AQUIND Limited

AQUIND INTERCONNECTOR

Environmental Statement Addendum – Appendix 3 – Supplementary Alternatives Chapter

The Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 – Regulation 5(2)(a)

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

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WSP

WSP House

70 Chancery Lane

London

WC2A 1AF

+44 20 7314 5000

www.wsp.com

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Prepared By	J. Oliver, C. Lomax and M. Marsh
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Approved By	M. Wood
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CONTENTS

TABLES

PLATES

APPENDICES

1. INTRODUCTION

1.1.1.1. AQUIND Limited ('the Applicant') submitted an application for the AQUIND Interconnector Order (the 'Order') pursuant to Section 37 of the Planning Act 2008 (as amended) (the 'PA2008') to the Secretary of State ('SoS') on 14 November 2019 (the 'Application'). The Application was accepted by the Planning Inspectorate ('PINS') on 12 December 2019.

1.1.1.2. The Application seeks development consent for those elements of AQUIND Interconnector (the 'Project') located in the UK and the UK Marine Area (the 'Proposed Development').

1.1.1.3. The Project is a new 2,000 MW subsea and underground High Voltage Direct Current ('HVDC') bi-directional electric power transmission link between the South Coast of England and Normandy in France. By linking the British and French electric power grids it will make energy markets more efficient, improve security of supply and enable greater flexibility as power grids evolve to adapt to different sources of renewable energy and changes in demand trends. The Project will have the capacity to transmit up to 16,000,000 MWh of electricity per annum, which equates to approximately 5 % and 3 % of the total consumption of the UK and France respectively.

1.1.1.4. The Proposed Development includes:

- HVDC Marine Cables from the boundary of the UK Exclusive Economic Zone to the UK at Eastney in Portsmouth;
- Jointing of the HVDC Marine Cables and HVDC Onshore Cables;
- HVDC Onshore Cables;
- A Converter Station and associated electrical and telecommunications infrastructure;
- High Voltage Alternating Current ('HVAC') Onshore Cables and associated infrastructure connecting the Converter Station to the Great Britain electrical transmission network, the GB National Electricity Transmission System (NETS), at Lovedean Substation; and
- Smaller diameter Fibre Optic Cables ('FOC') to be installed together with the HVDC and HVAC Cables and associated infrastructure.

1.1.1.5. The Application was accompanied by an environmental statement submitted in accordance with the requirements of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations'). Chapter 2 of the Environmental Statement (the 'ES') (Consideration of Alternatives) (APP-117) provides a description of the reasonable alternatives studied by the Applicant, which are relevant to the Proposed Development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment, as is required in accordance with Regulation 14(2) and Schedule 4 of the EIA Regulations.

1.1.1.6. Following submission of the application, discussions with various stakeholders have given rise to further questions regarding the reasonable alternatives that were studied by the Applicant and the main reasons for the final option chosen for the Proposed Development. In addition, the Applicant has considered where it may be helpful to provide additional information, so as to provide a fuller explanation of various options and the considerations in relation to them for the benefit of the Examining Authority.

1.1.1.7. This supplementary chapter to Chapter 2 (Consideration of Alternatives) of the ES has been produced so as to provide further clarity in respect of the description of the reasonable alternatives and the main reasons for the option chosen.

1.1.1.8. It should be noted that the decisions taken regarding the reasonable alternatives studied by the Applicant in respect of the options for the Proposed Development could not be taken in isolation from one another. This is particularly relevant given the linear nature of the Proposed Development, where the changing of one aspect will have a bearing on the other aspects of the Proposed Development. So as to provide as clear an explanation as is possible, this supplementary chapter considers the relevant elements of the Proposed Development separately to provide a full explanation in relation to each. There is inevitably however some cross over between the relevant considerations in relation to the individual aspects.

1.1.1.9. On that basis, this supplementary chapter explains more fully the considerations with regard to the following, which in addition to the information already provided in Chapter 2 of the ES, provide a description of the reasonable alternatives that were studied by the Applicant in relation to the Proposed Development:

- initial project technical feasibility (Section 4);
- the grid connection point, being the substation locations where the Proposed Development may connect to the NETS (Section 5);
- the utilisation of Langstone Harbour / Hayling Island (Section 6);
- the selection of the corridor for the Onshore Cables (Section 7); and
- consideration of the Countryside Route (Section 8).

2. LEGISLATIVE AND POLICY CONTEXT

2.1.1.1. It is important when considering the description of the reasonable alternatives provided in Chapter 2 of the ES and the further information provided in this supplementary chapter for the legislative and policy context relating to it to be clearly understood. For that reason, this supplementary chapter sets out below a summary of the legislative and policy context.

2.1.1.2. As mentioned above at paragraph 1.1.1.5, the requirements in relation to the information to be provided in an environmental statement regarding the reasonable alternatives studied are provided by the EIA Regulations, specifically Regulation 14(2) and Schedule 4 to the EIA Regulations.

2.1.1.3. Regulation 14(2) (d) and paragraph 2 to Schedule 4 of the EIA Regulations require an environmental statement to 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*"[1].

2.1.1.4. It should be noted in this regard that, as is confirmed in the government's planning practice guidance[2], the EIA Regulations do not require an applicant to consider alternatives. However, where alternatives have been considered a description of them is required to be included within the relevant environmental statement.

2.1.1.5. In addition to the requirements provided by the EIA Regulations, the national policy applicable to the Proposed Development, the Overarching National Policy Statement for Energy (EN-1) (the 'NPS'), includes policy and requirements in relation to alternatives. Paragraph 4.4.1 of the NPS confirms that, as in any planning case, the relevance or otherwise to the decision making process of the existence (or alleged existence) of alternatives is in the first instance a matter of law, and that from a policy perspective the NPS does not contain any general requirement to consider alternatives or to establish whether the proposed project represents the best option. It should be noted that the EIA Regulations also do not include any requirement to establish whether a proposed project represents the best option.

[1] Paragraph 2 of Schedule to the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.
[2] Paragraph: 041 Reference ID: 4-041-20170728 of the Planning Practice Guidance

2.1.1.6. As is set out at paragraph 2.2.1.2 of Chapter 2 to the ES , paragraph 4.4.3 of the NPS requires the SoS when determining an application, subject to any legal requirement, to be guided by the following principles when deciding what weight should be given to alternatives:

- the consideration of alternatives in order to comply with policy requirements should be carried out in a proportionate manner;
- the SoS 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;
- alternatives not among the main alternatives studied by the applicant (as reflected in the ES) should only be considered to the extent that the SoS thinks they are both important and relevant to its decision;
- if the SoS 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 SoS 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 SoS decision;
- alternative proposals which are vague or inchoate can be excluded on the grounds that they are not important and relevant to the SoS decision;
- it is intended that potential alternatives to a proposed development should, wherever possible, be identified before an application is made to the SoS 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 SoS may place the onus on the person proposing the alternative to provide the evidence for its suitability as such and the SoS should not necessarily expect the applicant to have assessed it.

2.1.1.7. In addition, in the case of the Proposed Development which is located in close proximity to the boundary of the South Downs National Park, and where National Grid in their capacity as the operator of the NETS have been involved in the identification of options for the Proposed Development to connect into the NETS, it is relevant that public bodies and statutory undertakers are under a duty when exercising and performing any functions in relation to, or so as to affect, land in any National Park, to have regard to the purposes specified in subsection (1) of section five to the National Parks and Access to the Countryside Act 1949, and that if it appears there is a conflict between those purposes and the performance of their function, shall attach greater weight to the purpose of conserving and enhancing the natural beauty, wildlife and cultural heritage of the area comprised in the National Park.

2.1.1.8. The purposes specified in subsection (1) of section five to the National Parks and Access to the Countryside Act 1949 are:

- the purpose of conserving and enhancing the natural beauty wildlife and cultural heritage of a National Park; and
- the purpose of promoting opportunities for the understanding and enjoyment of the special qualities of those areas by the public.

2.1.1.9. This duty provided by Section 11A of the National Parks and Access to the Countryside Act 1949 is of particular relevance in light of the relevant representation of the South Downs National Park Authority, which states "*it is not clear whether the assessment of alternatives (set out in Chapter 2 of the ES) by National Grid when preparing a feasibility study in relation to the Proposed Development in 2014 took into account the impact of the various options on the National Park. There is only limited information on how that duty has been met and the SDNPA will be seeking further information on this from National Grid*".

2.1.1.10. In this regard it should be noted that the Applicant is not National Grid and is not in a position to confirm all that National Grid did or did not take into account. Further, it was the Applicant that carried out the assessment of alternatives for the Proposed Development, albeit the decisions on the selection of the final option for the Proposed Development did take into account information provided by National Grid regarding the various connection options.

2.1.1.11. This supplementary chapter seeks to provide further clarity with regard to the considerations that the Applicant has taken into account in respect of the South Downs National Park in relation to reasonable alternatives studied by them.

3. APPROACH TAKEN TO CONSIDERING ALTERNATIVES

3.1.1.1. The overall philosophy applied to the consideration of the reasonable alternatives, or the options, for the Proposed Development by the Applicant is explained at paragraph 2.3 of Chapter 2 of the ES. This explains that a process of staged filtering was applied, increasing knowledge of the individual options, so as to proportionately consider them from a technical, cost and environmental perspective. Key to this exercise was the identification of whether the potential options could proceed and also whether they had a realistic prospect of delivering the same infrastructure capacity (including energy security and climate change benefits) in the same timescale.

3.1.1.2. Again, as explained at paragraph 2.3 of Chapter 2 of the ES, a proportionate multi-disciplinary approach was taken to the assessment of the reasonable alternatives, taking into account considerations relevant to and specialist input from experts in the fields of electrical engineering, cable engineering, the environment, planning and civil engineering in respect of both the onshore and marine environments. This included considerations relevant to geotechnical matters and access.

3.1.1.3. In addition, the consideration of the options took into account the potential impacts of the various options on land and the exploration of all reasonable alternatives to the compulsory acquisition of land. Exploring the reasonable alternatives to compulsory acquisition from the outset is considered to have allowed the Proposed Development to come forward in a manner which limits the interests in and rights over land that will be affected by it.

3.1.1.4. With particular regard to environmental considerations, constraints were identified including both statutory and non-statutory designations, ranging from international to local importance. These related to a number of different environmental disciplines, such as ecology, landscape, and heritage. The constraints identified were used to identify the potential effects on the environment in connection with the options and the level of mitigation that may be required to address those effects. The constraints and the likely level of mitigation that may have been required was considered having regard to the mitigation hierarchy approach.

3.1.1.5. The mitigation hierarchy approach is a tool designed to help limit possible adverse impacts on the environment. It requires that impacts should first be avoided, then reduced/mitigated and, only as a last resort, compensated (offset). The Mitigation Hierarchy is as follows:

- **Avoidance** - measures taken to prevent or avoid adverse effects as far as possible by designing out or by using preventative measures.
- **Minimisation** - measures taken to reduce the duration, intensity, extent and/or likelihood of impacts that cannot be avoided. For example, where the Proposed Development is likely to directly impact scrub and hedgerows, vegetation clearance would be undertaken outside of the bird breeding season, considered to be between March to August, to avoid killing of injuring breeding birds and their young.
- **Offsetting** - measures taken to compensate for any residual, adverse impacts after implementation and consideration of the previous steps.

4. INITIAL PROJECT FEASIBILITY ASSESSMENT

4.1.1.1. In 2014 the Applicant approached the consultancy firm Parsons Brinckerhoff (now WSP UK Ltd) to undertake a technical and economic feasibility study in relation to a high-power interconnector between the GB transmission network and the transmission network in continental Europe. The study focussed on the technology solutions which would be suitable for such an interconnector, based on the then current "state of the art" technology and on the expected technology position when the interconnector would likely be able to come to the market.

4.1.1.2. The study considered a range of scheme power ratings from 1000MW up to 2000MW, with DC transmission voltages from ±320kV up to ±525kV. As the submarine and underground cables would be major components of the scheme, the study considered monopole designs with 2 cables, bi-pole designs with 3 cables, and twin monopole designs with 4 cables. The study also considered the capital expenditure and timescales required to build the different options.

4.1.1.3. The higher rated options (i.e. those with higher power ratings) were found to have a better socio-economic rationale (in £/MW) than the smaller rated options, and the recommendation of that study, taking into account technical and economic considerations, was that the 1800MW bi-pole and 2 x 1000MW monopole options should be taken forward for further evaluation. So as to maximise the benefits, in all scenarios power flows were bi-directional so as to be able to best respond to prevailing market conditions.

4.1.1.4. The study considered the energy market in continental Europe at the time and reviewed the cross-border energy flows and wholesale electricity price differentials between different energy markets to assess whether each was a net importer or exporter of energy. It was anticipated that in the early years of the Project most energy flows for the interconnector would be into the GB market, and therefore a connection to countries which were predominantly net exporters of energy would be the rational approach.

4.1.1.5. Specific attention was given to the regions closest to GB, i.e. France, Belgium, the Netherlands, Germany, Scandinavia (Norway and Denmark), and Ireland (including Northern Ireland), with a connection with those countries being considered to be able to come to market earlier than with more distant countries (due to the increased time it would take to construct a longer length of submarine cables).

4.1.1.6. The study considered their import/export capability and the cost of energy (€/kWhr) in each country/region. The analysis indicated that France and Germany were net exporters of energy, while other regions had limited energy sources available to export or were net importers. Scandinavian countries were predominantly net exporters of energy, but it was determined that their distance from the GB market would have required very high capital costs associated with the long (>700km) submarine cables. Similarly, the distance to Germany (>600km) made this option less economically viable and also would mean the timescale for delivery would be significantly greater than a connection to those countries close to GB.

4.1.1.7. In addition, it was identified at this time that France (alongside Germany) was one of the most favourable countries to connect with, due to its proximity to the UK, lower electricity prices (as illustrated in Plate 1) and its clean energy mix (for reference, in 2017 (the most recent data) the UK residual grid carbon intensity was 367 gCO2/kWh whereas the French residual grid carbon intensity was 57 gCO2/kWh).

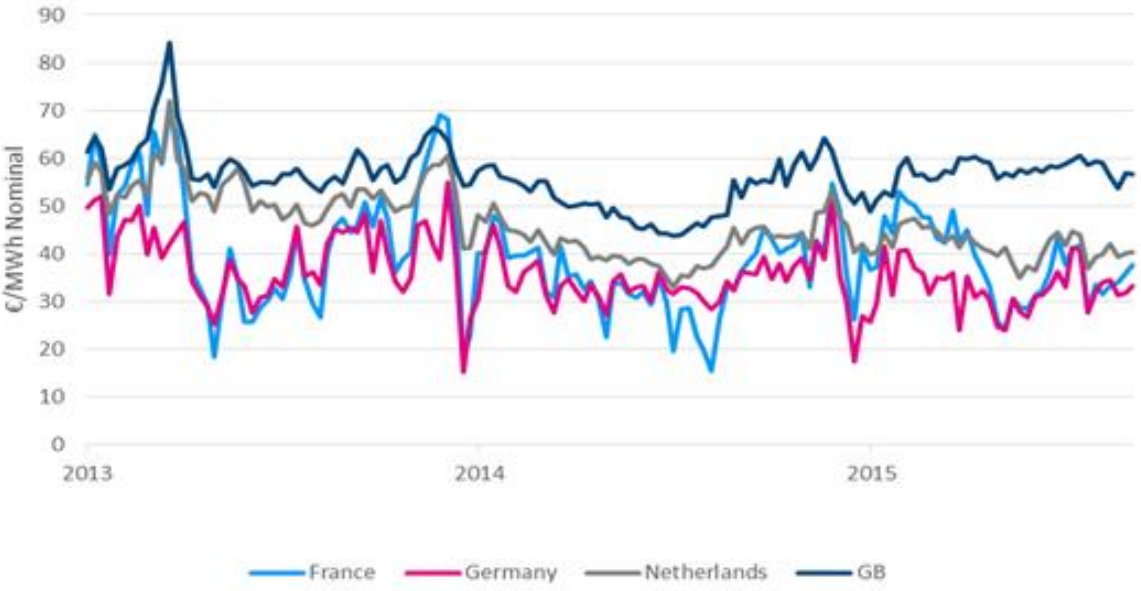


Plate 1 - Historic Price Differentials across energy markets (at time of initial AQUIND feasibility assessment)

4.1.1.8. At this early stage of feasibility assessment, the environmental impacts of the installation of the submarine cables was not considered as there were no defined potential cable corridors, however it was generally noted that longer sea crossings would be expected to encounter a higher number of environmental constraints and be likely to lead to greater impacts (or increased requirements and associated cost to mitigate the impacts).

4.1.1.9. In light of those considerations, the report identified France as the most viable point of connection for an interconnector with GB within a reasonable timescale.

4.1.1.10. Following the identification of France as the preferred country to connect with, possible connection points along the south coast of England and the north coast of France were considered, however the choice of locations to connect into the national electricity grids required discussion with both National Grid Electricity Transmission (NGET) in GB and Réseau de Transport d'Électricitié (RTE) in France.

4.1.2. INITIAL DISCUSSIONS WITH RTE

4.1.2.1. Initial discussions with RTE considered the 400kV transmission network in northern France and in particular the availability of existing electricity sub-stations which could accommodate the import and export of 1800MW to 2000MW of power, noting the earlier recommendation explained in paragraph 4.1.1.3 for 1800MW bi-pole and 2 x 1000MW monopole options to be taken forward.

4.1.2.2. RTE's advice regarding a connection into the French electricity network was to consider only those sub-stations indicated in the area circled blue on the drawing below . The reason for this was so as to avoid regions of the network which already had large import-export power flows, and which would be overloaded by the addition of a new interconnector.

Plate 2 – Substations considered following discussions with RTE (circled blue)

4.1.2.3. For ease of reference, the substations located within the area circled blue are as follows:

- Penly
- Barnabos
- Le Harve
- Paluel
- Rougemontier
- La Vaupaliere

4.1.2.4. To the east of Penly, the sub-station at Mandarins was connected to the in-service 2000MW IFA 1 interconnector and was also proposed to be connected to the 1000MW Eleclink interconnector, which is currently under construction. The Gravelines sub-station is close to the connection point for the future 1400MW GridLink interconnector, with it being understood at the time that discussions were ongoing regarding a connection to this substation. As a consequence of the existing and planned connections to this part of the French electricity network it was advised that there was not connection capacity in this region to support the connection of a further interconnector.

4.1.2.5. To the west of Le Havre a connection agreement was already in place for the 1000MW IFA 2 interconnector to connect to the substation at Tourbe, and for the FAB Link 1400MW interconnector to connect to the substation at Plaine-Haut. Accordingly, RTE advised that there was also not capacity on this part of the network to support the connection of the proposed interconnector. It was on this basis that the substations within the blue circled area were identified as being capable of supporting the proposed interconnector.

4.1.2.6. It was also acknowledged at this stage that the submarine cable route would need to cross what is one of the busiest shipping channels in the world, and it would therefore be important to identify a marine cable corridor which could accommodate the installation of 3 or 4 high voltage cables, whilst minimising impacts on both shipping and the natural environment.

4.1.2.7. The cables are generally anticipated to represent the largest part of the capital expenditure on the Project, so minimising the length of these cables in so far as is practicable was also important for the overall technical and economic viability of the project.

4.1.3. INITIAL DISCUSSIONS WITH NGET

4.1.3.1. Initial discussions were also held with NGET regarding the 400kV transmission network in southern England and the availability of existing electricity sub-stations which could accommodate the import and export of 1800MW to 2000MW of power.

4.1.3.2. Plate 3 below identifies the substations which NGET advised could accommodate the required connection to 400kV transmission network and which should be considered for the proposed connection. The search area, within the red curve, was purposefully large so as to ensure that a thorough and robust analysis of the available options was undertaken. However, it was recognised at this time by NGET that sub-stations further from the coast may be unrealistic options, as the distance would adversely impact on the project costs, the timescales for delivery would be longer and they would also likely give rise to greater environmental impacts associated with a larger (longer) project.

