final_Onshore		
Rev	0.1	Date	14/06/2018
By	LS	Layout	N/A

Figure 4.17

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THANET EXTENSION OFFSHORE WIND FARM

Figure 4.18

Final offshore RLB for formal consultation.

Legend

- Final RLB

Datum: ETRS 1989
Projection: UTM31N

1:100,000 0 1 2 km 0 0.55 1.1 nm

Drg No	Figure_4.18_Final_Export_v1		
Rev	0.1	Date	14/06/2018
By	LS	Layout	N/A

Figure 4.18

4.11 Summary of consultation prior to statutory consultation and DCO application submission

4.11.1 Thanet Extension developed and refined the project as a result of responses to the scoping exercise and information provided during bilateral and evidence plan meetings prior to submission of the PEIR and further technical appraisal. The following paragraphs provide a summary of the consultation that lead to the refinement of the project options which formed the PEIR, and have influenced the final design. The detailed consultation process is presented in the Consultation Report (Document Ref: 5.1)

4.11.2 Thanet Extension has engaged with a range of stakeholders with regards to the progress of the project and emerging project design matters. These stakeholders included:

- The Planning Inspectorate;
- Thanet District Council;
- Dover District Council;
- Kent County Council;
- The Environment Agency;
- Natural England;
- The Marine Management Organisation;
- Kent Wildlife Trust;
- Cefas;
- Trinity House;
- Port of London Authority
- Utility Providers;
- Landowners;
- Parish Councils; and
- Members of the public through consultation events and scoping.

4.11.3 As the project progressed towards the statutory consultation stage, Thanet Extension aimed to engage with and keep key stakeholders informed about project design and the selection process for preferred options, in response to consultation feedback, and ongoing engineering, commercial and environmental investigations.

4.11.4 The design changes that have drawn specifically on consultation responses prior to formal consultation include:

- Consideration of the north-west 'promontory' of the initial boundary as illustrated in Figure 4-4. The promontory was subsequently removed from the array boundary brought forward for scoping.
- Discussions held under the auspices of the evidence plan process indicated that landfall areas to the north of Pegwell Bay were in higher quality saltmarsh habitat and at higher risk of contamination as a result of proximity to the historic hoverport site. This informed the final landfall location;
- Consideration of HDD under the saltmarsh to the south of the Country Park/ north of the Baypoint sports club. This was considered but discounted in the context of the risk of HDD failure and/or drilling fluid 'break out' over distances >900m as demonstrated at other intertidal locations;
- Consideration of a Nemo crossing. Whilst initial technical review indicated that this may result in long term effects this was brought forward for formal consultation; and
- Consideration of Sandwich Rd constraints to test technical feasibility of trenching within the road. This was brought forward for further consultation;

4.11.5 Further alternative designs have since been brought forward as a result of the feedback provided during the statutory consultation. These are provided in section 4.12 *et seq*.

4.12 Thanet Extension Stage 6: Receipt of responses to Preliminary Environmental Information (PEI)

4.12.1 Thanet Extension Stage 5 consultation material, in the form of the PEIR, was sent to all registered consultees for Thanet Extension. Stakeholders were given 42 days, 27th November 2017 to 12 January 2018, to comment on the consultation information.

4.12.2 VWPL reviewed the responses from the Thanet Extension consultation and appropriate revisions to project design and environmental studies were implemented as detailed in the following sections.

4.12.3 In parallel with the receipt of formal feedback on the PEIR the final electrical ratings report, which followed on from the preliminary reports presented in paragraph 4.10.24, was finalised. The following paragraphs describe the key outcomes of that study.

Cable ratings study

4.12.4 Whilst it was considered prior to consultation that there may be a technical solution that would enable PEIR Option 1 to be feasible, the technical studies (Document Ref: 6.1.4.1) demonstrated that even with exceptionally large cables for Thanet Extension the recommended thermal separation distance to the TOWF cables is a minimum of 3m. There is likely to be insufficient space in Sandwich Road to accommodate the existing Thanet cables, the Thanet Extension cables and utilities/services present without compromising asset integrity. Additionally, space would need to be found for joint pits, link boxes and at least one crossing of the TOWF cables within the road. This crossing in particular would introduce localised hot spots, and could impact the performance of both wind farms, increase the likelihood of cable fault/damage and associated repairs/local disruption. To avoid localised hotspots it is necessary to avoid temperatures in excess of 90ºC. Maintaining a minimum operating temperature of 90ºC* would require at least a 2000mm^2 diameter copper cable separated by at least 5 m as identified in the technical cable study (Document Ref: 6.1.4.1). It is important to also note that increasing conductor size in order to address a need to increase the thermal efficiency is a law of diminishing returns; further increases in conductor size only result in minor improvements to efficiency.