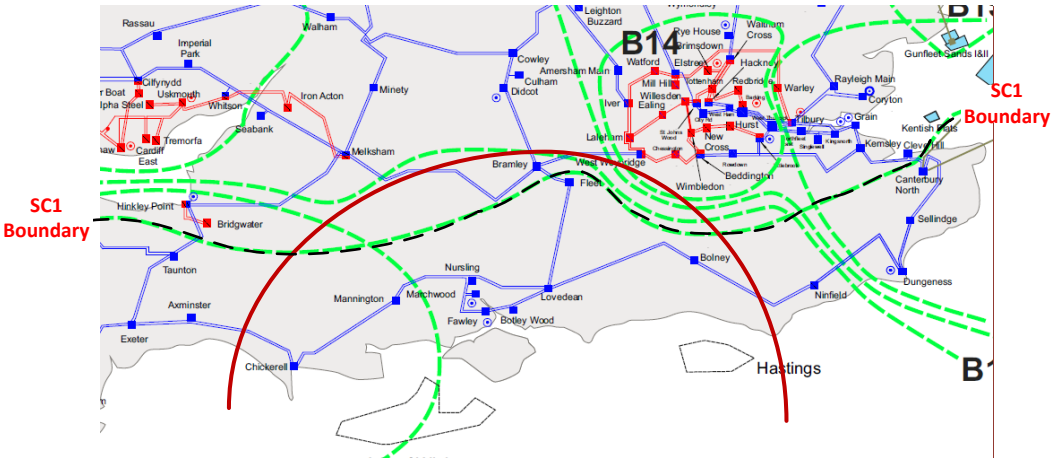


Plate 3 – Substations advised by NGET that could accommodate a 400kV transmission network

4.1.3.3. The region to the east of Bolney was considered by NGET to be too congested to accommodate the proposed 1800MW to 2000MW connection. In this context "congested" relates to the ability of the overhead transmission lines to carry the power flows from the adjacent generating stations (nuclear, gas and wind) and interconnectors. Accordingly, the individual substation options needed to be suitable for the additional connection from a new interconnector and the transmission lines in the local region needed to be capable of evacuating the power from that substation.

4.1.3.4. The Rampion 400MW off-shore wind farm near Hastings connects into Bolney. The 2000MW IFA 1 interconnector is connected into Sellindge and the Eleclink 1000MW interconnector would connect at the same station. The existing 1000MW interconnector to the Netherlands was connected at Grain substation. The new NEMO 1000MW interconnector to Belgium would connect into Richborough substation, which is close to Canterbury North. In addition, wind farms in the Thames estuary, notably London Array (600MW) and Thanet (300MW plus 340MW extension) connect into the network in this region. This made this south-eastern region, which is the closest region to France, unsuitable for a further large interconnector due to the potential congestion of power flows on the transmission lines in this area.

4.1.3.5. To the west of but within this search region, the 970MW Navitus Bay wind farm, off the Isle of Wight, was due to connect into Mannington substation. Further west, the FABLink 1400MW interconnector was due to connect into Exeter substation. NGET informed that the connection of a new interconnector in this region would have the effect of overloading the transmission lines, due to the power flows travelling from the west to east i.e. heading towards the major load centre of London.

4.1.3.6. Taking into account those existing and future planned connections and the constraints of the network as a consequence, and in turn considering the opportunities provided by the network where those constraints were not apparent, the substations within the area identified by the red curve were taken forward for consideration. The consideration of those substations and the grid connection options is discussed below in section 5 to this supplementary chapter.

5. GRID CONNECTION POINT

5.1. NGET FEASIBILITY STUDY

5.1.1.1. Subsequent to the initial discussions with NGET regarding the appropriate substations capable of accommodating the proposed interconnector, the Applicant submitted a request in December 2014 for a feasibility study to cover the technical and commercial aspects associated with a number of potential connection points to the GB NETS. The feasibility study was prepared by NGET in its capacity as GB system operator.

5.1.1.2. The purpose of the feasibility study requested by the Applicant was to evaluate and identify the connection options for connection to the NETS, the available dates for connection and the associated costs.

5.1.1.3. For the initial phase of this feasibility study ten existing substations were evaluated for the proposed connection. The ten substations on the 400kV network that were identified for initial evaluation were as follows:

- Bolney;
- Botley Wood;
- Bramley;
- Chickerell;
- Fleet;
- Fawley;
- Lovedean;
- Marchwood;
- Mannington; and
- Nursling.

5.1.1.4. Of those ten substations, three were selected to be taken forward for systems analysis to identify whether they provided feasible connection points to the NETS. Those three substations were:

- **Bramley** - being a substation on the northern side of the SC-1 boundary, shown with a dashed black line on the above drawing;

- **Chickerell** - being a substation at the other end of the of the identified search area relatively far from the South-East network, which may have assisted with reducing overloads on the NETS as a consequence of the proposed capacity increases; and
- **Lovedean** - being an option closer to the coast and representing an already strong part of the NETS.

5.1.1.5. Whilst the position of NGET was that the other substations represented similar connection issues to the sites taken forward, save for Bolney which was excluded because that part of the NETS was already constrained due to existing and planned future connection, the Applicant's preliminary views at the time on the suitability of the remaining substations were as follows:

- **Botley Wood** – the submarine cable would be required to be located through the busy shipping area around the Isle of Wight and the substation being north of Southampton would present significant technical and economic challenges;
- **Fawley** - the submarine cable would be required to be located through the busy shipping area around the Isle of Wight;
- **Marchwood** - the submarine cable would be required to be located through the busy shipping area around the Isle of Wight;
- **Nursling** - the submarine cable would be required to be located through the busy shipping area around the Isle of Wight;
- **Mannington** – the shared connection point with the 970MW Navitus Bay wind farm raised technical concerns; and
- **Fleet** – located much further inland and as such would require a much longer underground cable (and may in fact not be suitable for an underground cable as a result), with the potential to increase the extent of the environmental impacts as a consequence of construction. It was noted that there was the potential to route through the South Downs National Park, albeit this was not desirable given the constraints this presents for the purposes of construction.

5.1.1.6. Further discussion with NGET identified that whilst Fawley had been considered as a suitable connection point in the initial technical and economic feasibility study, as a 2000MW oil-fired power station had recently been de-commissioned there, NGET advised that part of this capacity was being taken up by a new gas-fired power station and much of the available site was being re-developed. Fawley was therefore not considered further.

5.1.1.7. As mentioned above at paragraphs 4.1.3.5 and 5.1.1.5, a connection agreement for the 970MW Navitus Bay offshore wind farm was in place in relation to the Mannington substation when the feasibility study was carried out, and therefore it was not considered to be suitable for the proposed connection. Although that project was later abandoned, the connection agreement remained in place with the developers of Navitus Bay offshore wind farm for some time following the feasibility study, during which significant progress was made advancing the proposals for Proposed Development. As a result it was not reasonable for the Applicant to re-consider the potential for a connection at Mannington at that later stage, and this was not considered further.

5.1.1.8. As explained at paragraph 5.1.1.4, the substations at Bramley, Chickerell and Lovedean were first taken forward for analysis of the impacts on the NGET network, with three capacity options considered by NGET for each being 1x1500MW, 1x2000MW and 2x1000MW. A summary of NGET's conclusions in relation to each substation is as follows:

5.1.2. BRAMLEY SUBSTATION

5.1.2.1. The location of Bramley substation at a "cross-road" on the 400kV transmission network and west of the major load centre of London, made it the optimum location to accept the import and export of up to 2000MW of power.

5.1.2.2. The detailed studies showed the need for network reinforcements prior to the connection of the Proposed Development. This may have involved upgrading the conductors on transmission lines and network shunt compensation works. Similar upgrades would also be required for a connection at Lovedean or Chickerell.

5.1.3. CHICKERELL SUBSTATION

5.1.3.1. NGET determined that Chickerell substation would need to be substantially re-built to be capable of accommodating the required connections. The cost of doing so and the associated disruption to their transmission network to achieve this was not considered to be acceptable by NGET. In addition, there were no technical or economic advantages for Chickerell over Bramley and Lovedean substations.

5.1.3.2. Due to these clear constraints AQUIND and NGET agreed not to pursue Chickerell as a viable connection solution for the purposes of the feasibility study and the evaluation did not proceed to a full Cost Benefit Analysis (CBA).

5.1.3.3. The Applicant's fuller consideration in relation to Chickerell as a reasonable alternative grid connection point is detailed at section 5.2 of this supplementary chapter.

5.1.5. LOVEDEAN SUBSTATION

5.1.5.1. Lovedean substation is located on the southern 400kV transmission line, running along the south coast of England. This line is only weakly interlinked with the transmission line which runs through Bramley. However, from Lovedean substation there is a 400kV transmission line running north connecting via Fleet to Bramley, making Lovedean a strong connection point on the network.

5.1.5.2. Lovedean's location, at less than 20km from the coast, was considered likely to be advantageous in minimising the overall potential environmental impact which would be caused by long underground DC cables, in particular from a perspective of for how long disruption associated with construction would be ongoing.

5.1.5.3. The detailed studies performed by NGET indicated no technical issues in connecting up to 2000MW of power at Lovedean sub-station. Requirements for network reinforcements were identified from the study and were of a similar order to those for Bramley.

5.1.6. COST BENEFIT ANALYSIS FOR BRAMLEY AND LOVEDEAN

5.1.6.1. The cost benefit analysis is complex and it, along with the feasibility study more generally, is subject to confidentiality requirements. For the purposes of this supplementary chapter, a brief summary of the analysis undertaken and the conclusions is presented. This analysis was one of a number of factors taken into account for the purpose of identifying the preferred grid connection point. Accordingly, a brief summary of the conclusions is considered to be proportionate, whilst also respecting the confidentiality requirements of the feasibility study undertaken by NGET.

5.1.6.2. Having discounted Chickerell substation due to the need for this to be substantially re-built, taking into account the additional time and cost of doing so, and the substation providing no technical or economic advantages, NGET proceeded to undertake a cost benefit analysis in relation to the Bramley and Lovedean substations.

5.1.6.3. The cost benefit analysis is designed to rationalise the capital cost for investment incurred between different connection substations; and the operational constraint costs that could occur over the lifetime of the project - the monetised benefit.

5.1.6.4. For the purposes of the proposed connection, the analysis undertaken took into account two connection capacities, being 1800MW and 2000MW. NGET advised that the costs associated with a 1500MW would be equally applicable to a 1800MW connection, so these were not considered separately.

5.1.6.5. The cost benefit analysis examined various National Grid forecasted future energy scenarios for each option of interconnector design at each of Bramley and Lovedean substations and alternative approaches for reinforcing the wider network to accommodate the proposed connection, with the conclusions emphasising that the connection of an interconnector at Lovedean substation was the most economically beneficial solution and the least worst regret option.

5.1.7. NGET FEASIBILITY STUDY CONCLUSIONS

5.1.7.1. Having undertaken an analysis of the impacts on the NGET network of the three shortlisted substations (Bramley, Chickerell and Lovedean) and a cost benefit analysis in relation to Bramley and Lovedean only, the conclusion of the feasibility study was that Lovedean substation provided the most suitable connection point for the Proposed Development.

5.1.7.2. In terms of the key differences between the Bramley and Lovedean, it was identified in the feasibility study that a connection to Bramley would take circa three years more because of the increased underground cable length (three times longer than for Lovedean and significantly longer than any other operational interconnector), and that as a consequence of the potential need to pass through the South Downs National Park there was a higher risk of environmental damage and planning delays. In addition, NGET indicated that a feasible date of connection to Bramley substation was three years later than for Lovedean.

5.1.7.3. Following the completion of the feasibility study the Applicant continued its assessment of the options and made a formal request to NGET to undertake the Connection and Infrastructure Options Note (CION) process to consider the options more broadly than the feasibility study (which was specifically undertaken to cover the technical and commercial aspects associated with a number of potential connection points to the GB NETS) so as to identify the preferred onshore connection points and allow for a representative connection offer to be made.

5.2. APPLICANT'S ASSESSMENT OF THE SUITABILITY OF CHICKERELL

5.2.1.1. As is identified above at paragraphs 5.1.3.1 and 5.1.3.2, for a connection to Chickerell to be possible the sub-station would need to be substantially re-built due to the redundant existing design and limited flexibility of the existing substation with no physical capability for new connection bays, making it unsuitable for the proposed connection.

5.2.1.2. It was identified that the cost to accommodate a 2,000MW connection would have been substantial, circa £130m more than the anticipated baseline cost of a connection to Bramley or Lovedean. For clarity this is the cost for NGET as the UK TO only, which does not take into account the cost of developing the interconnector for the Applicant.

5.2.1.3. During the feasibility study being carried out, WSP on behalf of the Applicant identified that the likely works to re-build the substation at Chickerell to accommodate the proposed connection would include:

- 4 overhead line bays (presently 3);
- 2 transformer bays;
- 2 bus coupler bays;
- 1 bus section bay;
- 2 cable bays for the interconnector;
- 1 reactive compensation bay; and,
- 1 spare bay (empty).

5.2.1.4. It was also noted that the additional time it would take to obtain consent to rebuild the substation and for the substation to be rebuilt whilst it remained operational would increase the time before the proposed connection could be made to it, and that the works to undertake the rebuild would inevitably lead to increased environmental impacts as compared to connections at Lovedean and Bramley substations where similar rebuilds were not required.

5.2.1.5. In addition to the feasibility study carried out by NGET and its findings in relation to Chickerell, the Applicant also considered more broadly the option of a connection at Chickerell substation, taking into account the land surrounding the substation and its ability to accommodate the required substation rebuild and the converter station halls and associated equipment, the options for the landfall to connect the submarine cables to the onshore underground cables and the likely submarine route that would be required to connect to a substation at Chickerell from the northern French coast.

5.2.3. SUITABILITY OF THE SURROUNDING LAND

5.2.3.1. Chickerell substation, shown in Plate 4 below, is a large substation with limited screening in close proximity to the operational site and with limited space to extend. It is closely located to existing settlements, with Southill to the East, Chickerell to the west and Wessex Golf Course and Weymouth to the south all within 500m of the existing substation. Further, the open space to north of the existing substation (shown to the right of the image below) is constrained by existing OHLs present in this location and the presence of a solar farm approximately 400m north-west of the substation site.

Plate 4 - Aerial image of Chickerell Substation

5.2.3.2. As a consequence of the surrounding constraints in the form of the existing settlements, OHLs and the solar farm, there is very limited space available to rebuild the substation and to locate the proposed converter station halls and associated equipment. Further, in the event sufficient land could be identified, the proximity to the existing settlements would mean there is a high likelihood of significant visual and noise impacts during construction and operation.

5.2.3.3. In terms of topography, it was also noted that the 500m area surrounding the substation site falls from approximately 15m to 11m AOD, being relatively flat and also a low overall AOD by virtue of being close to sea level at the coast. The surrounding land therefore offered little in the way of natural screening for the converter station halls and associated equipment to mitigate the likely visual and noise impacts on the surrounding settlements in close proximity.

5.2.3.4. By comparison it was noted that Lovedean provided a less visible, location, with more areas surrounding it which could accommodate the converter station halls and associated equipment further away from existing settlements. With regard to topography, the 500m area surrounding the Lovedean substation falls from approximately 97 m to 67 m above ordnance datum (AOD), therefore offering more opportunity to take advantage of the natural landscape to mitigate visual and noise impacts.

5.2.3.5. Further, due to the limited extent of National Grid land ownership in the locality of Chickerell substation, land purchases would have been required to obtain the land needed for the rebuild of the substation in the unlikely scenario sufficient and adequate land to accommodate the substation rebuild and the proposed converter station for the proposed interconnector could be identified. It was considered that this would also have increased the overall cost and time required to facilitate a connection to Chickerell substation.

5.2.3.6. It was not considered that Chickerell presented a feasible connection location from a perspective of the suitability of the surrounding land to accommodate the interconnector.

5.2.4. SUITABILITY OF LANDFALL OPTIONS

5.2.4.1. As detailed at paragraph 2.4.3 of the Chapter 2 to the ES, a preliminary desk study was undertaken by the Applicant to identify potential landfall locations along the south coast whilst the NGET feasibility study was ongoing. The search area extended across the south coast of England, bounded by West Bay, Dorset in the south west and Bognor Regis in the south east.

5.2.4.2. 29 potential landfalls were identified based on a number of engineering selection criteria. The landfalls identified were graded A (good) to C (less suitable with significant constrains). The categorisations for all 29 landfalls can be viewed at Table 2.3 to Chapter 2 of the ES, with further detail on the categorisations detailed within ES Appendix 2.2 (Landfall Weighting) (APP-351).

5.2.4.3. If Chickerell had been progressed the landfalls under consideration would have been those within 35km of the substation, with this distance being considered to be the extent of what was a “reasonable” maximum distance between a landfall and a grid connection point in terms of the potential construction impacts on traffic, number of possible HDD’s needed to avoid significant constraints, overall installation duration, cost, and propensity for a higher number of environmental impacts above this length. This distance was also close to the longest distance between a landfall and a grid connection location for an interconnector in the UK (being the East West Interconnector at 30km).

5.2.4.4. The landfall locations within 35km of Chickerell substation would have been those within the area between West Bay (the western limit of the search area) and approximately Swanage. The coastline between West Bay and Swanage is approximately 90km long and dominated by certain significant topographic or other features that substantially rule out over 85% (78km) of the coastline as follows:

Table 1 – Landfall Options within 35km of Chickerell substation

Feature	Length	Proportion of coastline	Comment
Cliffs	44	49%	At the waters edge or behind beach. Of varying heights, but would act as a constraint to a landfall nonetheless. Occasional valleys allow access to the coast, and these were identified as potential landfalls where appropriate.
Chesil Beach (Single Beach and Coastal Waters)	13	14%	Approximately 13km between East Bexington and Portland. A conventional trench approach would not be possible here due to the presence and make-up of the shingle beach (typically 100-200m wide), and impounded water behind it (Fleet Lagoon, 65-900m wide), would add significant length (200-1200m) to any HDD approach.
Portland	21	23%	A very rocky promontory approximately 17km in circumference, connected to the mainland by a thin strip of land, unsuitable for landfalls due its cliffy coastline, spatial constraints and narrow connection to mainland; includes adjacent harbour

5.2.4.5. On the basis that a landfall would need to have been categorised as A, A/B or B to be considered as potentially suitable, there would have been 8 suitable landfall sites situated between West Bay and Overcombe. 6 landfall locations west of Chesil Beach were identified to be rated as A/B or B. On the basis that the three locations graded as B would have had no advantage over those graded A/B, the three locations graded as B that were west of Chesil Beach were discounted.

5.2.4.6. The 5 shortlisted landfall locations in this area were Weymouth and Overcombe, both Category B and 3-4 km from the substation to the east of Chesil Beach, and to the west of Chesil Beach, West Bay, Freshwater Beach or Hive Beach, all category A/B and 19-22km from the substation.

5.2.4.7. Of those 5 landfall sites the two nearest landfall points graded A/B or B to Chickerell, and therefore the most suitable for a proposed connection to Chickerell substation, were Weymouth and Hive Beach. These landfalls were subject to a number of nearshore environmental constraints as identified in Table 2 below.

Table 2 - Review of constraints at Weymouth and Hive Beach landfalls

	Weymouth (at Overcombe Beach, avoiding Portland Bill)	Hive Beach
Onshore cable length	>3 km	**>19 km**
Marine cable length	c330 km	**c290 km**
Water depth 1400 m from beach (max HDD length)	9-10 mLAT	**15-16 mLAT**
Other constraints	• Within Harbour Area • Designated anchorage area • Several charted wrecks • Restricted areas – bathing, water ski and sailboard approaches, small craft anchorages, PWC lane (jetski) • Adjacent to Portland Harbour and its ship channel, high speed craft operational areas, military practice areas, etc. • Strong tidal currents associated with Portland Bill	• Possible subsea cables • Possible marine farms • Military practice areas • Strong tidal currents associated with Portland Bill

5.2.4.8. The constraints identified in the table above would pose difficulties for the construction of the submarine cables and their landfall in that location. Whilst it may have been possible for the construction methodology to limit the impacts on the human constraints, such as on shipping and amenity users, the difficult sea conditions caused by the strong tidal currents associated with Portland Bill would have been very difficult to overcome from a technical engineering perspective, irrespective of the construction methodology used.

5.2.4.9. It should also be noted that the coastline in this region forms part of the Jurassic Coast, a UNESCO World Heritage Site stretching 155km from Devon to Dorset, and it was therefore considered this coastline would be highly sensitive to both temporary and permanent impacts associated with proposed development works due to its importance to many aspects of geology, palaeontology and geomorphology and would not be preferential.

5.2.4.10. In this regard temporary impacts would likely result from cable installation works including trenching and vegetation clearance until such time as any reinstatement works and planting has become established. A landfall would likely have a temporary impact on the Dorset AONB designation during construction, including indirectly impacting the landscape character. It was also noted that there would have been the potential for permanent impacts to geological features and in turn on the integrity of the UNESCO World Heritage Site.

5.2.4.11. Taking into account the identified constraints relevant to the preferred landfalls for a connection to Chickerell, the difficulties posed by these from a construction methodology perspective and the potential impact on the feasibility of constructing a landfall in that location and the potential for temporary and permanent impacts on the UNESCO world heritage site, from a landfall perspective connecting at Chickerell was not preferred when compared to the relatively constraint free Landfall options further east i.e. those relevant to Bramley and Lovedean.

5.2.5. SUBMARINE CABLE ROUTE

5.2.5.1. As the westernmost substation within the search area, Chickerell represented the longest submarine cable distance from the northern French coast, between Le Havre and Penly, being the area of the French coast identified as appropriate for a landfall in light of the potential grid connection substations identified by RTE.

5.2.5.2. Any submarine cable route would had to have achieved the following to be considered feasible as an option:

- Avoiding French and UK windfarms (including the Navitus Bay windfarm that has now been abandoned, but was in development at the time of route development and therefore taken into account);
- Avoiding dredged areas (UK and France), with industry guidance recommending avoidance of dredged areas by 1 nm;
- Avoiding French environmental designations - ZNIEFF – French natural areas of ecological, faunistic and floristic interest;
- Avoiding UK environmental designations, including SPA, MPA, MCZ and SAC;
- Aiming to cross the shipping lanes as close to 90 degrees as possible, which would require running parallel to them in places

- Minimising impacts on existing in-service cables (SMW3, TAT14 and AC1), including IFA2, in terms of minimising number of crossings;

5.2.5.3. As the cables are generally anticipated to represent the largest part of the capital expenditure on the Project, minimising the length of these cables was also considered to be important for the overall technical and economic viability of the proposals. The increased length of cables to Chickerell, compared to the proposed Eastney-Pourville proposed for AQUIND Interconnector, are indicated below.

Table 3 - Submarine Cable Route Options

Option	Length (km)	Length compared to Project (km)
Lovedean (Eastney-Pourville)	182	n/a
Chickerell (Weymouth-Pourville)	292	+110
Chickerell (Hive Bay to Pourville)	330	+148
Chickerell (Weymouth to Le Havre)	260	+78

5.2.5.4. As can be seen from the above table, the length of the required submarine cable to a landfall to connect with Chickerell would have been significantly longer than the options for the eastern landfalls and the chosen Eastney landfall. A longer route would result in more seabed disturbance, a longer construction period (stakeholder disturbance but also a longer working duration and therefore greater H&S risk), and increased cost.

5.2.5.5. Supply chain estimates from 2019 would suggest that the additional marine cable for a Chickerell route would add at least £115-218m to the cost of the submarine cables and an additional 5-9 months to the cable manufacturing time. Marine operations would also take longer (surveys, seabed preparation, cable lay and cable burial / protection, joints, etc).

5.2.5.6. These cost and time increases do not include seabed preparation or other aspects, which would also all add cost and time, including:

- Additional survey costs, including additional DRASSM (department for marine archaeology of France) survey costs;
- Need to cross IFA2 interconnector with associated increased cost, time and likely environmental impact (see paragraphs 5.2.5.10 – 5.2.5.15 for further details);

- Increased number of joints (anticipate 2-4 more per cable, 4-8 per circuit and therefore 8-16 more for both circuits, adding 8-20 weeks to the installation programme) increasing cost, construction time and risk of failure;
- Longer installation programme (estimated to take a further 137-305 days or one or two more marine work seasons for cable load out, transit, lay and burial; adding 1-2 years to the Project's construction timeframe);
- Additional lifetime monitoring costs; and
- Increased risk of damage, since more cable is installed.

5.2.5.7. As well as the cost and time associated with longer cables, this also represents a significant challenge to the supply chain. The introduction of an additional 312,000-592,000m of cable production would increase the risk for the Proposed Development's timely completion, including potential bottlenecks in the cable supply chain with other interconnectors and offshore wind projects driving high demand for submarine cables.

5.2.5.8. A submarine cable route to the west of the search area would also have meant crossing the major shipping lane in the English Channel was unavoidable, and this would have required running in parallel with the shipping lane before and after the crossing so as to achieve a crossing at as close to 90 degrees as possible. As a consequence the potential for impacts on shipping commerce whilst the submarine cable was constructed were much higher than for a connection further east to facilitate a connection at either of Bramley or Lovedean, and would have been likely to result in a more complicated construction methodology so as to mitigate the impacts on shipping commerce.

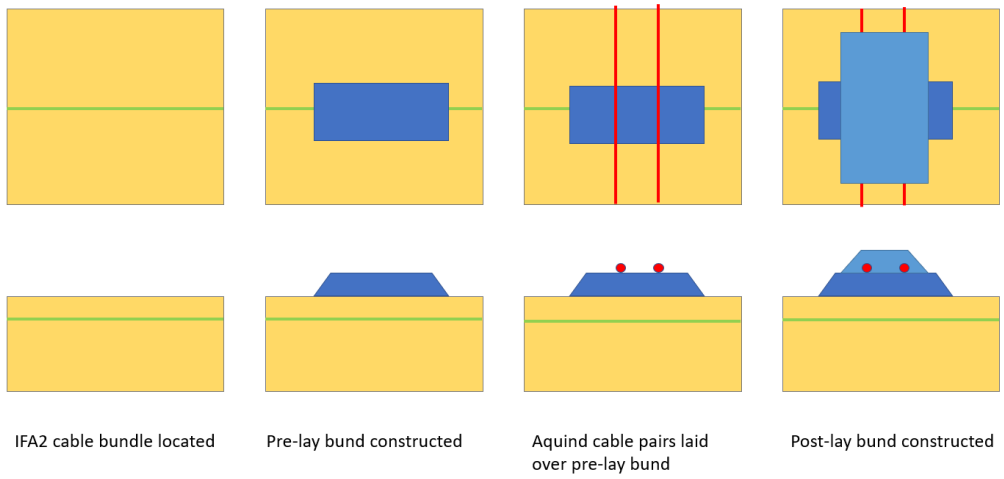
5.2.5.9. In addition to the identified challenges during construction so as to minimise impacts on shipping commerce, a connection to Chickerell and the more western submarine cable route associated with it would have exposed the submarine cables to a higher risk of damage from ships anchors whilst operational by virtue of being located in a busier shipping area, an event which had occurred on the IFA 1 project a number of years ago, breaking 4 out of the 8 cables. The costs associated with an outage in the event of such damage whilst repairs are undertaken and the cost of such repairs are significant. In addition, the benefit of the interconnector in the public interest is lost for any period within which it is not operational. Accordingly, it is preferable to avoid locating the submarine cables in areas where there is a higher risk of this occurring.

5.2.5.10. A submarine cable route from Le Havre/Penly to Chickerell would also have needed to cross the cables for the IFA 2 interconnector, which runs from Tourbe to Chilling sub-station west of Portsmouth.

5.2.5.11. Whilst it is possible to construct a crossing of one HVDC interconnector over another, a cable crossing results in significant subsea features and in turn poses greater potential environmental impact, a longer overall programme (with potential stakeholder, environmental, H&S and cost implications) and risk of reduced navigation depth due to installation. Regulators and stakeholders (such as fishermen) would prefer less rock placed on the seabed to maintain the maximum navigational depth, therefore supporting the preference for a route that minimises the number of crossings.

5.2.5.12. The construction sequence is illustrated in Plate 5 below.

Plate 5 - Subsea Cable Construction Sequence



5.2.5.13. In terms of managing such a construction, once the IFA2 cable pair had been identified, a protection / separation layer (pre-lay bund) would need to be constructed above it. Whilst this could be mattresses, it would more likely be constructed of rock, a minimum of 0.3m thick, but likely to be closer to 1-1.5m to provide stability for it to be wide enough for both cable pairs to be run across it. The cable pairs for the proposed interconnector would then be laid across this first rock blanket as two pairs 50 m apart. A second protection rock blanket (post-lay bund) would then be laid over the cable pairs, which would be bigger than the first, because it is covering two pairs of cables. This would again be a minimum of 0.3m thick, but more likely about 1-1.5m to provide adequate protection.

5.2.5.14. In addition, a crossing represents increased risk to both the crossed cable and the crossing cable, with the crossed cable potentially being disturbed by construction works and the additional handling associated with the crossing cable increase the risk of damage to it.

5.2.5.15. If a cable is damaged at a crossing, the approach to a repair would depend on whether it was the crossed, or crossing, cable that was damaged. Damage to the crossed cable would require repair comprising a new section of cable over the top of the crossing cable, and a further protection layer, resulting in the crossing cable being sandwiched between the old and new crossed cable, with three layers of rock blanket. In addition, the new section would require a new joint either side of the crossing – these would include additional non-burial protection requirements for them. The additional handling that is required for repairs and joints also increases the risk of future damage to the cable.

5.2.5.16. Taking into account the increased length of cables required for a submarine cable route to Chickerell in comparison to those required for connections further east associated with Bramley and Lovedean and the additional constraints associated with such a route, including the need to cross the major shipping lane in the English Channel and the IFA2 Interconnector, and the risk associated with those, a western submarine cable route to provide for a connection to Chickerell was not preferred.

5.2.6. CONCLUSIONS IN RELATION TO THE SUITABILITY OF CHICKERELL

5.2.6.1. Whilst Chickerell is located closer to the coast than both of Lovedean and Bramley and therefore has associated benefits in terms of reducing the amount of onshore cable works required and the amount of impacts associated with those works, Chickerell was not considered to be suitable for the proposed interconnector for the following reasons:

- The substation required a substantial rebuild to accommodate the proposed connection, resulting in additional time, cost, likely environmental impacts (at the least from a duration perspective), land acquisition and consenting risk.
- The land surrounding the substation was not deemed to be suitable to accommodate the substation rebuild and the proposed interconnector, as a consequence of the surrounding constraints in the form of the existing settlements, OHLs and the solar farm.
- In addition, even where both the substation rebuild and the proposed interconnector could be located in the land surrounding the existing substation, it was not considered adequate visual and noise screening could be achieved given the topography of the land and the proximity of the surrounding receptors and settlements.
- The potential suitable landfall locations in accordance with the initial identification and categorisation exercise were subject to considerable constraints, including difficult sea conditions caused by the strong tidal currents associated with Portland Bill, which would have been very difficult to overcome from a technical engineering perspective, irrespective of the construction methodology used.

- The coastline in this region forms part of the Jurassic Coast, a UNESCO World Heritage Site stretching 155km from Devon to Dorset, and a landfall would likely have a temporary impact on the Dorset AONB designation during construction, including indirectly impacting the landscape character, and causing permanent impacts to geological features and in turn on the integrity of the UNESCO World Heritage Site.
- The length of the required submarine cable to a landfall to connect with Chickerell would have been significantly longer than the options for the eastern landfalls, resulting in more seabed disturbance, a longer construction period (stakeholder disturbance but also a longer working duration and therefore greater H&S risk), and increased cost and supply chain risk.
- A submarine cable route from Le Havre/Penly to Chickerell would need to cross the major shipping lane in the English Channel and the IFA2 Interconnector, resulting in increased constraints and risk associated with both the construction and operation of the interconnector.
- The higher overall cost of a connection to Chickerell, set out below at Table 4, would challenge the commercial viability of the project even without taking into account the increased time to completion, risk and potentially insurmountable environmental constraints.

Table 4 – Chickerell Substation estimated additional costs

Component	Estimated Additional Cost
Substation Rebuild	£129.5
Marine cable	£115 - £218m
Total	£344.5 - £447.5

- Coupled with the estimated increased costs, the increased time to market due to increased cable length and substation rebuild would also reduce viability.

5.2.6.2. Taking all of the above into account, in the view of the Applicant there was no realistic prospect of a connection to Chickerell delivering the same infrastructure capacity and the benefits associated with that infrastructure capacity in the same timescale as the Proposed Development.

5.2.6.3. Further, it is the Applicant's view that a connection to Chickerell would not have been commercially viable in light of the significant increased cost for both the Applicant and NGET, and in addition that the land surrounding the existing Chickerell substation, taking into account the proximity of the surrounding settlements and the flatter topography of the land closer to the coast, was not suitable for the proposed interconnector, particularly when compared to the availability and topography of land surrounding the Lovedean substation.

5.2.6.4. Accordingly, the option for the proposed interconnector to connect at Chickerell was not explored any further by the Applicant, with the focus from a grid connection perspective then being on confirming the suitability of Bramley and/or Lovedean for the proposed interconnector, and where suitable identifying the preferred location.

5.3. APPLICANT'S ASSESSMENT OF BRAMLEY AND LOVEDEAN

5.3.1.1. Due to the landfall location and the route options being largely the same for both Bramley and Lovedean substations by virtue of Bramley being located due north of Lovedean, the technical, economic and environmental considerations relevant to the marine cable corridor, the proposed landfall locations and the proposed onshore cable route options up to and as far as Lovedean were not deciding factors in the choice between the options of Bramley and Lovedean substations.

5.3.1.2. Noting the above, the differentiating factors between the two were:

- the suitability of each to accommodate the proposed interconnector and its associated buildings and equipment, and the likely environmental impacts for each as a consequence of this;
- a comparison of the time difference to construct the cable routes to each and the costs associated with the construction of the cable routes to each; and
- the additional environmental impact associated with constructing a longer cable route to Bramley;

5.3.1.3. It is the case that by virtue of having a considerably shorter cable route the option of Lovedean will be less costly and quicker to construct than a connection to Bramley and that the option of Lovedean will therefore provide the infrastructure capacity and the benefits associated with that earlier. Those factors were taken into account alongside the other differentiating factors detailed above and explained below when deciding which grid connection option was preferred and would be pursued where suitable. To provide as clear an understanding as possible of how those factors were taken into account by the Applicant when considering the alternative grid connection options, the time and cost considerations are explained in detail in this supplementary chapter.

5.3.2. SUITABILITY OF THE LAND SURROUNDING BRAMLEY AND LOVEDEAN SUBSTATIONS

5.3.2.1. Bramley substation, shown in Plate 6 below, is a large substation originally constructed in 1965. It is immediately surrounded in established Ancient Woodland, being located within the Bramley Firth Wood, which is also classified as a Priority Habitat (deciduous woodland). In addition, the substation and surroundings within 500m lie within a species priority zone for Lapwing and Redshank.

Plate 6 – Aerial image of Bramley Substation

5.3.2.2. In terms of the settlements within 500m of Bramley substation, there are a low number of residential properties located at Latchemere Green to the west, Bramley Corner to the south west, Bramley to the south east and Three Ashes to the north west. In addition, there are various farmsteads and properties along lanes skirting around Bramley Substation.

5.3.2.3. By virtue of the existing substation being immediately surrounded on all sides by Bramley Firth wood, it was noted that there was not land available to provide any extensions required to the substation to accommodate the proposed interconnector without directly impacting the ancient woodland. In addition, the presence of the ancient woodland would have required the converter station halls and associated equipment to be located further away from the existing substation, and in turn likely at a closer proximity to the surrounding settlements. It was noted that this would likely result in increased visual and noise related impacts associated with construction and the presence of the interconnector on a permanent basis.

5.3.2.4. Furthermore, whilst there are some gaps in the ancient woodland surrounding Bramley substation, these are used by pylons for overhead lines into the substation. Accordingly, work beneath these so as to utilise those gaps for the cable connection to the substation would not have been technically feasible. This would have meant there would be an unavoidable and irreversible adverse impact on Bramley Firth wood as a consequence of the proposed interconnector.

5.3.2.5. Ancient woodland is a valuable biodiversity resource both for its diversity of species and for its longevity as woodland, and once lost it is not possible to recreate this biodiversity resource via other forms of mitigation planting. Accordingly planning policies provide high levels of protection for ancient woodland, with the NPPF providing that development resulting in the loss or deterioration of ancient woodland should be refused unless there are wholly exceptional reasons and a suitable compensation strategy[3], and the NPS similarly providing that the SoS should not grant development consent for any development that would result in the loss or deterioration of ancient woodland unless the benefits (including need) of the development, in that location outweigh the loss of the ancient woodland habitat[4]. The potential loss of ancient woodland associated with the proposals for the interconnector was considered by the Applicant to be a major constraint in relation to a connection at Bramley substation, and it was noted that the loss of ancient woodland would be an environmental impact difficult, if not impossible, to entirely surmount, and would likely mean the proposals would be contrary to the planning policies relating to ancient woodland applicable to the interconnector when determined.

5.3.2.6. In terms of designated landscapes within the vicinity of Bramley substation, the North Wessex Downs AONB is located within less than 5km of the substation.

5.3.2.7. With regard to the surrounding topography of the landscape, the 500m area surrounding the substation site falls from approximately 67m to 75m AOD. Due to the shallow gradient, it was noted that there would be opportunities to use cut and fill techniques to partially screen the converter station halls and associated equipment at this location. In this regard it was also noted that the underlying geology of the substation site and surrounding 500m area is formed of London Clay and is not located within a groundwater protection zone.

[3] Paragraph 175 (c) of NPPF, February 2019.
[4] Paragraph 5.3.14 of NPS EN-1, July 2011

5.3.2.8. Lovedean substation, shown in Plate 7 below, constitutes a large existing feature within the local landscape, with the surrounding area being characterised by undulating landforms, predominantly comprised of fields enclosed by hedgerow boundaries. The substation site is surrounded by fragments of Priority Habitat in the form of deciduous woodland at Crabdens Copse, which is designated as semi-natural Ancient Woodland and a SINC. The South Downs National Park surrounds the substation site to the north, east and west, within 150m at its closest point. The closest AONB is located approximately 9km to the south-west.

Plate 7 – Aerial image of Lovedean Substation

5.3.2.9. There are no existing settlements within 500m of Lovedean substation, though there are isolated farmsteads and properties along lanes skirting around Lovedean substation. Horndean is the closest settlement, located approximately 1.5km to the east of Lovedean Substation. Denmead is located approximately 2km to the south west.

5.3.2.10. Therefore by comparison to Bramley where the area surrounding the substation is surrounded by ancient woodland and in closer proximity to existing settlements, Lovedean provided a more remote, and in turn less visible, location, with more areas surrounding it which could accommodate the converter station halls and associated equipment not directly affecting designated habitats and further away from existing settlements, thereby providing a more advantageous position for the purpose of minimising permanent visual and noise related impacts.

5.3.2.11. As detailed above at paragraph 5.2.3.4, the topography of the 500m area surrounding the Lovedean substation falls from approximately 97m to 67m above ordnance datum (AOD), therefore offering more opportunity to take advantage of the natural landscape to mitigate visual and noise impacts. It was also noted however that the substation and 500m surrounding area is located within a groundwater source protection zone, and the underlying geology of the substation site and surrounding 500m area is karstic limestone and lies close to or at the surface. This therefore limited opportunities to use cut and fill techniques to partially screen the converter station halls and associated equipment at this location.

5.3.2.12. As noted above, Lovedean substation is partly bordered by the South Downs National Park to the north, east and west, within 150m at its closest point to the east, but generally more distant to the north and west. Plate 2-4 located at Chapter 2 to the ES identifies the proximity of the boundary of the South Downs National Park to Lovedean substation.

5.3.2.13. The South Downs National Park became fully operational on 1 April 2011. The park covers an area of approximately 1,627 square km (or 628 square miles) in southern England, stretching 140 km from Winchester in the west to Eastbourne in the east through the counties of Hampshire, West Sussex and East Sussex. Of particular note in terms of features, the National Park covers the chalk hills of the South Downs, which on the coast form the white cliffs of the Seven Sisters and Beachy Head, and the western Weald, an area of undulating countryside in Hampshire and West Sussex containing a mixture of woodland and heathland areas.

5.3.2.14. As a consequence of being located close to the boundary of South Downs National Park it was acknowledged that the development of an interconnector connecting at Lovedean substation would have the potential for direct and indirect effects on the setting of the designated landscape as well as visual amenity impacts for those using the National Park recreationally in this specific location, though in this regard it was also considered that the landscape quality, condition and the tranquillity of area surrounding Lovedean substation had been eroded by the presence of the substation, the associated overhead lines and change in agricultural practice and horticulture, and that the extent to which direct and indirect impacts on the National Park arose would depend on the micro-siting of the Converter Station and the visual screening that could be provided.

5.3.2.15. Whilst noting that there was the potential for direct and indirect impacts as a consequence of Lovedean substation being located outside of but in proximity to the National Park, it was considered that in the context of the National Park as a whole, proposals for the development of the interconnector in this location would not conflict with its purposes (detailed at paragraph 2.1.1.8 of this supplementary chapter). For this reason whilst the impacts on the South Downs National Park were considered by the Applicant when determining the suitability of a connection to Lovedean substation and whether it was the preferred option, no greater weighting was needed to be attached to the purpose of conserving and enhancing the natural beauty, wildlife and cultural heritage of the area comprised in the national park, as would have been required in accordance with subsection (1) of section five to the National Parks and Access to the Countryside Act 1949 where a conflict with those purposes did arise.