4.12.5 In order to thoroughly investigate the feasibility of PEIR option 1 a technical assessment (Document ref: 6.1.4.1) was commissioned to look specifically at the thermal interaction between TOWF cables and the proposed Thanet Extension cables. The assessment took a best case approach by identifying particularly large (in terms of cable conductor diameter) and efficient onshore cables and a best case cable layout to conclude whether this option was technically viable. Onshore cable conductors have a maximum operating temperature of 90ºC. As the temperature approaches this point cable failures are more likely and the cable rating (the amount of electricity the cable can transmit) reduces.

4.12.6 The study concluded that even when using some of the parallel separation distance between TOWF and Thanet Extension cables would need to be a minimum of 3m in order to keep conductor temperatures below 90ºC. This severely limits the ability to install Thanet Extension cables within the confines of Sandwich Road, particularly when considering the other infrastructure in the road and the requirement for joint pits and link boxes.

4.12.7 In addition, the study assessed the crossing of the TOWF cables. Cable crossings lead to localised hotspots (due to the cables close proximity to each other) and are ideally undertaken perpendicularly. A 90º crossing of the TOWF cables would take up nearly 10m in width (Figure 4-19) but most significantly would result in conductor temperatures on the TOWF cables at or within a fraction of 90ºC (Table 4.12). A 90° crossing represents the best scenario for installation which may not be practical or feasible in reality.

4.12.8 In summary the study concluded that it would not be technically advisable or acceptable to install Thanet Extension cables in Sandwich Road.

4.12.9 The results are colour-coded according to Table 4.11 with green cells indicating cable ratings which are above the required current, amber cells near but within the requirement, and red cells below the requirement.

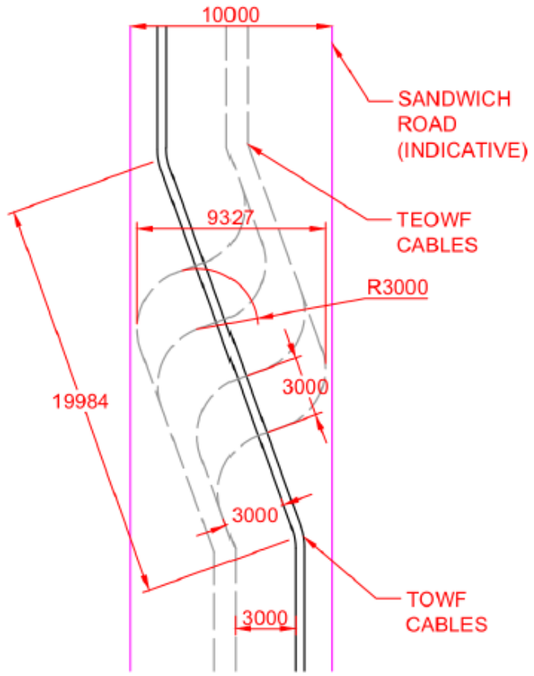

Figure 4-19 Indicative plan arrangement of TOWF crossing

Table 4.11 Colour grading for cable rating results

Colour	Description
Green	The calculated cable rating meets the current requirement, or the cable temperature is within its operating limit.
Yellow	The calculated cable rating is near but meets the requirement, or the cable temperature is near but within its operating limit.
Red	The calculated cable rating does not meet the current requirement, or the cable temperature is above its operating limit.