5.3.2.16. As is discussed below, impacts on the South Downs National Park were also considered in the context of the cable route to facilitate a connection to Bramley substation, where the cables would need to be located through or in close proximity to the National Park.

5.3.2.17. Noting the above considerations, both of Bramley and Lovedean substations were determined to be potentially suitable to facilitate the connection for the proposed interconnector and to accommodate the converter station halls and associated equipment to be located in proximity to it.

5.3.2.18. By way of a comparison, and focusing on the visual and noise impacts which were considered likely to give rise to greatest level of impacts in those locations, Lovedean was preferable as it was located further away from existing settlements and the associated buildings and equipment could be located in closer proximity to the existing substation, by virtue of it not being surrounded by ancient woodland in the same way as Bramley substation. It was noted that that Bramley presented greater opportunities for the use of cut and fill techniques to screen the interconnector, albeit to do so would add cost and complexity and would create non-natural forms in the landscape. As a consequence of the size, in particular the height of the converter station halls, it would also only ever be feasible to screen to a certain extent using cut and fill techniques.

5.3.2.19. The potential impacts associated with loss and deterioration of ancient woodland surrounding Bramley substation were noted, and given the protections provided to this resource weighted accordingly. In turn, the potential for direct and indirect effects on the setting of the South Downs National Park as well as visual amenity impacts for those using the park recreationally in the location were noted in relation to Lovedean substation.

5.3.2.20. Taking all of the above into account, the Applicant concluded that a connection to Lovedean substation was preferable from a site suitability perspective.

5.3.3. TIME AND COST DIFFERENCE FOR THE CONSTRUCTION OF THE PROPOSED CABLE ROUTES

5.3.3.1. As has been noted above, Bramley Substation lies due north of Lovedean Substation, on the other side of the South Downs National Park. Therefore, in parallel with the NGET feasibility study being undertaken, the Applicant undertook a review of the likely onshore cable routes that could be used to facilitate a connection to Bramley substation, so as to understand the likely additional time it would take to construct the additional length of onshore cables and the likely additional cost as a result.

5.3.3.2. To enable this review preliminary routes were identified from the landfall at East Wittering to Lovedean and on to Bramley, both via Horndean, with the Plate 8 below showing the shared route to Lovedean substation in purple and the additional route to Bramley substation in red.

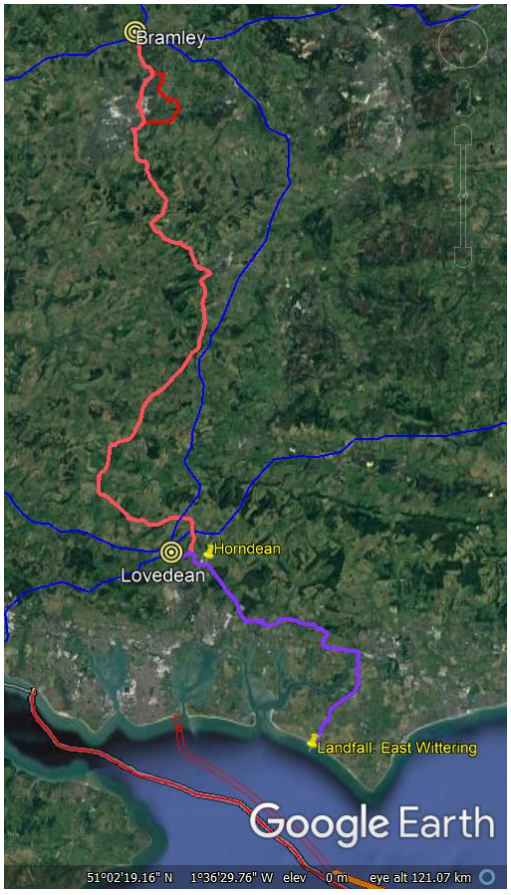


Plate 8 – Preliminary Onshore Cable Routes

5.3.3.3. The identified route to Bramley was largely the same as to Lovedean, diverging at nearby Horndean, and then extended by another 68.9km, with an option for an additional 4.1km of cable route on top of the additional 68.9km to minimise disruption in Basingstoke town centre. It was also noted that taking this route option would have required the cable route to go directly through the South Downs National Park for a significant distance. If the South Downs National Park were to be avoided, so as to minimise the likely environmental impacts and planning challenges posed by doing so, the onshore cable route would extend by circa 16.4km.

5.3.3.4. Taking into account the additional onshore cable routing to minimise disruption in Basingstoke town centre, where a route through the South Downs National Park was avoided, the overall additional cable length to facilitate a connection to Bramley substation would be circa 90km longer than the onshore cable route required to facilitate a connection to Lovedean substation.

5.3.3.5. Based on these preliminary routes, in August 2015 the project team estimated that the capital costs for a connection at Bramley substation would be at least £230m higher than the capital cost for a connection at Lovedean substation for the shortest route between Horndean and Bramley. This cost would increase where a route around the South Downs National Park was taken to minimise the likely impact on the associated landscape designation in terms of visual amenity and potential longer term impacts on environmental receptors, including hedgerows and trees which may require removal / works to facilitate cable installation

5.3.3.6. The additional costs for the cable route to facilitate a connection to Bramley substation included:

- Costs associated with the supply and installation of increased HVDC cable route length;
- Likely increase in the number HDD crossings, and the costs associated with these, with it being considered an additional 12 HDD crossings would be required;
- Additional site Investigation costs (desk studies and ground investigation); and
- Additional planning and environmental costs (environmental surveys, EIA and planning advice).

5.3.3.7. In addition to the estimated increased costs of a connection to Bramley substation, the estimated delay by comparison to a connection to Lovedean was also considered and the below table sets out a summary of the estimated time differences between the two.

Table 5 – Bramley and Lovedean Substation construction timeframes comparison

Activity	Lovedean	Bramley	Difference
EIA	18 months	30 months	12 months (52 weeks)
Planning	3 LPAs	5 LPAs	Not quantified but anticipated increased consultation and preparation of materials, and increased time to obtain all required consents.
Construction	49 weeks	100-127 weeks (4-5 teams)	51-78 weeks
Total	-	-	103-130 weeks (2.0-2.5 yrs)

5.3.3.8. The above table demonstrates that in the best case it was considered a connection to Bramley substation would take two years longer than a connection to Lovedean, with the increase in time to deliver the same infrastructure capacity and the benefits of it potentially taking up to three years longer for a connection to Bramley than for a connection to Lovedean.

5.3.3.9. It should be noted that the above preliminary assessment of the additional time it would take for a connection to Bramley substation to be made aligned with the findings of the feasibility study undertaken by NGET, which identified that a feasible date of connection for Bramley substation was 3 years later than for Lovedean substation.

5.3.3.10. It also notable that since 2015, refinement of project details and further engagement with the supply chain has confirmed that if a connection to Bramley was pursued, a further 3-10 months would be added to the time taken to manufacture the required additional cable lengths, with the time taken to install the onshore cables increasing by potentially a further 22 months, validating the estimates of the Applicant and of NGET that the total increase in timescale for a connection to Bramley substation would be circa 2-3 years compared to a connection to Lovedean substation.

5.3.3.11. The additional cost of building a significantly longer connection would have been prohibitive at the least, and it is considered by the Applicant that commercially this may have prevented the proposed interconnector coming forward.

5.3.3.12. In addition, the additional likely time for this connection to be made would have meant there was no realistic prospect of the proposed interconnector delivering the same infrastructure capacity (including energy security and climate change benefits) in the same timescale as a connection to Lovedean substation, whilst continuing to utilise underground onshore cables. Further, due to higher losses inherent to a longer cable length, the capacity of a connection to Bramley would likely not deliver as high capacity as a connection to Lovedean.

5.3.3.13. It may have been possible to construct a route to Bramley substation using overhead lines so as to make the proposals viable and feasible for the Applicant, but the associated unavoidable permanent visual impact of this option, noting this overhead line route would have needed to pass through or in close proximity to the South Downs National Park, meant that this option was not seriously considered by the Applicant to be feasible from a planning or EIA perspective.

5.3.4. ENVIRONMENTAL IMPACTS OF A LONGER ONSHORE CABLE ROUTE TO BRAMLEY SUBSTATION

5.3.4.1. The additional length of the onshore cable route required to facilitate a connection to Bramley substation by comparison to Lovedean substation was considered to represent much more than an incremental increase in the likely environmental impacts as a result. In this regard, the following environmental considerations were noted:

5.3.4.2. The installation of the required onshore cables through the South Downs National Park would have been likely to generate higher levels of impact on visual amenity, landscape character and associated landscape features than outside the National Park during the period of installation. Equally there would undoubtedly be a greater impact on tranquillity within the National Park. Careful consideration of the siting of the cable route and extent of laydown areas would have been required to minimise impacts, with it being considered difficult to do so without having considerable temporary adverse impacts. Careful consideration of site accesses to facilitate the works without adversely impacting the surrounding environment would also have been required and would have presented difficulties from a construction methodology perspective. In addition, the designation of the National Park as a dark skies reserve would have limited the times at which works could be carried out, effectively preventing any activities after dark in the National Park.

5.3.4.3. The installation of the additional cable lengths would be likely to result in significant impacts on Ancient Woodland sites, due to the close proximity and abundance of ancient woodland in the area of the proposed routes, particularly in areas where parcels are present on either side. A minimum 15m buffer would be needed between works areas and ancient woodland, which it is considered would not have been achievable in all instances, and even where direct impacts on ancient woodland could be avoided there would remain the very real prospect of indirect impacts on the protected species that use these types of habitats e.g. bats.

5.3.4.4. As explained above, given the location of Bramley substation being due north of Lovedean, and noting that onshore cable corridors in so far as Lovedean were anticipated to be broadly the same whichever option was selected, the impacts on traffic and traffic receptors as a consequence of connection to Bramley and Lovedean substation was not considered in detail at this stage, but it was noted that as a consequence of the cable length required to connect to Bramley being considerably longer, there would be increased adverse impacts in relation to traffic and transport related effects.

5.3.4.5. More recently and in light of queries raised generally regarding the preliminary considerations in relation to impacts on traffic, the Applicant has commissioned an independent verification exercise to be undertaken by Royal HaskoningDHV. This is independent from work undertaken in relation to the Proposed Development to date. In addition to undertaking a preliminary assessment of the Cable Corridor Options to Lovedean substation, discussed in section 6 below, this also considered the likely extent of additional impact were a route to Bramley substation to be followed.

5.3.4.6. A copy of the findings of that independent assessment is provided at Appendix 2 to this supplementary chapter, and a summary of the findings contained therein relevant to additional likely route to Bramley is provided below. For reference, the additional length of the cable route to Bramley is approximately 66km.

(A) In respect of the level of traffic management required, single lane closures are anticipated to be required along 53.1km of the route, lane closures are anticipated to be required for 4.5km of the route and it is anticipated that 8.1km of the route would require a full road closure whilst the works were undertaken.

(B) In respect of the sensitivity of the route, 2.1km of the route is anticipated to be of high sensitivity, 5.9km of medium sensitivity, and 57.7km of low sensitivity.

(C) With regard to pedestrian severance and amenity impacts, the majority of the route (59.4km) it is anticipated that users would experience minor adverse impacts, with users experiencing moderate impacts for 6.1km and major adverse impacts for 0.3km of the route.

(D) With regard to traffic delay, for the majority of the route (57km) users would be anticipated to experience medium effects, with users experiencing high effects for 8.3km of the route and low effects for 0.3km of the route.

5.3.4.7. The installation of a cable route to facilitate a connection to Bramley substation would have the potential to give rise to impacts to heritage assets and any associated archaeology along the route. In particular, it was noted that there was the potential for impacts to arise on the Scheduled Monuments listed below, which would be physically crossed by the preliminary cable route and/or close proximity to a refined cable route:

(A) Pyotts Hill Entrenchment;

(B) Devil's Jumps – a group of 5 large bell barrows at Privett, Hampshire;

(C) Linear feature of Cross Dyke and Low Bank which is assumed by the HER Record to possibly continue the line of the Cross Dyke;

(D) Bronze Age and Saxon Burial Site, Storeys Meadow, West Meon; and

(E) Linear features including: Barrow at Sheepbridge and Saxon Parish Boundary Bank.

5.3.4.8. Two SSSIs were located within 500m of the route, including Catherington Down SSSI, Catherington Lith, Yeoll's Copse, Chineham Woods (4 parts) and Mapledurwell Fen SSSI. Potential effects to these protected areas include direct and indirect impacts from disturbance and displacement to species and habitats.

5.3.4.9. The preliminary cable route would cross 6 Main Rivers in Hampshire, with numerous additional watercourses located within 500m. Whilst it is possible these could have been traversed with adequate mitigations in place to avoid impacts, the impact on surface water receptors and risk of pollution/ contamination would nonetheless need to be addressed in relation to any surface water linkages to other surface water receptors. The areas where the preliminary cable route crossed these Main Rivers fall within Flood Zones 2/3, where there is the potential for adverse impacts on tidal or fluvial influences. Temporary works and flood risk management would need to be considered in detail to ensure that no reduction in the flood protection offered by the existing flood defences is introduced through a reduction in crest height or creation of a preferential flood pathway as a consequence of the installation of the cables.

5.3.5. CONCLUSIONS OF THE APPLICANT'S ASSESSMENT OF CONNECTIONS TO BRAMLEY AND LOVEDEAN SUBSTATIONS

5.3.5.1. Both of Bramley and Lovedean substations were determined to be potentially suitable to facilitate the connection for the proposed interconnector and to accommodate the converter station halls and associated equipment to be located in proximity to it.

5.3.5.2. With regard to visual and noise impacts for human receptors, which were considered likely to give rise to greatest level of impacts, Lovedean was preferable in the sense that it was located further away from existing settlements and could be located in closer proximity to the existing substation, by virtue of it not being surrounded by ancient woodland in the same way as Bramley substation.

5.3.5.3. The potential loss of ancient woodland associated with the proposals for the interconnector was considered by the Applicant to be a major constraint in relation to a connection at Bramley substation, and it was noted that the loss of ancient woodland would be an environmental impact difficult, if not impossible, to entirely surmount, and would likely mean the proposals would be contrary to the planning policies relating to ancient woodland applicable to the interconnector when determined.

5.3.5.4. In turn, the potential for direct and indirect effects on the setting of the South Downs National Park as well as visual amenity impacts for those using the park recreationally in the location were noted in relation to a connection to Lovedean substation.

5.3.5.5. Based on this assessment of the two substation connection options, Lovedean was determined to be preferential from a site suitability perspective.

5.3.5.6. In the best case it was considered a connection to Bramley Substation would take two years longer than a connection to Lovedean, with the increase in time to deliver the same infrastructure capacity and the benefits of it potentially taking up to three years longer for a connection to Bramley than for a connection to Lovedean. Accordingly, there was no realistic prospect of the proposed interconnector delivering the same infrastructure capacity (including energy security and climate change benefits) in the same timescale as where a connection to Lovedean substation was pursued whilst continuing to utilise underground onshore cables.

5.3.5.7. In addition, it was estimated that the capital costs for a connection at Bramley Substation would be at least £230m higher than the capital cost for a connection at Lovedean Substation for the shortest route between Horndean and Bramley. This additional cost would have been prohibitive at the least, and it is the informed view of the Applicant that commercially this may have prevented the proposed interconnector coming forward altogether.

5.3.5.8. The additional length of the onshore cable route required to facilitate a connection to Bramley substation by comparison to Lovedean substation was also considered to represent much more than an incremental increase in the likely environmental impacts as a result, including impacts on the South Down National Park, ancient woodland, designated heritage and ecological assets and various water based receptors. Whilst it was noted those impacts could be minimised by undertaking further optioneering work, the general consensus of the project team was that they could not be mitigated entirely and to do so would add more cost and technical complexity to the proposals, presenting an unacceptable level of risk.

5.3.5.9. Taking into account all of the above, the Applicant's preference for the grid connection point for the proposed interconnector was Lovedean substation.

5.4. THE OUTCOMES OF THE CONNECTION & INFRASTRUCTURE OPTIONS NOTE (CION)

5.4.1.1. A CION was prepared in relation to the proposed interconnector by NGET in 2016 as part of the connection application process to identify NGET's preferred connection point to the NETS. The CION was carried out utilising information from the feasibility study already undertaken by NGET.

5.4.1.2. The purpose of the CION is:

- To provide a joint process to centrally record decisions and design rationale from the technical, commercial, regulatory, environmental, and socio-economic aspects of a project as it progresses
- To document the clear reasoning why a specific design option has been chosen; and
- To provide visibility of the decision making process and to record the underlying assumptions.

5.4.1.3. It is specifically noted in the CION, which is a confidential document, that following any initial connection offer, all parties will be required to undertake more detailed assessments which take into account (but are not limited to) deliverability, construction complexity, land issues, consents, technology, costs, and environmental issues. These detailed assessments will either reconfirm the initial option or trigger the need for a modification application. This is important to note, as it is a clear indication that the CION is by no means the only determinant of the appropriate connection location, and its completion does not remove the need for the Applicant to fully consider the reasonable alternatives for the grid connection point.

5.4.1.4. The outcome of the CION was that a 2,000MW connection to Lovedean substation was the preferred option, with the reasons for this being:

- that the onshore cable works required were the lowest, logically resulting in a lower overall consenting risk and lower overall environmental impacts;
- that this option required the least amount of enabling works; and
- the use of preferred VSC monopole technology, as opposed to bi-pole technology which has a high technology risk.

5.4.1.5. A connection to Lovedean substation was considered to be able to be completed at that time by 2020/2021.

5.4.1.6. In explaining this outcome, the CION also considered and explained the reasoning behind not preferring a connection to Bramley substation, with it being noted from an issues and risks perspective:

- the connection point is significantly further inland, with an onshore route potentially in excess of 100km, nearly three times longer than a connection to Lovedean substation and significantly longer than any other existing or planned interconnector;
- the longer route by virtue of being located within more regulatory authorities presents a greater risk of planning delay;
- the longer route would likely be required to pass through the South Downs National Park, with significant environmental impacts expected to be associated with this;
- the longer route would require more crossing points, increasing the technical complexity, cost and risk of delays; and
- that there was considered to be a risk of delay due to unexpected archaeology along a significant 35km length of the required onshore cable route.

5.4.1.7. A connection to Bramley substation was considered to be able to be completed at that time by 2023/2024.

5.4.1.8. Furthermore, the total estimated costs for a connection at Bramley were circa £260m higher than the total estimated costs for a connection to Lovedean. Given the inherent similarities between the two schemes excluding the additional cable length required to facilitate a connection to Bramley, the Applicant considered that the main reason for the additional cost to Bramley was the additional length associated with the onshore cable route.

5.5. GRID CONNECTION POINT OVERALL CONCLUSIONS

5.5.1.1. The conclusion of the feasibility study undertaken by NGET was that Lovedean substation provided the most suitable connection point for the Proposed Development.

5.5.1.2. This conclusion was further supported by the work undertaken to produce the CION, with the clear reasons for this detailed at section 5.4.

5.5.1.3. The Applicant's assessment of the reasonable alternative grid connection points discounted the potential for a connection at Chickerell substation for the various reasons summarised at paragraph 5.2.6.1, and taking those reasons into account the Applicant's view that:

- there was no realistic prospect of a connection to Chickerell delivering the same infrastructure capacity and the benefits associated with that infrastructure capacity in the same timescale as the Proposed Development; and
- that a connection to Chickerell would not have been commercially viable in light of the significant increased cost for both the Applicant and NGET, and in addition that the land surrounding the existing Chickerell substation, taking into account the proximity of the surrounding settlements and the flatter topography of the land closer to the coast, was not suitable for the proposed interconnector, particularly when compared to the availability and topography of land surrounding the Lovedean substation.

5.5.1.4. With regard to the Applicant's comparison between the options of connecting at Bramley and Lovedean:

- Lovedean was determined to be preferable from a site suitability perspective for the reasons set out. In particular the potential loss of ancient woodland associated with the proposals for a connection to Bramley was considered by the Applicant to be a major constraint and it was noted that the loss of ancient woodland would be an environmental impact difficult, if not impossible, to entirely surmount, and would likely mean the proposals would be contrary to the planning policies relating to ancient woodland applicable to the interconnector when determined.
- In the best case Bramley Substation would take two years longer than a connection to Lovedean, and potentially up to three years longer. Accordingly, it is the Applicants view that there was no realistic prospect of a connection to Bramley delivering the same infrastructure capacity (including energy security and climate change benefits) in the same timescale as a connection to Lovedean substation whilst continuing to utilise underground onshore cables.
- The capital costs for a connection at Bramley Substation, being estimated as £260m more than a connection to Lovedean, would have added a considerable cost to the proposals.

- The additional length of the onshore cable route required to facilitate a connection to Bramley substation was considered to represent much more than an incremental increase in the likely environmental impacts and included impacts on the South Down National Park, ancient woodland, designated heritage and ecological assets and various water based receptors. The general consensus of the project team was that those additional impacts could not be mitigated entirely, and to do so would add more cost and technical complexity to the proposals, presenting an unacceptable level of risk.

5.5.1.5. For all of the above reasons, the Applicant determined that Lovedean was the preferred reasonable alternative for the grid connection point and proceeded with NGET in relation to the connection offer for a connection at Lovedean substation, whilst continuing the development and refinement of the wider proposals for the Proposed Development.

6. THE APPLICANTS ASSESSMENT OF UTILISING LANGSTONE HARBOUR / HAYLING ISLAND

6.1.1.1. Information relevant to the consideration of the available landfall locations, their initial raking based on defined engineering parameters and the assessment of their appropriateness for providing the landfall for the Proposed Development is provided at the following paragraphs within Chapter 2 of the ES:

- Paragraph 2.4.3;
- Paragraph 2.4.7;
- Paragraph 2.4.9; and
- Paragraph 2.4.14

6.1.1.2. In addition, further information relevant to the consideration of the Landfall locations is provided at Appendix 2.2 and Appendix 2.3 to the ES.

6.1.1.3. The information already provided in Chapter 2 to the ES and the appendices relevant to that paragraph is not repeated in this supplementary chapter, rather this supplementary chapter seeks to provide a clearer explanation of all of the options considered for the use of Langstone Harbour for the installation of the submarine cables, and why an option of routing the submarine cables through Langstone Harbour was not pursued by the Applicant.

6.2. EXPLANATION OF THE ENVIRONMENTAL DESIGNATIONS RELEVANT TO OF LANGSTONE HARBOUR / HAYLING ISLAND

6.2.1.1. Langstone Harbour is an inlet of the English Channel, sandwiched between Portsea Island to the south and west, Hayling Island to the south and east and Langstone to the north. It is subject to various environmental designations which can be summarised as follows:

- **Chichester and Langstone Harbour Special Protection Area (SPA)**: the SPA supports more than 10,000 wintering wildfowl, more than 20,000 wintering waders. Chichester and Langstone Harbours SPA, together with the adjacent Portsmouth Harbour SPA, forms one of the most important sheltered intertidal areas on the south coast of England. Composed of extensive, intertidal mudflats and sandflats with seagrass beds, saltmarsh, shallow coastal waters, coastal lagoons and coastal grazing marsh. The estuarine sediments and areas of saltmarsh support rich populations of intertidal invertebrates which provide an important food source for wintering birds and also shelter roosting flocks, in particular black-tailed godwit, dark bellied brent goose, dunlin and red-breasted merganser. Internationally important numbers of red breasted merganser are known to overwinter (feed and roost) in the harbour between October and March in Langstone Harbour, they favour Farlington Marshes (which is also a Local Nature Reserve) in the north of the harbour and have moderate sensitivity to disturbance and displacement. Internationally important numbers of tern species feeding on small fish, worms and molluscs present in estuaries and shallow waters. Terns are summer visitors with Little Terns favouring Baker's Island possessing moderate sensitivity to disturbance and displacement. The Kench, Hayling Island LNR is also used as a sheltered feeding area for birds, a saltmarsh and tidal inlet on the south shore of Langstone Harbour.
- **Chichester and Langstone Harbour Ramsar Site**: Two large estuarine basins linked by the channel which divides Hayling Island from the main Hampshire coastline. The site includes intertidal mudflats, saltmarsh, sand and shingle spits and sand dunes. The two harbours are joined by a stretch of water that separates Hayling Island from the mainland. Tidal channels drain the basin and penetrate far inland. The basin contains a wide range of coastal habitats. The boundaries of the Ramsar site are entirely coincident with those of the Chichester and Langstone Harbour SPA.
- **Solent and Maritime Special Area of Conservation (SAC)**: A complex site encompassing a major estuarine system on the south coast of England. The Solent and its inlets are unique in Britain and Europe for their unusual tidal regime, including double tides and long periods of tidal stand at high and low tide. As a result, the Solent Maritime SAC is a unique suite of functionally linked estuaries and dynamic marine and estuarine habitats. The primary features for which the SAC is designated are estuaries, Spartina swards and Atlantic Salt Meadows. In addition, the following natural habitat type specified in Annex I to the Habitats Directive are present as qualifying features, but not as primary reasons for its selection as an SAC:

    (A) Sandbanks which are slightly covered by sea water all the time;

(B) Mudflats and sandflats not covered by seawater at low tide;

(C) Coastal lagoons (as a priority feature);

(D) Annual vegetation of drift lines;

(E) Perennial vegetation of stony banks;

(F) Salicornia and other annuals colonising mud and sand; and

(G) Shifting dunes along the shoreline with Ammophila arenaria ("white dunes").

- **Solent and Dorset Coast SPA**: A new SPA classified on 16 January 2020 (consulted on as a pSPA in September 2016), protecting foraging habitat for internationally important populations of common tern, sandwich tern and little tern. This area is particularly important to these birds as much of the sea around their breeding colonies is the ideal habitat for plunge diving for food.
- **Langstone Harbour Site of Special Scientific Interest (SSSI)**: Designated for the combination of intertidal habitats (coastal lagoons, sheltered muddy shores) it supports and its importance to wintering waterbirds (red breasted merganser and tern spp.).
- **Chichester Harbour SSSI**: A site of particular significance for wintering wildfowl and waders and also breeding birds. There is a wide range of habitats which have important plant communities.
- **Langstone Campus Solent Waders and Brent Goose Strategy Site**: The Langstone Campus playing fields are a core area designated for Solent Waders and Brent Goose Strategy sites, aimed to conserve internationally important Brent Goose and wading bird populations within and around the SPAs and Ramsars of the Solent Coast. The playing fields are otherwise used as football pitches for the University of Portsmouth Langstone Campus.
- **Hayling Billy and West Hayling Island Local Nature Reserves (LNR)**: West Hayling LNR is located on the site of the 1864 South of England Company Oysterbeds. Hayling Billy LNR comprises parcels of land, mainly to the East of the Hayling Billy Trail and the Trail itself.
- **Chichester Harbour Area of Outstanding Natural Beauty (AONB)**: Chichester Harbour was designated as an Area of Outstanding Natural Beauty (AONB) for its unique landscape, as one the few remaining undeveloped coastal areas in Southern England.
- **Sinah Common SSSI**: designated for its coastal shingle, saltmarsh and grassland habitats. The saltmarsh area within the Hayling golf club is managed as a nature reserve by the Hampshire and Isle of Wight Wildlife Trust.

6.2.1.2. Appendix 1 to this supplementary chapter is an environmental constraints map for Langstone harbour, identifying the location of all of the above referred to designations relevant to Langstone Harbour.

6.2.1.3. In addition to the above explained designations, Langstone Harbour is used by sailing clubs who use the Broom channel and there are many moorings and anchorages for smaller vessels contained with the harbour. The channel into Langstone Harbour is narrow, it is mainly used by fishing, charter and recreational vessels however, the harbour is used frequently by dredgers travelling to the northwest of the harbour at Kendall's Wharf aggregate site.

6.2.1.4. With regard to Hayling Island, a road bridge (and the Hayling Billy line) connects its northern end to the mainland at Langstone. The island is surrounded by the environmental designations noted above.

6.2.1.5. Langstone Harbour is a heavily designated area from an environmental, and particularly an ecological, perspective, and accordingly any works that are to take place in Langstone Harbour would need to be very aware of impacts on those designations, and in addition be accompanied by a comprehensive package of mitigation measures so as to avoid harming the integrity of the designated sites, where possible.

6.2.1.6. Despite the plethora of designations, noting the potential benefits of routing the submarine cables through Langstone Harbour so as to avoid the need to route the Onshore Cables through Portsea Island and the requests from Portsmouth City Council for a route through Langstone Harbour to be fully explored, the Applicant explored multiple potential options to determine whether it would be feasible to route the submarine cables through Langstone Harbour.

6.3. OPTIONS FOR THE SUBMARINE CABLES TO BE LOCATED IN LANGSTONE HARBOUR

6.3.1.1. Five options were identified by the Applicant to potentially utilise Langstone Harbour/Hayling Island to bring the submarine cables onshore, which can be summarised as follows:

- **Option A**: Fixing the cables to an existing bridge (from Portsea Island (Option A1) or Hayling Island (Option A2);
- **Option B**: Fixing the cables to the former Hayling-Billy Line (a former railway bridge structure);
- **Option C**: The use of a HDD adjacent to an existing bridge (from Portsea Island or Hayling Island);
- **Option D**: The use of a HDD across the entrance channel to Langstone Harbour from Hayling Island to Portsea Island; and

- **Option E**: Laying the cables through the Langstone Harbour entrance channel.

6.3.1.2. Each of the above summarised options are explained in more detail, together with an explanation of the technical, economic and environmental considerations relevant to each of them.

6.3.2. OPTION A: FIXING THE CABLES TO AN EXISTING BRIDGE (FROM PORTSEA ISLAND (OPTION A1) OR HAYLING ISLAND (OPTION A2)

6.3.2.1. Option A1 comprised of a crossing across the Eastern Road Bridge (A2030) from the roundabout on the mainland to Portsea Island. This included the consideration of using the existing deck of the bridge, or an alternative to attach the cables to the bridge.

6.3.2.2. The bridge supports the Eastern Road immediately south of the roundabout junction where the A27 crossed Eastern Road. Whilst the depth of the road deck appears to be adequate for the HVDC cables to be installed in trenches, disruption to the Eastern Road would have occurred where trenching was undertaken.

6.3.2.3. In addition, it would also have been necessary to cross the roundabout junction. In this regard it was noted that there would not have been sufficient space for HDD compounds at the south side of the roundabout, so the crossing would have to be effected by trenching, causing considerable disruption to the 4-lane roundabout.

6.3.2.4. The route under this option crosses Langstone Harbour SPA, SAC, Ramsar and SSSI via an existing road bridge, therefore only indirect impacts on the harbour were considered to be likely. Numerous habitats are present within Langstone Harbour, the local communities within which would be negatively affected by any removal or degradation of these habitats. It was identified that any disturbance would likely have a negative impact on the bird communities present, due to the related degradation of roosting, foraging and breeding habitat.

6.3.2.5. Likely immediate receptors within 500m of this option are high density residential settlements including Anchorage Park, users of the Solent Way, Sustrans Routes 222 and 22, other footpaths, Langstone Harbour and sailing club, and road users. During construction it was considered to be likely that users would experience temporary disruption to their journeys, changes to the amenity value and adverse health effects from stress and deterring from active travel.

6.3.2.6. As a consequence of the potential impacts identified, particularly those related to the need to trench across the four lane roundabout on Eastern Road which serves the Havant Bypass, this option was not taken forward.

6.3.2.7. Option A2 comprised the landfall for the connection of the submarine and onshore cables being located at the south of Hayling Island, with the onshore cable route then continuing northwards across Hayling Island before proceeding across the existing road bridge to the mainland forming part of Langstone Road. This option is illustrated on Plate 2-9 located at Chapter 2 to the ES, where the route 2 options are identified.

6.3.2.8. As is explained at paragraph 2.4.11.14 of Chapter 2 to the ES, it was deemed that crossing the bridge from Hayling Island to the mainland which forms part of Langstone Road was not technically feasible. The reasons for this can be further summarised as follows:

- Following a visual on site assessment of the bridge to determine its engineering suitability to accommodate the onshore cables, it was determined that the bridge is constructed of reinforced concrete with a shallow deck not sufficient to accommodate the installation of both cable pairs. It would therefore be necessary to install the cables in reinforced duct blocks, with additional protection, most likely via steel plates. This would result in an increased structural loading on the bridge.
- Because the bridge deck is narrow the feasibility of installing either cable trench without closing the whole bridge could not be confirmed. In the event that the bridge would need to be closed, it was estimated this would have required a closure for a period of approximately one month.
- Any proposed construction of a trough system to the bridge to accommodate the cables or any form of aerial system to transport the cables overhead would have required a closure of the bridge as a whole for a minimum one month period. The bridge is the only existing bridge connecting Hayling Island to the mainland. Such a level of impact on the inhabitants of Hayling Island would not be acceptable and could not be mitigated.
- Based on a preliminary assessment of the structure of the existing bridge, the additional loading of weight associated with the installation of the cable pairs would be likely to adversely impact on the overall stability of the bridge, the risk of which was in no way acceptable for the Applicant to bear.
- Furthermore, the Applicant was conscious that the future maintenance regime for the installed cables would likely be complicated by their location in the bridge and could pose additional restrictions in this regard. Noting the already identified potential issues regarding the structural integrity of the bridge where the cables were installed in this location, this was a reason why this option was not considered to be practicable.

6.3.2.9. In addition to the identified technical engineering reasons for why both of options A1 and A2 were deemed not to be feasible and/or practicable, it was also noted that the carrying out of such works would be likely to have an adverse impact on the Langstone Harbour SPA, SAC, Ramsar, SSSI and Chichester Harbour SSSI, with it being expected that both options had the potential for disturbance effects on the bird community due to the degradation of roosting, foraging and breeding habitat.

6.3.2.10. For the above reasons, both of options A1 and A2 were not explored further by the Applicant.

6.3.3. OPTION B: FIXING THE CABLES TO THE FORMER HAYLING BILLY LINE (A FORMER RAILWAY BRIDGE STRUCTURE)

6.3.3.1. As an alternative to utilising the bridge forming part of Langstone Road to cross from Hayling Island to the mainland, the Applicant explored the feasibility of utilising the existing remains of the Hayling Island railway branch line bridge to the west of the existing road bridge, known as the Hayling Billy Line.

6.3.3.2. The Hayling Billy Line was constructed in the 1860's and abandoned in 1963, now being comprised of the original supporting concrete structure only, shown in the images below.

Plate 9 – Images of the Hayling Billy Line

6.3.3.3. From initial exploration , it was considered that it was unlikely the supporting concrete structure would be capable of accommodating either of the cable pairs without the need for structural repairs, the undertaking of which would have been likely to cause significant impacts on the surrounding designated environment.

6.3.3.4. Further, it was identified that liability issues may arise as a consequence of the need to prevent unauthorised access onto the existing structure. Whilst it was considered whether some form of security structures could have been utilised, it was noted that additional structures in this landscape would have been likely to give rise to significant impacts which it was felt could not be justified, and in any event the residual health and safety risk and associated potential liabilities for the Applicant as a result was not considered to be acceptable.

6.3.3.5. For these reasons, the option of utilising the supporting concrete structural remains of the Hayling Billy Line was not feasible and/ or practicable and was not further explored by the Applicant.

6.3.4. OPTION C: THE USE OF A HDD ADJACENT TO THE EXISTING HAYLING ISLAND BRIDGE.

6.3.4.1. Following the consideration of utilising the existing bridges (Option A1 and A2) and the former Hayling Billy Line (Option B), the option of proceeding via a HDD adjacent to the existing road bridge from Hayling Island to the mainland was considered. This would have avoided the need to utilise existing structures to lay the cables (deemed not to be feasible).

6.3.4.2. Whilst explored, the option of proceeding with a HDD parallel to Hayling Island Bridge to take the cables from Hayling Island to the mainland was discounted for the following reasons:

- The only suitable locations available for HDD compounds (required to be a minimum of 50 m x 50 m, with associated laydown areas for storage and pulling of ducts likely to be approximately 200 m long) were within the areas subject to environmental designations. Accordingly, it was deemed that the disturbance impacts associated with the placing of a compound in those areas would not be acceptable from an environmental perspective; this had the very real potential to impact on the integrity of those designated areas.
- The required length of the HDD at around 1.6 km is at the upper end of what is feasible when utilising HDD techniques. As a consequence of being at this upper end, the HDD would require a significant laydown area to one side of the HDD compound to allow the duct to be constructed. It had already been identified that sufficient land was not available for this save for within environmentally designated areas.

- Whilst ground conditions were assessed and found to be potentially suitable for a HDD, the long length of the HDD required could only be carried out by a very limited number of HDD contractors and would need to be confirmed as deliverable through a full detailed assessment. For an HDD of this length, the contractor would have to minimise the number of pipe welds where a 1600m continuous pipe pull was not possible (which was considered likely to be the case due to limited laydown space available). Based on the availability of laydown areas, having already noted these are located within environmental designated sensitive areas, the maximum length for the sections would likely be 200-300m, resulting in the need for around 5-7 welds. Each weld takes approximately 4-10 hours to complete, and the longer the bore is left unlined, the greater the risk of collapse of the bore. Where a bore collapses a new bore is required, at considerable time and cost.

6.3.4.3. Noting the constraints in the locality, the likely impacts on the designated environmental areas as a result of a HDD being carried out in this location, the resultant limitations on the construction methodology that would need to be utilised and the level of risk this created from a technical feasibility perspective, it was considered by the Applicant that the limitations on the available land for this option posed too high a level of environmental and technical risk to be considered as a reasonable alternative.

6.3.5. OPTION D: THE USE OF A HDD ACROSS THE ENTRANCE CHANNEL TO LANGSTONE HARBOUR FROM HAYLING ISLAND TO PORTSEA ISLAND

6.3.5.1. The potential for a HDD across the Langstone Harbour entrance channel to Portsea Island was considered, with it being noted that it was not possible to exit Hayling Island to the north and so as to seek to avoid impacts related to traffic in Eastney.

6.3.5.2. The potential HDD across Langstone Harbour entrance channel from Hayling Island to Portsea Island between the Ferryboat Inn car park on Hayling Island to the University of Portsmouth (Langstone Campus) Playing Fields considered by the applicant is illustrated in the image below.

Plate 10 - Indicative HDD crossing across the Langstone Harbour entrance channel to Hayling Island

6.3.5.3. The option of a HDD across the entrance to Langstone Harbour was discounted for the following reasons:

- Given the numerous environmental designations that could be impacted on Hayling Island and within Langstone Harbour and the technical distance restrictions for the use HDD, the only available location which could potentially be used for the HDD installation compound was identified to be the car park associated with the Ferryboat Inn.
- Utilisation of the car park would provide a restricted area of 2,000sqm, 500sqm less than the minimum 2,500sqm advised by drilling contractors as being required to accommodate the required HDD compound and associated equipment. In addition, there was no suitable area for the laydown of the required pipes. As a result, it was not possible to confirm that a HDD would be feasible in this location.
- The Langstone Harbour channel entrance is steep sided, which poses particular restrictions for HDD installation. HDD plant is designed for an approach angle of 12-15°. If a steeper angle were to be required, modified or new plant would be required, plus new handling methods, because the drill pipes are fed into the back of the rig, so if this is higher the feeding process will be more complicated and involve additional risks of working at height and of dropping materials from a greater height.

- A steeper approach angle also means that the depth of the crossing would increase, as the bend radii for HDD ducts are large, typically 500m for long crossings. This, plus the significant silt movement in the channel, presents a risk of the burial depth of the cables being so great that the thermal rating may not be achieved.
- HDD contractors consulted with in relation to the feasibility of this option confirmed that bores beneath channels were considered to be high risk, due to the potential for buried channels (where a channel may have moved over time) through which drilling fluid could be lost into the local environment, leading to collapses, and in the worst case abandonment of the bore with a need to re-drill nearby (in this instance further south – see below for further information in this regard).
- In light of the issues identified within the previous bullet, preparation would therefore require a much more detailed level of ground investigation, including intrusive work, to ensure accurate mapping of any buried channels. This would require more drilling rigs within the channel for a longer period, which would obstruct and in turn have an adverse impact on other marine operations/traffic
- In terms of the potential further constraints to a HDD in this location, it was identified that there are existing telecommunication cables crossing the northern end of the entrance channel (in proximity to the ferry route). These would need to be avoided by an appropriate clear distance, which would push the HDD route to the south and in turn increase the overall length and complexity of the HDD.
- The Eastney Wastewater Transfer Tunnel crosses the sports fields at unknown depth (but thought to be 2-3 m). The tunnel continues north and then east under Langstone Harbour. This is a significant buried structure, and its operators would have concerns about the proximity of an HDD, both for reasons of accuracy of directional drilling (to avoid damage) and the potential of related subsidence impacting on the tunnel structure. Drilling deeper below the tunnel to minimise risk of impact on the tunnel would result in increased length for the HDD. This would present a constraint to the HDD alignment and profile in this locality, requiring it to go deeper and in turn extending the length of the HDD and making a HDD compound more challenging to locate.