Table 4.12 Effect of group separation (during cable crossings) on cable temperatures

Thanet Extension group horizontal separation (mm)	Thanet Extension cable temp (°C)	TOWF cable temp (°C)
800	80.3	98.2
2,000	67.8	93.3
3,000	63.2	91.1
4,000	60.6	89.9
5,000	58.9	89.2
6,000	57.7	88.7

4.12.10 When considered in the context of the existing infrastructure within Sandwich Rd the risk of thermal hotspots is apparent at two discrete locations (Document Ref: 6.1.4.1) where the existing Thanet cables will require crossing which represents a significant risk to the proposed project infrastructure and that of existing infrastructure. Whilst the most significant infrastructure is crossing the existing Thanet cable, due to the proximity of the cable within Sandwich Road and two crossings, it is also important to note that the Nemo interconnector cable, which would also need to be crossed for this option, would also require multiple onshore crossings, and this represents a further risk on the cable rating.

4.12.11 In summary this option is very high risk, unlikely to be deliverable and presents a significant risk to the project which Vattenfall engineers and external engineering advisors have recommended should be avoided. It is not therefore considered to be a viable option. Option 1 (Nemo crossing) was therefore discounted as a result of consultation responses and engineering feasibility studies.

Withdrawal of Thanet Cable replacement

4.12.12 During this phase the TCR project was also withdrawn as described in paragraph 4.9.6[2]. The removal of the TCR project resulted in a reappraisal of Option 1B (as per section 4.10.10 *et seq*) within Pegwell Bay to confirm whether it was feasible to trench down Sandwich Rd. The reappraisal of Option 1b was conducted in the context of the Sandwich Road constraints analysis already presented in section 4.12.4 of this report, and the consultation responses received on the PEIR. Further information is provided on the changes in design and site selection in paragraph 4.12.14 *et seq* but certain key consultation responses were of relevance within the reappraisal of options within Pegwell Bay. These comprised the request received to avoid the installation of project infrastructure within the managed approaches to Ramsgate harbour, for which a 100m buffer was applied to Ramsgate harbour limits; and the request to avoid cable laying within the Thanet Coast MCZ to avoid areas of chalk substrate. The avoidance of areas of chalk reef habitat is a commitment made as a result of the formal section 42 consultation responses received from KWT, but has also been highlighted as a constraint for the existing TOWF cable that has resulted in secondary cable protection being required (Natural England, Evidence Plan Document Ref: 8.5).

4.12.13 Combined with the available sea room for cable installation, separation distances and anchor spreads are severely limited given the close proximity to Thanet cables, the cable exclusion area introduced in response to consultation responses, and the recognised constraints within Sandwich Road. The reappraisal of Option 1B in Pegwell Bay concluded that this option was not viable even in the absence of TCR.

Consultation responses

4.12.14 The responses received to the Thanet Extension consultation information identified a number of concerns of relevance to the project design and alternatives considered. The following section summarises the revisions to the project design.

Revision to the offshore array boundary

4.12.15 A revision was made to the north-west corner of the offshore array boundary as a result of *inter alia* shipping and navigation concerns. The revision has seen a reduction in the western extent of the array area to allow greater room for marine operations.

Revision to the offshore export cable corridor cable installation area

4.12.16 A revision to the offshore export cable corridor cable installation area was made as a result of feedback received from TDC regarding the approaches to Ramsgate Harbour, and from KWT regarding the presence of the Thanet Coast MCZ. it is recognised that any installation within the Ramsgate harbour approach would result in temporary effects during construction but potentially long term management difficulties of the maintained dredge channel. Furthermore, it was noted that this area sits within the Thanet Coast MCZ which is designated for, amongst other features, geogenic chalk reefs. In light of these constraints the project has introduced a cable exclusion area in which no cable will be installed, avoiding long term effects.

Reduction in proposed seawall extension

4.12.17 Whilst only required for PEIR Option 2, significant concern was raised by stakeholders regarding the larger of two seawall extension options brought forward at PEIR. The larger of the two options would facilitate the TJB to be within the saltmarsh area rather than the Pegwell Bay Country Park area, but would result in loss of low value saltmarsh habitat that has the potential to increase in value in the absence of the project. The project has therefore removed this alternative design as detailed within Volume 3, Chapter 1, Project Description – Onshore (Document Ref: 6.2.1), and committed to installation of the TJB either above ground in the Pegwell Bay Country Park or, if Site Investigation proves positive, installation of the cable underground either through the use of HDD or trenching.

Introduction of undergrounding at the landfall and Pegwell Bay Country Park

4.12.18 Following receipt of the Section 42 consultation responses, undergrounding was brought forward as an alternative design at the landfall and Pegwell Bay Country Park. Horizontal Directional Drilling (HDD) and/or open trenching was brought forward as an additional method of landfall installation to seek to avoid the presence of berms to house the TJB within the Pegwell Bay Country Park, and to reduce interactions with both the sea wall and the saltmarsh. This option was in particular brought forward to address Kent County Council's concerns with regards the long term presence of a chalk berm, and Natural England's concerns with regards the potential for loss of saltmarsh habitat at the landfall.

Discounting of the 'Nemo crossing' option

4.12.19 Whilst crossing the Nemo interconnector would avoid the short term construction phase disturbance of the Stonelees nature reserve it would introduce long term landscape and visual impacts on Pegwell Bay Country Park which were considered undesirable. Due to the need to retain an above ground option until the Site Investigation is complete and it would therefore be necessary to seek to progress the option to create a large bund structure to allow the proposed cables to cross those of the Nemo Interconnector. Therefore, as a result of the feedback received during the consultation on the PEIR, combined with the confirmation that burial within Sandwich Road was considered to be prohibitively high risk, the project discounted the option to cross the Nemo Interconnector.

Tenant relocation area

4.12.20 Following further consultation with the relevant parties and landowners the project has brought forward an extension of the Red Line Boundary south of the proposed substation to account for the need to relocate the current tenants of the proposed substation location.

Overall reduction in export cable corridor

4.12.21 Taking on board additional consultee feedback, the entire cable route was also the subject of a process with the same multidisciplinary team assessing every request for a change to the route, and seeking where possible to reduce the red line boundary. The following summarises why those modifications were implemented:

- The need for further refinement of the landfall following the identification of additional technical and environmental hurdles;
- The need to define a final route corridor, and reduce the broad corridor down to a final narrow corridor that accommodates the cable width, plus working areas either side;
- Responding to consultation feedback and requests. This has influenced many of the post PEIR route refinements;
- The requirement for construction compounds and cable construction access routes; and
- Design refinements to the HVAC substation.

Landfall temporary construction compound

4.12.22 A construction compound would be temporarily installed in the same broad location as the Transition Joint Bay in order to support the landfall works. This location was determined by the technical, environmental, and commercial decision making of the final cable landfall. The preferred site for the HDD works will be immediately adjacent to the HDD works themselves.

Substation and temporary construction compound(s)

4.12.23 If required by the prnincple contractor (PC) a main construction compound would operate for the substation, landfall, and export cable corridor. In order to maintain a range of flexible options for the construction phase, three potential sites were identified and assessed within the PEIR, whilst an additional site was identified during the PEIR consultation period.

4.12.24 The preferred site for the substation, at Richborough Port, was deemed suitable due to it already comprising hard standing for the temporary placement of site facilities and storage of plant and materials. It is also immediately adjacent to the proposed substation location. The site has direct access from the A259, a route that does not require traffic to pass through any large settlements and therefore would have minimal impact on sensitive residential receptors.

4.12.25 The site for the cable route temporary construction compound, in the Pegwell Bay Country Park, has been used previously as a construction compound by Nemo and is considered suitable due to the flat nature of the ground making it suitable for the temporary placement of site facilities and storage of plant and materials. It is also immediately adjacent to the proposed cable corridor with good access off Sandwich Road.

4.12.26 A temporary works area is proposed within the Bay Point Club to ensure that these sections of the export cable corridor within the Stonelees Nature Reserve can be constructed as rapidly as possible. It was selected on the basis that it provides a logical and sensible location, appropriately spaced along the cable corridor between landfall and the onshore substation. It has been sited to avoid environmental constraints, located away from sensitive receptors and close to the works within Stonelees. It represents open ground which is readily accessible from the Bay Point Club access roads. It has been located to fit into an area of land that might be temporarily severed or redundant during the cable construction works e.g. the corners of the recreation fields.