6.3.6. OPTION E: LAYING THE CABLES THROUGH THE LANGSTONE HARBOUR ENTRANCE CHANNEL

6.3.6.1. To achieve a more northern landfall and remove the need to route the onshore cables through much of Portsea Island, the Applicant explored the option of installing the submarine cables through Langstone Harbour. Following this approach the cables would be required to enter through the entrance channel to Langstone Harbour and would make landfall at Kendall's Wharf, on the basis that there is no known dredged channel to north of Kendall's Wharf that could otherwise be utilised.

6.3.6.2. The below provides a summary of the considerations relevant to exploration of this option as an alternative:

- This option would cross directly through the Chichester and Langstone Harbour SPA, SAC, Ramsar, SSSI and the Sinah Common SSSI via a cable lay. It was therefore anticipated that there would be a direct negative significant impact on these protected areas due to the removal or degradation of habitat and direct disturbance for ecological communities and degradation of roosting, foraging and breeding habitat for birds. In this regard it was noted that whilst the impacts would be temporary, for the duration of the works to install the submarine cables, this option had the potential by virtue of the disturbance likely to be caused, to harm the integrity of the designations.
- There are many users of Langstone Harbour, including: clam fishery; marine mammals; shipping and navigation activities in relation to activities at Kendall's Wharf (a mineral aggregate wharf) and other amenity users to the harbour. Works to lay the cables in the harbour would adversely impact on such users for the duration of the works in this location.
- From a technical feasibility perspective, it was noted that Langstone Harbour includes generally shallow water depths which would have limited the types of vessels that could have been utilised to install the cables in this location.
- Bathymetry for the Entrance Channel and estuary is illustrated in Plate 11. The entrance channel to Langstone Harbour is typically 230-300m wide (MLWS to MLWS on either side of the channel) and comprises a steeply sided channel, locally reaching depths in excess of 13 mLAT at the northern end. However, shallower areas exist, such that there is no continuous channel at depths of greater than 10 mLAT (Plate 11).

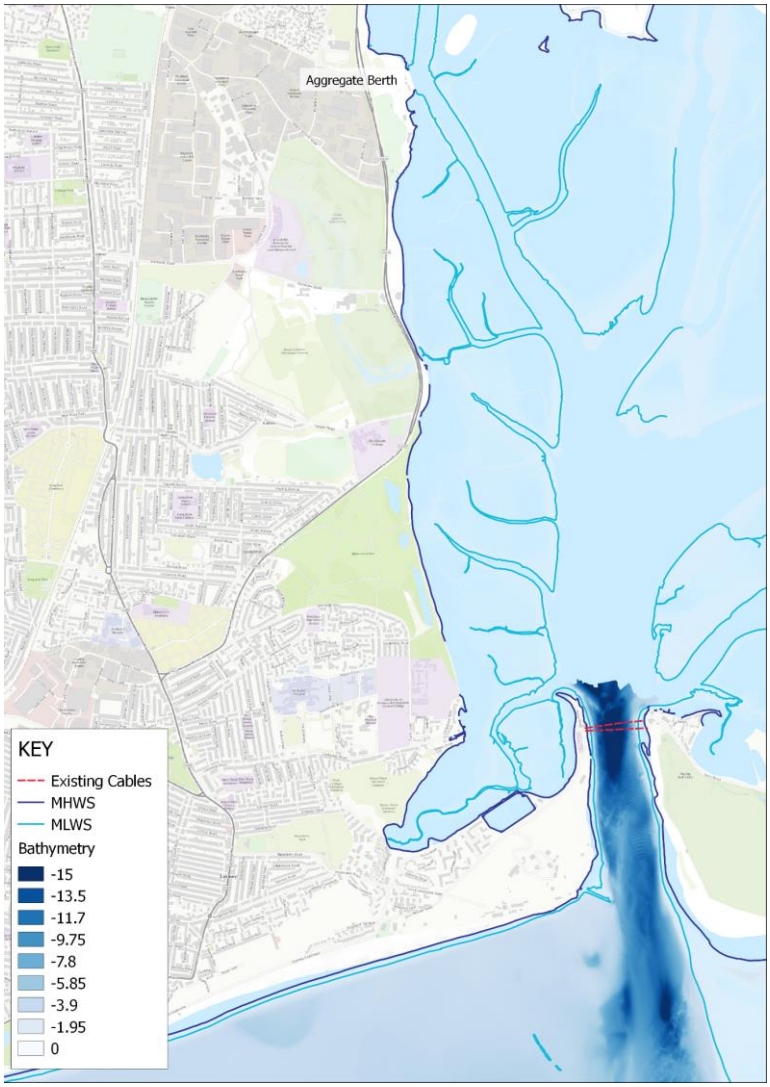


Plate 11 – Bathymetry of Langstone Harbour Entrance Channel

6.3.6.3. For the sea approaches, the 10 mLAT water depth contour is approximately 8 km off the harbour entrance. From 10 m LAT, the water shoals up to 2-3 mLAT about 2 km from shore, before deepening again as it approaches the entrance channel. The route is bordered to the east by the East Winner Sands which dry out at low tide and extend approximately 2 km from the entrance.

6.3.6.4. Where a dynamically positioned cable lay vessel is to be used, a working corridor of approximately 80 m is assumed to be required, so this would be able to navigate through the width of the channel entrance. However, considering an allowance for vessel draught, the existence of thrusters beneath the hull and the need for an Under Keel Clearance Allowance, a minimum water depth of 10m is required. Therefore a dynamically positioned cable lay vessel could not be used as there is no continuous channel at depths of greater than 10 mLAT.

6.3.6.5. A Cable Lay Barge has shallower vessel draught (4 m assumed including under keel clearance) but requires its position to be held by a mooring spread of typically 4 or 6 (but up to 8) anchors. Each anchor is on a mooring cable, with each cable typically limited to a 500 m length due to the mooring winch capacity. Contractors generally prefer to use longer moorings to allow greater movement along the route before repositioning the moorings. At a detriment to the speed of installation, the length of the moorings can be reduced to around 250 m in length.

6.3.6.6. Where the cable lay and installation would be undertaken by a moored Cable Lay Barge, a minimum 250m wide mooring spread (centred on the cable to be installed) is required. A 50m distance would be required between the two cable circuits, therefore requiring a total mooring spread of 300m. In the circumstances the moorings would need to be positioned in very shallow water, and potentially above low tide. This would be a potentially impossible operation, and would also result in complete blockage of the channel during the installation operations.

6.3.6.7. Soft muds within the estuary would also pose an installation constraint, being extremely difficult to lay and bury a cable through due to vessel draught, water depth for burial tool operations and burial tool stability. In this regard, the Langstone Harbour Board indicated that it would have significant concerns about any option to route the cable through the navigable channel and into the harbour.

6.3.6.8. The nature of this channel is that it must be either dredged, or self-scouring, to maintain its charted navigable depth. Either of these activities would result in a need for a greater than typical burial depth so as to avoid cable exposure in the future. If the channel is dredged, the cables would have to be buried to such a depth that they would not be impacted by any over-dredge during maintenance dredging of the channel. If the channel is self-scouring, the cables would have to be at such a depth as to be in stable seabed, below the level of erosion estimated for the lifetime of the cable. The sediment in the channel, as with all estuaries of this type, is likely to be mobile – both vertically and laterally.

6.3.6.9. According to the Langstone Harbour management Plan (1997) the main channels were last subject to a capital dredge in the 1970's, and the Harbour Board does not undertake any maintenance dredging. This would indicate that the channel is self-scouring, however occasional dredging is known to be undertaken at Kendall's Wharf, where the Landfall would be required to be located, to maintain the required berth depth.

6.3.6.10. The cable burial would therefore have to be designed such that it was at a depth below the stable seabed level to avoid exposure, but equally designed such that it could tolerate increased sediment thicknesses which generate thermal increases in the cable.

6.3.6.11. Further, where repairs are required, they would be anticipated to take a minimum of 2-4 weeks for the joints, plus survey time, creating additional disruption to shipping. The joints would be required to be repaired and would then have to be protected by non-burial protection mattresses or rocks, which would reduce navigable depth in already shallow waters, likely to a navigable depth below MCA requirements. In addition, this repair activity would have an adverse impact on the protected sensitive environment at Langstone Harbour by virtue of the disturbance caused.

6.3.6.12. As shown on Plate 11, there are existing telecommunications cables located across the entrance channel to Langstone Harbour, and a cable crossing would therefore also be required. The location of a cable crossing in this entrance channel would reduce the water depths to below MCA requirements. The MCA require that navigable depth must not be reduced by more than 5%, which at this location would be about 0.5-0.65 m. The minimum thickness for a crossing for this type of construction is approximately 0.9 m, with no allowance included for installation tolerances. A cable crossing in this location was therefore not feasible from an engineering perspective.

6.3.6.13. As can be seen from the above, the potential to route the submarine cables through Langstone Harbour was thoroughly investigated, however the potentially impossible cable lay due to the available navigable depth and width of the entrance channel and the impossibility of constructing the required cable crossing meant that this option was not feasible from an engineering perspective. Further, had it been feasible from an engineering perspective, there would still have been considerable complexity associated with the operations, carrying an inherent high level of risk of issues arising. In addition, there were serious concerns about the potential for impacts on the surrounding environment, which as has been explained is highly sensitive and turn subject to multiple environmental designations and protections, which had the potential by virtue of the disturbance likely to be caused to impact the integrity of the designations.

6.4. CONCLUSIONS IN RESPECT OF THE OPTIONS FOR THE SUBMARINE CABLES TO BE LOCATED IN LANGSTONE HARBOUR

6.4.1.1. As explained above, multiple alternative options were considered by the Applicant to utilise Langstone Harbour and Hayling Island to route the submarine cables onto the mainland, however for the reasons set out those options were not feasible from an engineering perspective and would have prevented the development from coming forward, carried too high a level of risk in various respects, and/or were considered likely to result in adverse impacts to the surrounding sensitive and heavily designated environment. For those reasons the option of routing the cables via those options were not explored further by the Applicant, with the focus continuing on the assessment of Eastney and East Wittering as the potential Landfall locations.

7. SELECTION OF THE ONSHORE CABLE CORRIDOR

7.1.1.1. Further to the information relevant to the selection of the options for the Landfall locations which determine the starting points of the options for the Onshore Cable Corridor (the location of which is identified at paragraph 6.1.1.1 above), information relevant to the consideration of the alternatives for the Onshore Cable Corridor for the Proposed Development is provided at the following paragraphs within Chapter 2 of the ES:

- Paragraph 2.4.11
- Paragraph 2.4.13
- Paragraph 2.4.14

7.1.1.2. As is explained at paragraph 2.4.11.14 – 2.4.11.16 of Chapter 2 to the ES and above in section 6 to this supplementary chapter, whilst the option of routing the cable through Hayling Island and across the Langstone Road bridge, or via a HDD parallel to this was considered by the Applicant, this was deemed to not be feasible from an engineering perspective. Accordingly, all route 2 options shown on Plate 2-9 within Chapter 2 to the ES were subsequently discounted following the Applicant's assessment of those options.

7.1.1.3. On that basis, the two preferred Landfall locations were Eastney and East Wittering. For the reasons explained at paragraph 2.4.11 of Chapter to the ES Route 3D was preferred and was progressed to a further detailed assessment. In addition, Route 1D was also taken forward as a potential alternative and subject to a further detailed assessment to determine its suitability as a potential Onshore Cable Corridor.

7.1.1.4. This section 7 of this supplementary chapter provides a further detailed explanation of the considerations relevant to Route 1D by comparison to Route 3D which was taken forward as the preferred option for the Onshore Cable Corridor and subject to further refinement.

7.1.1.5. In addition to more fully explaining the considerations taken into account at the time, this section also refers to a verification exercise undertaken by Royal HaskoningDHV on behalf of the Applicant and independent from work undertaken in relation to the Proposed Development to date, in respect of the likely impacts to be experienced by traffic in relation to Route 1D and Route 3D.

7.2. LOCATION AND CHARACTERISTICS OF ROUTE 1D AND ROUTE 3D

7.2.1.1. Plate 12 below shows both Route 1D and Route 3D, with Route 1D shown in purple and Route 3D shown in blue. This figure is the same as that shown as Plate 2-10 within Chapter 2 to the ES.

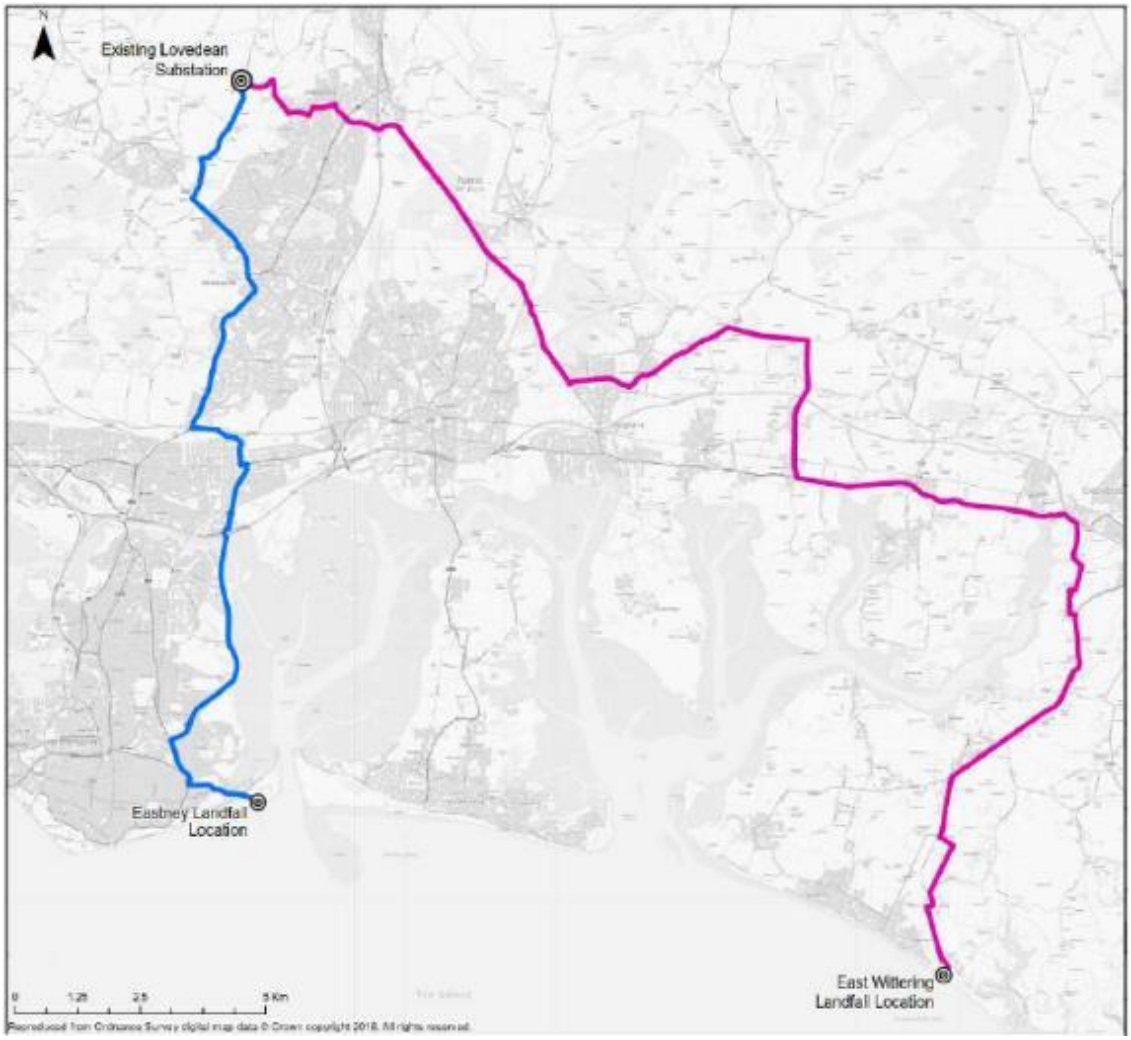


Plate 12 – Route 1D (purple line) and Route 3D (blue line)

7.2.1.2. Route 1D can be broadly summarised as a route which utilises the East Wittering Landfall, progressing through fields near Earnley, before progressing along the B2198 - A286 - A259 - B2146- B2147 -B2148 - B2149, through Lovedean town and then on to the existing Lovedean substation, identified as the preferred grid connection point for the Proposed Development.

7.2.1.3. Route 3D can be broadly summarised as a route which utilises the Eastney Landfall. Progressing along the A288 - A2030 - B2177 - A3 - B2150, and then through country roads and fields to the existing Lovedean substation.

7.2.1.4. Table 6 below provides a high level summary of key information relevant to Route 1D and Route 3D based on the preliminary assessment of the routes undertaken by the Applicant.

Table 6 – High level route summary

Route	1D	3D
Approx. route length	35.2km	18.6km
Estimated number of joint bays	28-35	15-18
No. HDD required	10	2
Initial estimate of total HDD lengths	1.1-1.5km	1.45km

7.3. ASSESSMENTS UNDERTAKEN

7.3.1.1. Following Route 1D and Route 3D being identified to be taken forward for further detailed assessment, detailed desk study exercises were carried out in relation to each of the two routes, which included a review of the following:

- Available environmental information, including a review of geotechnical and historical information, to develop a better understanding of the constraints relevant to each route and the likely impacts associated with them.
- Detailed utilities search information for each route, used to identify potential utilities pinch points. These pinch points were locations that would require further discussions with utilities companies or an assessment of options for an alternative route to bypass the pinch point.

- A review of third party land ownership within each cable corridor, in areas where third party land access is required.
- The potential crossings associated with each route to understand if they presented any ‘showstoppers’, including a review of the techniques available to cross with the onshore cables and consideration of the consequential impacts on the programme for and cost of the works.

7.3.1.2. With regard to the review of the available environmental information, the following studies and surveys were undertaken to inform a proportionate comparative review of the environmental impacts likely to be associated with each of the two routes:

- A desktop review of publicly available sources of online data (online mapping, Lidar data, aerial photography and data records);
- A desktop review of protected species data, provided by Hampshire Biodiversity Information Centre and Sussex Biodiversity Record Centre Records;
- Habitat surveys were conducted by ecologists to identify dominant plant species and to confirm habitat types already identified from a review of online mapping resources; and
- An arboriculture survey of each route, with a particular focus on the location of Ancient Woodland adjacent to Route 1D.

7.3.1.3. With regard to the further consideration of engineering constraints relevant to each route and the feasibility of the options in relation to those constraints, concept design studies were carried out. Building on the review of the available geotechnical data and information obtained from the detailed utilities searches, the concept design studies focused on assessing the feasibility of each route in terms of technical factors such as ground burial suitability, utilities and potential pinch points. Pinch points in this respect included areas where there was a high level of risk to the integrity of the cables e.g. exceeding the bending radius or compromising the cable rating.

7.3.1.4. The below paragraphs provide a summary of the findings of the assessment undertaken relevant to the environment in relation to Route 1D and Route 3D.

7.3.2. TRAFFIC AND TRANSPORT IMPACTS

7.3.2.1. With regard to traffic and transport impacts, both routes were routed along highways following the early project strategic decisions in this regard, the reasons for which are outlined at Table 2-1 within Chapter 2 to the ES. On this basis, it was identified that both routes would be likely to result in traffic and transport impacts, with the preliminary view being that Route 3D was more likely to give rise to higher level of impacts in terms of the number receptors affected due to its more urban nature, but that impacts on traffic would last for a longer period in relation to Route 1D as a consequence of the route being close to double the length of Route 3D and therefore taking a longer period to construct, discussed further below.

7.3.2.2. Whilst it was acknowledged that there would inevitably be significant impacts on traffic and transport receptors related to traffic as a consequence of the proposed works, that Route 3D was located within a more urban environment was considered to be beneficial, with the roads generally being of a greater width for larger amounts of the route and therefore more likely to be able to accommodate both cable pairs without the need to impact on the environment adjacent to the highways in question or to encroach onto parcels of land outside of the highway boundary, further limiting the amount of land acquisition likely to be required.

7.3.2.3. In addition, given the more urban nature of Route 3D, it was considered that there would be a greater ability to mitigate the impacts that arise by virtue of their generally being a greater width of road within which to do so, which it was considered would limit the need for full road closures and the length diversions as a consequence. In addition, the urban location of Route 3D offered the ability for diversions to be located so as to route highways users around the immediate areas where the works were being carried out over shorter distances, in addition to the ability to keep traffic on the roads where works were being carried out moving (albeit at a reduced capacity for the short term period of the works), and therefore resulting in a lesser overall qualitative impact on the highway users experience.

7.3.2.4. By comparison, it was noted that as Route 1D was much more rural in its location, the impacts of the works on the highway would be less likely to give rise to indirect impacts to human receptors adjacent to where works were being undertaken, including in relation to issues relating to access and any disruption caused as a result (albeit noting that short sections of works would be undertaken at any one time, limiting the extent of the impacts at any one time, and the period of impact on the adjacent receptor). In addition, it was generally considered that road user movements would be lower on the roads comprised in Route 1D as compared to Route 3D given their rural nature, therefore limiting the magnitude of the effects experienced.

7.3.2.5. More recently and in light of comments made in relation to the impacts associated with the works in the highway on traffic and transport receptors, the Applicant has commissioned an independent preliminary review of the impacts on traffic and highway users to be undertaken, to verify the considerations explained above regarding the likely impacts and ultimately to outline more clearly the differences in the level of impacts to be experienced for both of Route 1D and Route 3D (in addition to assessing the likely impacts of a grid connection point at Bramley substation, discussed above). To ensure a direct comparison of the preliminary review for Route 1D and the Onshore Cable Corridor forming part of the Proposed Development can be made, the same assessment methodology has been applied to and undertaken for each.

7.3.2.6. A copy of the findings of that independent assessment is provided at Appendix 2 to this supplementary chapter, and a summary of the findings contained therein relevant to Route 1D and Route 3D is provided below.

7.3.2.7. With regard to Route 1D, the findings can be summarised as follows:

- In respect of the level of traffic management required, single lane closures are anticipated be required along 23.3km of the route and 12km of the route would be anticipated to require a full road closure whilst the works were undertaken.
- In respect of the sensitivity of the route, 3.9km of the route is anticipated to be of high sensitivity, 10.1km of medium sensitivity, and 21.2km of low sensitivity.
- With regard to pedestrian severance and amenity impacts, users of the majority of the route (28.6km) would be anticipated to experience minor adverse impacts, with users anticipated to experience moderate adverse impacts for 6.7km. No major impacts on pedestrian severance and amenity were identified.
- With regard to traffic delay, users of the majority of the route (22.9km) would be anticipated to experience medium effects, with 12.3km experiencing high effects. No experiences of low effects are identified.

7.3.2.8. With regard to refined Route 3D which forms part of the Proposed Development, the findings can be summarised as follows:

- In respect of the level of traffic management required, single lane closures would be anticipated to be required along 13.7km of the route and 4km of the route would anticipated to require a full road closure whilst the works were undertaken.
- In respect of the sensitivity of the route, 7.1km of the route would be anticipated to be of high sensitivity, 9.4km of medium sensitivity, and 1.2km of low sensitivity.

- With regard to pedestrian severance and amenity impacts, users of the majority of the route (15.5km) would experience minor adverse impacts, with users anticipated to experience moderate adverse impacts for 1.3km of the route and major adverse impacts would be anticipated to be experienced for users along 0.3km of the route.
- With regard to traffic delay, 12.9km would experience be anticipated to experience medium effects, with 4.5km anticipated to experience high effects.

7.3.2.9. Focusing on impacts, it is notable that 12km of Route 1D would be expected to require a full road closure whilst the works are undertaken (in comparison to 4km for the Proposed Development, 3 times as much despite the route being twice the length), with users anticipated to experience 12.3km high traffic delay effects along 12.3km of the route also, by comparison to users being anticipated to experience the same effects for 4.5km of the Proposed Development route (again, circa three time higher).

7.3.2.10. With regard to pedestrian severance and amenity it is noted that the proportion of impacts in terms of the level of significance is broadly similar when comparing Route 1D to the Proposed Development. It is noted in this regard that the Proposed Development route being in a more rural location, would be anticipated to provide a greater ability to provider shorter diversions, which it would be anticipated would lessen the extent of the residual impacts.

7.3.2.11. Noting the findings of the independent verification assessment, it is considered that the considerations of the Applicant at the time of deciding the preferred Onshore Cable Corridor with regard to traffic and transport impacts were accurate in terms of the extent of likely effects that would arise in relation to Route 1D and Route 3D and the ability of the environments within which they were located to be able to accommodate the works.

7.3.3. ECOLOGY AND ARBORICULTURE

7.3.3.1. In respect of Route 1D, three sites of European and International Importance were identified as being adjacent to the proposed route, being:

- Chichester and Langstone Harbours SPA/Ramsar;
- Solent Maritime SAC; and
- Solent and Dorset Coast SPA.

7.3.3.2. Having undertaken a review of the habitats provided by those designated sites and the reasons for which they were designated, it was identified that the following protected species may be present within them:

- Great crested newts (GCN) and amphibians - surveys undertaken in 2017 revealed 41 ponds s breeding habitats and all 12 ponds subject to eDNA survey testing positive for the presence of GCN;
- Hazel dormouse – surveys undertaken in 2017 identified the presence of this species, and whilst tubes were placed along Route 1D to attract dormice to next within them no dormice were recorded;
- Otters – suitable habitat identified within a preliminary ecological appraisal undertaken in 2017;
- Water vole – suitable habitat identified within a preliminary ecological appraisal undertaken in 2017;
- Badger – suitable habitat identified within a preliminary ecological appraisal undertaken in 2017;
- Bats – activity surveys undertaken in the vicinity of Lovedean during 2017 identified the presence of common and widespread bat species;
- Reptiles – suitable habitat identified within a preliminary ecological appraisal undertaken in 2017; and
- Breeding birds – suitable habitat identified within a preliminary ecological appraisal undertaken in 2017.

7.3.3.3. By comparison, it was identified that Route 3D was located adjacent to one site of European and International importance, being the Chichester and Langstone Harbours SPA which provides habitat for important wintering and breeding bird populations. Further sites that are functionally linked to the SPA (Solent Wader and Brent Goose Strategy sites) were also present in proximity to the proposed Route 3D.

7.3.3.4. The more rural nature of Route 1D brings it into contact with more natural and semi-natural habitats than Route 3D, where developed areas with less ecological importance are more common. Whist it would be anticipated to be possible to identify mitigation measures to address the potential adverse effects to a certain extent, as a consequence of Route 1D being likely to impact on more ecologically important habitat there would remain a greater risk of residual impacts.

7.3.3.5. Route 1D was identified to have the potential to impact on several Site of Special Scientific Importance (SSSI), Sites of Importance for Nature Conservation (SINC) and Local Wildlife Sites (LWS), falling within the footprint of the Bracklesham Bay SSSI and being adjacent to Dell Piece West LNR and Chichester Harbour SSSI. With regard to the Bracklesham Bay SSSI, the East Wittering landfall was located within this and it was identified that whilst there was potential for impacts, with the application of mitigations in the form of a HDD, similar to that to be utilised for the Proposed Development, it was anticipated that impacts on this would be able to be mostly minimised.

7.3.3.6. In this regard, Route 3D was identified as being adjacent to the Milton Common SINC and needing to cross the Kings Pond SINC. Kings Pond SINC was noted to contain a range of habitats that has the potential to support a variety of communities and species, including some of conservation concern or protected, like hedgehog, reptiles, invertebrates, GCN, badgers, dormouse and birds.

7.3.3.7. Where the cable route runs directly adjacent to these protected sites but not within them, impacts on those sites would likely be indirect and broadly relate to the disturbance of qualifying features of the sites. Noise and visual stimuli from construction workers and machinery would lead to disturbance effects whilst deposition of dust from works could result in impacts on site features.

7.3.3.8. Further, in the event it was identified as necessary for the cable routes to be located within any parts of those sites so as to avoid other constraints within the highway, it was identified that the removal or degradation of hedgerows, shrub, woodland, grasslands, etc. would have the potential to negatively affect the species present within them and may affect a site's integrity and capacity to support species present.

7.3.3.9. Even if only one part of the site is affected, this may imply the increase of "edge effects", therefore affecting the susceptibility of the site to further degradation and its capacity to support species. In this regard it was also noted that several species located within those designated areas which the proposals had the potential to impact were also subject to additional protections, so cannot be disturbed during the breeding period.

7.3.3.10. By way of a comparison between the two routes, it was noted that Route 1D had the potential for increased interaction with the designated sites, and that whilst it may be possible to identify measures to mitigate the effects on those sites and the species present within them, the more species that are potentially affected the more mitigations need to be provided for, increasing the complexity of the construction methodology and the seasonal times at which works need to be undertaken.

7.3.3.11. With regard to the arboriculture present in proximity to each of the proposed routes, several areas of ancient woodland were located within the Route 1D cable corridor, notably along Foxbury Lane and Comley Hill (near Westbourne). In addition, there are dense areas of ancient woodland on either side of the B2149 between Red Hill and Horndean for approximately 850m.

7.3.3.12. Although the conditions beneath a typical road construction are less favourable for root growth, it is likely that tree roots of this ancient woodland would be encountered if using trenching methods within the highway where ancient woodland exists either side given the narrow width of the road (B2149) and adjacent verges. Standing guidance is that 15m should be allowed between woodland and any development, although this is the minimum distance to allow trees to survive, as some tree roots have potential to extend much further than 15m.

7.3.3.13. Due to the width of the roads in this location and the proximity of the ancient woodland to the boundary of the highway along this route, it was considered to be likely that tree roots may be severed during trenching and (depending on the extent and type of root loss) ancient woodland trees may need to be felled.

7.3.3.14. Alternative installation methods were considered to address this issue, but a preliminary assessment determined that there may not suitable locations in the locality to launch and receive a HDD, and even where suitable locations for the HDD compounds could be found, the spread of cables required to avoid cable de-rating due to thermal increases would pose further technical engineering complexities that it may not have been possible to overcome. This part of Route 1D was therefore was therefore determined to have the potential for significant impacts on irreplaceable ancient woodland sites and for direct impacts on protected species which occupy the habitats within and surrounding the ancient woodland, such as bats.

7.3.3.15. By way of a comparison, Route 3D transitions between an agricultural environment at Lovedean, through suburban areas of Waterlooville, to the urbanised environment of Portsmouth. Semi-natural habitat is present in agricultural areas where arable land and grasslands are present, enclosed by hedgerows, with occasional woodland, scrub and broadleaved trees. Whilst it was noted that there was a likelihood some trees would be required to be removed in connection with the installation of the two cable pairs, this would not impact ancient woodland trees and it was considered this impact could be appropriately mitigated/compensated.

7.3.4. LANDSCAPE AND VISUAL AMENITY

7.3.4.1. Whilst it was noted that the works associated with the construction of the Onshore Cable Corridor would be temporary in nature, and that by virtue of the strategic decision to utilise underground cables any permanent adverse landscape and visual amenity impacts associated with the Onshore Cable Corridor had been largely avoided, consideration was still given to the landscapes through which each cable route was located and the potential impacts that may arise as a result.

7.3.4.2. In respect of Route 1D it was identified that the route ran directly adjacent to the southern boundary of the South Downs National Park for approximately 4km in total across three separate sections, (1) along Day Lane; (2) along the B2149 and the B2147; and (3) passing between the Holt / Havant Thicket Ancient Woodland on the B2149. Although it should be noted that it was also identified that Day Lane would likely not be suitable for the location of the Onshore Cables due to it needing to be utilised as a construction route for the Converter Station area, and that this would be likely to require a refined Route 1D to be located through the South Downs National park in this location.

7.3.4.3. The location of Route 1D adjacent to the South Downs National Park would have the potential to give rise to direct impacts on visual receptors in the vicinity including users of the Shipwrights Way, Monarch's Way and Sussex Border Path, indirect impacts on the setting of the National Park and direct and indirect impacts on landscape character types and associated features in the South Downs National Park including:

- Direct and indirect impacts on Landscape Type D (Downland Mosaic);
- Direct impacts on Landscape Type E (Chalk Valley Systems); and
- Indirect impacts on Landscape Type B (Wooded Estate Downland) and Landscape Type Q (Upper Coastal Plain).

7.3.4.4. Further, the southern section of Route 1D was located along the northern and eastern boundary of the Chichester Harbour AONB. Although the cable route itself did not run through the AONB, given its proximity it was identified that there was the potential for the cable corridor to be required to route within it where local diversions were required to avoid other constraints in the highway, and for direct and indirect temporary effects to arise as a consequence during the construction stage. In addition, three HDDs were proposed along the part of the route adjacent to the AONB to overcome other constraints, with the HDD compounds associated with these likely need to be located within the AONB itself, giving rise to further temporary impacts.

7.3.4.5. By way of comparison, Route 3D was identified to run adjacent to the boundary of the South Downs National Park for a very limited stretch with the potential for indirect effects as a result, but to a much more limited extent than those identified in connection with Route 1D. Further, Route 3D was not located within an AONB and the closest AONB to Route 3D, Chichester Harbour AONB, is located approximately 1.2 km from the route at its closest point, so no effects were anticipated on this.

7.3.4.6. With regard to visual amenity more generally, Route 1D runs through a varied landscape ranging from countryside to urban, whereas Route 3D largely runs through urban areas and as consequence had the higher potential to impact the visual amenity of more receptors. However, much in the same way as was noted for the impacts on landscape, it was identified that the likely impacts would be localised and over a shorter duration which would be reversible.

7.3.5. ARCHAEOLOGY AND HERITAGE

7.3.5.1. With regard to archaeology and heritage, the presence of Scheduled Monuments and listed buildings were considered for each of the two routes.

7.3.5.2. Route 1D was identified to lie directly adjacent to the boundary of Fishbourne Roman Palace, a Scheduled Monument of high significance. Whilst the works in this location were proposed to remain in the highway and therefore it was considered any effects on the monument would be indirect and limited to the duration of the works in that location, the likelihood for below ground archaeological remains within Fishbourne Road West was considered to be high. The proximity of the cable route to this highly significant asset would be considered a constraint, albeit one on which the impacts could be mitigated through appropriate measures.

7.3.5.3. Four Scheduled Monuments were identified to be within 500m of Route 3D, being Fort Cumberland, 18th/19th century Hillsea Lines; Pickett Hamilton Fort; and Eastney Sewage Pumping Station. Based on the nature of the proposals for Route 3D it was not anticipated that the monuments would be likely to be affected.

7.3.5.4. With regard to listed buildings, Route 1D was identified to have 142 Listed Buildings within 500m, including some areas containing clusters of Listed Buildings, where there would be increased risk of direct and indirect effects on buildings/structures, being:

- Somerley
- Apuldrum
- Fishbourne
- Westbourne

7.3.5.5. Whilst given the nature of the proposals (an underground cable), it was noted that it was not likely there would be significant impacts on those listed buildings, it is the case that there will be limited above ground structures associated with the Onshore Cables and therefore avoiding high numbers of listed buildings on which those structures could potentially impact was preferable.

7.3.5.6. By comparison, 31 Listed Buildings were identified to be within 500m of Route 3D, with two areas containing clusters of listed buildings, being Eastney and Purbrook.

7.3.5.7. It was also noted that Route 1D passed through four conservation areas which would need to be taken into account, whereas Route 3D did not pass through any conservation areas, albeit again the potential for impacts on the conservation areas was noted to be limited.

7.3.6. WATERCOURSE CROSSINGS

7.3.6.1. A number of watercourse crossings and/or works to watercourses directly adjacent to Route 1D would be required, which it was identified would have the potential to impact 10 main rivers and a number of other ordinary watercourses. By way of comparison, watercourse crossings or works directly adjacent to the Route 3D were also identified as being required, with the potential to affect 7 main rivers and a number of other ordinary watercourses.

7.3.6.2. Risks associated with crossing such watercourses relate to both works within a watercourse related how the cable route would pass the watercourse (e.g. new structure over a watercourse, within existing structures over the watercourse, new crossing under the watercourse through trenched methodologies and/or new crossing under the watercourse through trenchless methodologies) and works directly adjacent to a watercourse, where land is located in either Flood Zone 2 or 3. In both instances the following impacts could arise:

- Impacts on flood risk upstream and downstream during both construction and operation from new temporary or permanent structures resulting in a change to the conveyance of a watercourse and/or associated floodplain;
- Impact to the safety of construction workers from working within and adjacent to watercourses;
- Associated impact on water quality resulting from pollutants linked to construction activities and impacts to aquatic ecology and other surface water receptors;
- Impacts on hydrodynamic evolution of watercourses during operation and the potential future impact on flood risk from new temporary or permanent structures; and
- Impacts from open cut activities and vegetation clearance, causing river bed and bank erosion.

7.3.6.3. It was identified that the above impacts, where likely to arise, could largely be managed through technical design, by assessing the most suitable form of crossing such as trenchless methodologies, open trenching or bridging over watercourses, as appropriate, to ensure no significant, or at least limited, impacts occur. Albeit, doing so would add a further level of technical complexity to the proposals, resulting in additional time and cost to construct the cables within this corridor.

7.3.6.4. It was also noted that where non HDD crossings are used, which would likely need to be the case because of the land required for a HDD compound to be located being considerable, there may be a need for:

- Fish rescue and turbidity monitoring during open-cut activities;
- Reinstatement of the river bed with natural substrate mix to avoid compaction of the bed materials, which could otherwise disrupt connectivity within the hyporheic zone; and
- Reinstatement of riparian vegetation on the river banks following the completion of works.

7.3.6.5. Again, whilst it was identified those mitigation measures could likely be incorporated, they add a level of complexity to the proposals, resulting in additional time and cost to construct the works, and ultimately adding risk to the proposals overall.

7.3.6.6. It was also noted that surface watercourses are likely to be in direct connectivity with groundwater, therefore there is potential for pollution incidents within any surface watercourses to impact groundwater. Whilst any risk could be adequately removed through appropriate mitigation or design, as mentioned above, avoidance is preferable.

7.3.7. ENGINEERING CONSIDERATIONS AND CONSTRAINTS

7.3.7.1. The below paragraphs provide a summary of the considerations relevant to engineering and project feasibility in relation to Route 1D and Route 3D.

Joint Bays

7.3.7.2. It is preferable for the number of cable joints to be minimised in so far as is practicable. This is because joints, being assembled in the field, are potentially weak points in the cable system. Each joint bay also requires significant temporary works, including excavation and casting a base slab and they must be kept open for cable pulling. Considerable space and access is also required for the cable drums and their trailers or stands, and/or cable winches and other associated equipment. In addition, the jointing operation requires a shelter, to provide a clean and dry working environment, plus space for storage, workshop, generator, lighting, parking and security.

7.3.7.3. Ideally the joints will be on the cable route, therefore not requiring the cables to be diverted to them, but this means that the civil works, cable pulling, and jointing will disrupt traffic and other activities. Typically, a joint bay would be open for 4 weeks, 1 week to excavate and cast the base slab, 1 week for cable pulling, 1 week for jointing and 1 week for reinstatement. An increase in the number of joints will also lengthen the associated environmental impacts as a consequence of these works.

7.3.7.4. As Route 1D is considerably longer than Route 3D, an increased number of joint bays would be required. Based on the length of the two routes and the general assumption that a joint bay will be needed at each interval of 1.0 – 12 km along the route, for Route 1D it was anticipated that up to 29-35 joint bays would be required per cable circuit, whereas for route 3D up to 17-20 joint bays were anticipated as being required per cable circuit.

Technical Pinch Points

7.3.7.5. From a cable system perspective, there are two meanings of the term pinch point as follows:

- A location where the space available for the cables to be laid is such that the distance between the cables is not optimal, leading to thermal inefficiencies and de-rating, and in turn requiring additional measures in order to maintain the cable rating and the overall capacity of the infrastructure.
- A location where construction/installation may be inhibited or unable to proceed as a consequence of other constraints within the land in which the cables are proposed to be located

7.3.7.6. A preliminary review of the likely number of pinch points associated with each of Route 1D and 3D identified 73 pinch points for Route 1D, compared to 26 pinch points for Route 3D. With regard to Route 1D, a combination of narrow residential streets coupled with existing utility services gave rise to the higher number of identified pinch points and was considered likely to obstruct the ability for the Onshore Cables to be installed as intended, thereby requiring careful navigation by either changing the position of the cables within the road, moving the circuits closer together (with the potential to lead to cable de-rating), installing the cables at greater depth (which may require alternative techniques, such as HDD) or by abandoning the congested area and finding an alternative route.

7.3.7.7. A higher number of pinch points would impact on the overall installation programme and cost, and as the pinch points are predominately located within highways it was considered that this was likely to result in additional localised lane closures, road closures or out of hours working where the available road space was not adequate to allow works to be undertaken with the highway remaining open.