4.12.27 Although none of the changes resulting from the responses received were considered material, VWPL provided stakeholders with further information highlighting the changes. Further consultation and notifications were provided where changes in the RLB occurred either through reduction (as per the cable route in Stonelees), or increases as per para 4.12.23 *et seq* with regards the construction compound in the corner of the Baypoint Club, and the substation relocation area.

4.13 Stage 7 – The application boundary

4.13.1 The final cable route as presented within this Environmental Statement is the result of multi-disciplinary workshops, discussions and decision making across the entire route, in order to balance a wide range of environmental, technical, economic and social effects, to drive and derive the final export cable corridor choices. Decisions made by the multi-disciplinary team in response to consultee comments and feedback, detailed technical, commercial and environmental studies, have directly informed the preferred route alignment and selection of the landfall location and HDD option.

4.13.2 The optimum route for an onshore grid connection can be considered to be the shortest route from A to B from landfall to the main National Grid substation. The final route presented within this Environmental Statement is considered to effectively achieve this optimisation, within the environmental, technical and social constraints that have been identified along the proposed cable route corridor. The final route and DCO plans for the Thanet Extension application are provided within Document Refs 2.1 to 2.16 and in Figure 4-20.

4.14 Conclusion

4.14.1 The site selection process undertaken for Thanet Extension has concluded in the application for Development Consent for the areas and works assessed throughout this Environmental Statement. Wherever possible and practicable, VWPL has sought to accommodate concerns raised by stakeholders through the site selection process whether by adjustments to the development boundary, areas of works, or designs being considered. Examples of this regard to stakeholder consultees is evident throughout this document. The site selection process and alternatives considered have been through a process of detailed analysis of environmental, social, and engineering constraints, with key feasible alternatives taken forward for consultation either through the scoping process, the evidence plan, or through the formal consultation undertaken on the PEIR. Feasibility is an inherent part of the process and as such consultation has been on key milestones where consultation is a true consultation on alternative designs. The consultation processes undertaken are summarised in this document and provided in full detail within the Consultation Report (Document Ref: 5.1) and the Evidence Plan Report (Document Ref: 8.5).

4.14.2 As detailed in Volume 1, Chapter 3: EIA Methodology (Document Ref 6.1.3), the project has employed a maximum design scenario approach. Therefore, it is recognised that whilst the site selection process undertaken to date has included a number of refinements to the project envelope so far as practical, there remain some areas of uncertainty around the final project design.

4.14.3 Whilst the detailed design of the landfall and cable route within the Pegwell Bay Country Park has not yet been conducted, and is dependent on Site Investigation data, various documents within the application which require subsequent agreement with the relevant authorities constrain how this could be built out in future. These include:

4.14.4 Volume 2 and Volume 3, Chapter 1: Project Description (offshore and onshore respectively (Document Ref: 6.2.1 and 6.3.1)) - provides the maximum design scenario which must be complied with for each component;

- The Landscape and Ecological Mitigation Plan – provides commitments on the detailed design of key components, namely the principles that will guide the design of the surface laid berm if this option is carried forward in the final design, including specifying which body is responsible for confirming that Thanet Extension complies with these requirements;
- The Access Management Plan – provides proposed management measures to mitigate potential impacts during the construction, operation and decommissioning phases of the project, including specifying which body is responsible for confirming that Thanet Extension complies with these requirements; and
- The Works Plan(s) – Onshore works plans (Document Ref: 2.6) details the total area within which works associated with each component.

390000

400000

410000

5700000

5690000

N

Thanet Wind Farm

1828

1607

Richborough Port

North Foreland

Broadstairs

Ramsgate

North Sand Head

Goodwin Knoll

London Arrival / London Departure

CALDOVREP

Thanet N

NE Goodwin

Drill Stone

Cross-Channel Fe

(see Note)

Datum: ETRS 1989
Projection: UTM31N

1:100,000 0 1 2 km 0 0.55 1.1 nm

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THANET EXTENSION OFFSHORE WIND FARM

Figure 4.20

Thanet Extension Offshore and Onshore RLB.

Legend

- Offshore Red Line Boundary
- Onshore Red Line Boundary

Drg No	Fig2.1_LocationMap			Figure 4.20
Rev	0.1	Date	04/06/2018	
By	RM	Layout	N/A	

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