Available Highway Corridor

7.3.7.8. As identified above, due to the more rural nature of Route 1D roads would be of a lesser width for larger amounts of the route and therefore less likely to be able to accommodate both cable pairs without the need to impact on the environment adjacent to the highways in question, or to encroach onto parcels of land outside of the highway boundary.

7.3.7.9. When Route 1D was considered from an engineering perspective, to identify any particular areas of concern, areas were identified as presenting particular challenges due to the presence of overlapping constraints and limited space being available for the location of the required Onshore Cables within the highway.

7.3.7.10. The B2149 (shown in Plates 13 and 14 below) is bounded on both sides by Ancient Woodland, with a gas main recorded as running the length of the road. The areas identified with red hatching are areas comprised within the SDNP. The necessary stand off from the gas main would mean that where the installation of the cables was by way of cable trenches, these would have to be located within an area of Ancient Woodland. This would likely involve the removal of irreplaceable ancient woodland trees and it was also considered that further damage could occur to tree roots during excavation of the cable trench.

7.3.7.11. In addition, it was noted that tree roots can detrimentally effect or damage the cables and that as a result, a minimum preferred clearance of 2.0m from any trees is usually required. To avoid damage to the Ancient Woodland and cable it was necessary to consider whether installation via HDD would be feasible in this location.

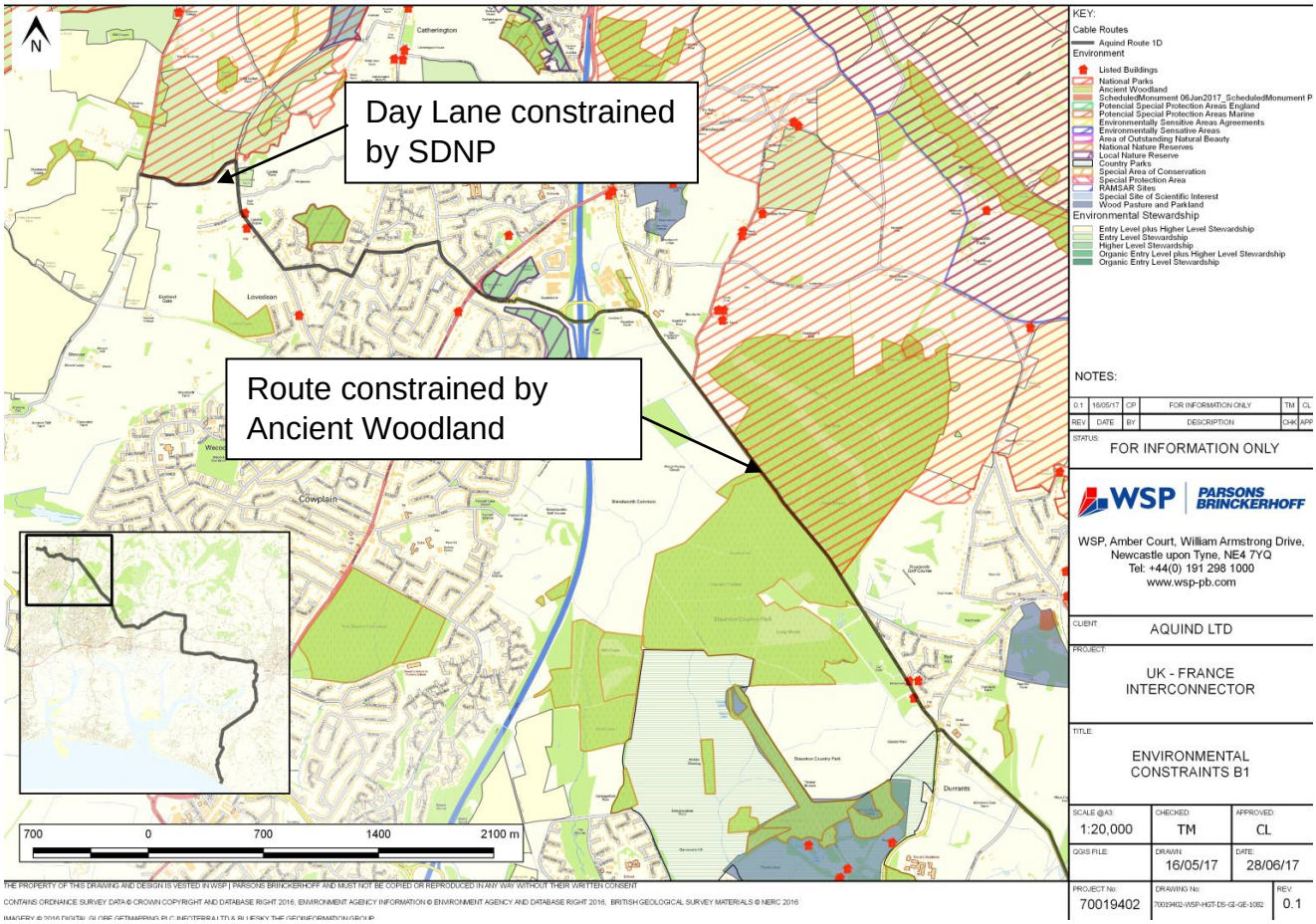


Plate 13 – Extract from Environmental Constraints Plan

Plate 14 - Street view of Ancient Woodland on the B2149

7.3.7.12. To overcome the constraints associated with this stretch of the B2149 and the adjacent ancient woodland a HDD in excess of 1.5km in length would be required and for which compounds at either end of the HDD would be needed, which it was identified could potentially be located in the Rowlands Castle Golf Course or open space land. The existing topography of the land which it was identified could be used for these HDD compounds is such that earthworks would be required to level the ground before they would be suitable for use, which not only would increase the level of construction activity required at these sites for the purposes of construction, but would mean some permanent impacts in relation to that land would likely remain following construction.

7.3.7.13. In addition, whilst no preliminary intrusive ground investigation was undertaken in this area, ground conditions in this location were recorded as Lambeth Group (Clay, Silt and Sand) overlying chalk, with historical boreholes indicating the Lambeth group geology in this area to be between 5 to 10m thick. During HDD operations a general minimum of 5m of ground cover is required to avoid any surface blow out of drilling fluids and to avoid HDD operations connecting with chalk a minimum buffer of 5m from the Lambeth group to the chalk boundary would also likely be required.

7.3.7.14. Given the length of the HDD that would be required so as to avoid the Ancient Woodland, and the depth required so as to provide the minimum distances to avoid a connection with chalk, it was considered the known geology in this area was such that a HDD operation would be high risk, and potentially not possible as there may not be adequate thickness of Lambeth Group or other suitable deposits for HDD operation to remain above the chalk.

7.3.7.15. By way of a comparison to Route 3D, similar ground conditions were encountered at Kings Pond and discussions were held with Portsmouth Water, as a concern was raised regarding both the Lambeth Group and Chalk in the area being separate aquifers and the mixing or connecting the two aquifers being prohibited. To address this issue at Kings Pond HDD activities are restricted to the Lambeth Group (the shallowest unit) and by limiting drill lengths (to a few hundred meters) to make sure the HDD operations do not make contact with the Chalk boundary. However, in the B2149 location given the required characteristics of the drill to avoid the constraints, a similar approach would not be possible as shorteneing the length of the drill would require a HDD compound in an area of ancient woodland, requiring the removal of irreplaceable ancient woodland trees.

7.3.7.16. A further area of particular concern was Day Lane at Lovedean, which is a narrow country road bounded along its northern verge by the South Downs National Park (see Plate 15) along its full length. Day Lane has a number of existing utilities linking to local residences and Lovedean Substation which cable installation via trenching would be required to avoid.

7.3.7.17. As identified above, Day Lane is also the main access to the existing Lovedean Substation and it was anticipated that it would need to be utilised for construction of the Converter Station based on the availability of roads in the locality to access the proposed Converter Station Area. Therefore it was identified that this road must remain fully open during construction to allow access and could not be used for the installation of the cables.

7.3.7.18. To ensure the road is able to be kept open and to allow the cable route construction in this area, the option of diverting the cable route into the verge to the south was considered, however there are a number of existing residential properties that bound the south of the road that would be impacted if this was done (see Plate 15) with the cables needed to be constructed in private driveways and gardens. In addition a solar farm is located on the southern side of the road and construction within the boundary of this would have been necessitated. As a consequence it was considered likely that route would need to be located through the South Downs National Park in this location on the northern side of the road, which as identified above would have given rise to direct adverse impacts on the South Downs National Park.

Plate 15 - Street view of Day Lane

Horizontal Directional Drilling

7.3.7.19. The majority of the HDD crossings considered likely to be required in connection with Route 1D were deemed to be feasible, however there were exceptions to this. The first of these is discussed above in relation to the potential for a HDD to avoid ancient woodland along the B2149 to avoid the loss of ancient woodland trees.

7.3.7.20. One other major exception was in respect of the crossing required at the B2149 and A3 (M) roundabout (see Plate 16). The HDD in this location was likely to be up to 400m in length to bypass the constraints at the B2149 and A3 (M) roundabout, with this considered to be technically challenging due to ground conditions, with the ground conditions at this location also recorded as Lambeth Group (Clay, Silt and Sand) overlying chalk.

Plate 16 - Street view of 1D-HDD10 Crossing B2149 and A3 (M) roundabout

7.3.7.21. Given the required length of the HDD, the ground conditions, as explained above, would therefore require the depth of the drill to be increased to avoid potential hydro-fracture (where the pressurised drilling fluid breaks out at ground level). It was also considered that the depth of the existing A3 cutting and foundations for the highways bridge structures would add further complexity and likely require a further increase to the drilling depths (and in turn the length of the drill).

7.3.7.22. In addition, it was identified that there was restricted access for HDD compound setup in this location. As a result, these conditions combined to present a very high risk technically complex HDD at this location, increasing the likelihood of drill failure, which would have consequential impact on programme and cost, whilst also resulting in additional environmental risks. On balance, this was considered to be on the limits of being feasible, with it not being certain that it would be. It should also be noted that there would be no other way around this constraint, it would have to be crossed for Route 1D to be feasible.

7.3.7.23. Whilst a comparative analysis of the similar engineering constraints associated with Route 3D is not provided here, it has been shown that Route 3D, as refined as part of the Proposed Development, is able to be constructed without any concerns regarding feasibility.

7.3.8. COST AND PROGRAMME IMPACTS

7.3.8.1. As has already been identified, Route 1D is almost twice as long as route 3D, by an additional 16.6km. This additional cable length has impacts in terms of time and cost for cable manufacture and thereafter its installation. The increased length, and in turn duration of the installation works, will also increase the duration of the environmental impacts overall.

7.3.8.2. In 2017 it was estimated that the manufacture and installation of Route 1D would cost approximately £47m more than Route 3D. Within this figure an allowance has been made in respect of the manufacturing cost saving by virtue of the reduction of approximately 9km of marine cable required by virtue of the Landfall being located at East Wittering for Route 1D, rather than Eastney for Route 3D.

7.3.8.3. In terms of the HDDs identified to be required, ten HDD's were identified as being required to facilitate the installation of the Onshore Cables along Route 1D, whereas two HDD's were identified as being required to facilitate the installation of the Onshore Cables for Route 3D. It is noted that the Proposed Development involves more HDD's than this following its refinement from Route 3D, but this was the information available at the time.

7.3.8.4. Whilst the total length of HDD was similar (the HDDs required in connection with Route 1D were generally short), the number of HDDs was more and therefore the costs associated with mobilisation of the HDD were identified to be more than for Route 3D. Again, this has been allowed for in the cost estimate difference for Route 1D and Route 3D provided above.

7.3.8.5. Taking into account the type of areas where the cables were anticipated to be installed and the predicted rates of installation for those areas, Route 1D is estimated to take up to 65 weeks (or 1.25 years) longer to construct than Route 3D.

7.3.9. LAND ACQUISITION

7.3.9.1. With regard to the impacts on land and the likely number of land parcels and landowners that would be impacted, Route 1D was identified to be likely to require the acquisition of more private land and/or rights over land to facilitate the installation of the Onshore Cables and their operation thereafter than for Route 3D, particularly when having regard to the likely need for a number of diversions around rural villages, sensitive infrastructure and utilities pinch points.

7.4. CONCLUSIONS IN RESPECT OF ROUTE 1D AND ROUTE 3D

7.4.1.1. Noting the information provided above, the key findings in relation to the options of Route 1D and Route 3D can be summarised as follows:

- With regard to traffic and transport impacts, it was acknowledged that there would inevitably be significant impacts on traffic and transport users and related to traffic as a consequence of the proposed works for both Route 1D and Route 3D.
- That Route 3D was located within a more urban environment was considered to be beneficial, with the roads generally being of a greater width for larger amounts of the route and therefore more likely to be able to accommodate both cable pairs without the need to impact on the environment adjacent to the highways in question or to encroach onto parcels of land outside of the highway boundary.
- Given the more urban nature of Route 3D, it was considered that there would be a greater ability to mitigate the impacts that arise by virtue of their generally being a greater width of road within which to do so, which would limit the need for full road closures, and by virtue of their being greater alternative options for road users allowing for shorter diversions around works and as a consequence, lessening impacts on all highway users.

- Route 1D was much more rural in its location, and as a consequence the impacts of the works in the highway would be less likely to give rise to indirect impacts to human receptors adjacent to where works were being undertaken, including in relation to issues relating to access and disruption caused as a result. In addition, it is was generally considered that traffic movements would be lower on the roads comprised in Route 1D, therefore limiting the extent of the effects experienced.
- With regard to potential effects on the surrounding ecology, Route 1D was located in closer proximity to a greater number of sites of European and International Importance and in turn a greater number of protected species, resulting in a greater likelihood of impacts on them, in addition to requiring the proposals to be subject to greater amount of restrictions to mitigate impacts, including breeding restrictions at varying times of the year in accordance with seasonal breeding patterns.
- Dense areas of ancient woodland are located on either side of the B2149 between Red Hill and Horndean. Due to the width of the roads in this location and the proximity of the ancient woodland to the boundary of the highway along this route, it was considered to be likely that tree roots may be severed during trenching and (depending on the extent and type of root loss) ancient woodland trees may need to be felled. Alternative methods of constructing were considered to address this issue, but it was determined that there were not suitable locations in the locality to launch and receive a HDD.
- With regard to Route 3D, Whilst it was noted that there was the potential for some trees to be required to be removed in connection with the installation of the two cable pairs, this would not impact ancient woodland trees and it was considered this impact could be appropriately mitigated/compensated.
- The location of Route 1D adjacent to the South Downs National Park would have the potential to give rise to direct impacts on visual receptors in the vicinity including users of the Shipwrights Way, Monarch's Way and Sussex Border Path, indirect impacts on the setting of the National Park and direct and indirect impacts on landscape character types and associated features in the SDNP. Route 3D was identified to run adjacent to the boundary of the South Downs National Park for a very limited stretch with the potential for indirect effects as a result, but to a much more limited extent than those identified in connection with Route 1D.
- The southern section of Route 1D was located along the northern and eastern boundary of the Chichester Harbour AONB. Although the cable route itself did not run through the AONB, given its proximity it was identified that there was the potential for the cable corridor to be required to route within it where local diversions were required to avoid other constraints in the highway.

- A number of watercourse crossings and/or works to watercourses directly adjacent to Route 1D would be required, which it was identified would have the potential to impact 10 main rivers and a number of other ordinary watercourses. By way of comparison, watercourse crossings or works directly adjacent to the Route 3D were also identified as being required, with the potential to affect 7 main rivers and a number of other ordinary watercourses.
- As Route 1D was considerably longer than Route 3D, an increased number of joint bays would be required. Based on the length of the two routes and the general assumption that a joint bay will be needed at each interval of 1.0 – 12 km along the route, for Route 1D it was anticipated that up to 29-35 joint bays would be required per cable circuit, whereas for route 3D up to 17-20 joint bays were anticipated as being required per cable circuit.
- A combination of narrow residential streets coupled with existing utility services led to a significantly higher number of pinch points being identified in relation to Route 1D and was considered likely to obstruct the ability for the Onshore Cables to be installed as intended, thereby requiring careful navigation by either changing the position of the cables within the road, moving the circuits closer together (with the potential to lead to cable de-rating), installing the cables at greater depth (which may require alternative techniques, such as HDD) or by abandoning the congested area and finding an alternative route.
- There were two locations along Route 1D where it was identified that a HDD would be required but where it was not possible to confirm this was feasible (or its feasibility remained in question), being along the B2149 where bounded on both sides by Ancient Woodland and the crossing required at the B2149 and A3 (M) roundabout. No such locations were identified for Route 3D.
- In 2017 it was estimated that the manufacture and installation of Route 1D would cost approximately £47m more than Route 3D.
- Route 1D is estimated to take up to 65 weeks longer to construct than Route 3D.

7.4.1.2. With regard to Route 1D, it was noted that questions remained regarding the feasibility of the route in all locations, it was estimated that it would take up to 15 months longer to construct, and generally it was considered there would be more potential impacts on the natural environment as a consequence of Route 1D, resulting in the need for additional mitigation measures to seek to mitigate those impacts, adding complexity to the construction of the proposals, in particular by limiting when construction may take place along the route.

7.4.1.3. With regard to the impacts on traffic and traffic receptors, it was noted that as the route was longer the impacts would continue for a longer duration, and that due to the nature of the roads in a rural location it would be more difficult to mitigate the impacts via appropriate traffic management and that this would result in a higher amount of full road closures. Conversely it was noted that as the roads were rural in nature they would be subject to less traffic, and therefore whilst the impacts on users would likely be greater, they would not necessarily be experienced by as many users.

7.4.1.4. With regard to Route 3D, whilst there were areas of technical/engineering complexity and refinement of the installation approach required, no areas were identified where the feasibility of the proposals could not be confirmed at that stage. As identified, the impacts of the proposals on the natural environment, which by comparison to human receptors is considered generally less able to accommodate change without lasting detrimental impact, in particular in relation to protected sites and species were notably less for Route 3D when compared to Route 1D. With regard to traffic, it was acknowledged that routing through a more urban location would create disruption that would be experienced by more users, but that given the nature of the roads and the surrounding road network, the highways along this route would be more readily able to accommodate mitigation measures and that there would also be more options for diversions to alleviate disruption in the areas where works were being carried out.

7.4.1.5. Taking into account the above considerations and balancing all relevant factors it was decided by the Applicant that Route 3D remained preferable following the further studies, and this was taken forward as the preferred option for refinement for the Onshore Cable Corridor to form part of the Proposed Development.

8. COUNTRYSIDE ROUTE

8.1.1.1. As detailed at paragraph 2.6.4 of Chapter 2 to the ES, following the undertaking of consultation in relation to the proposals for the Proposed Development between February to April 2019 and in response to that consultation, Havant Borough Council ('HBC') and Winchester City Council ('WCC') jointly requested the consideration of alternative options for the Onshore Cable Route (known as the 'Countryside Route').

8.1.1.2. Since the submission of the Application, both HBC and WCC have requested the provision of further information to that provided at paragraph 2.6.4 of Chapter 2 to the ES regarding the considerations of the Applicant in relation to the proposed Countryside Route.

8.1.1.3. This section of this supplementary chapter sets out further information to more fully detail the considerations of the Applicant in relation to the Countryside Route, and in particular provide further information in relation to the following key considerations which the Applicant took into account when considering the proposed Countryside Route:

- Ecological constraints and likely impacts on ecological receptors;
- Sterilisation of land, and the potential for impacts on future Development above and in the vicinity of the Onshore Cables;
- Impacts on land and the need to acquire it;
- Impacts on watercourses; and
- Changes to the Proposed Development where the Countryside Route is followed, particularly the extent of the corridor required in connection with construction.

8.1.1.4. Plate 2.13 to Chapter 2 of the ES visually displays the Countryside Route options provided to the Applicant by HBC and WCC respectively, and these are also shown on the drawings at Appendix 3 to this supplementary chapter. All options for a Countryside Route proposed by HBC and WCC would have involved the Onshore Cable Corridor running through land to the west of the built-up areas of Widely, Purbrook and Waterlooville, instead of running along the A3 from the junction with B2177 (Portsdown Hill Road).

8.1.1.5. The route suggested by HBC, shown with a black dashed line on Appendix 3, is to be known as the 'HBC Route', and the routes proposed by WCC, shown with dashed purple lines on Appendix 3, are to be known as the 'WCC Route'.

8.1.2. HBC ROUTE

8.1.2.1. The HBC route diverges from the Order Limits for the Proposed Development at Hambledon Road at its most northern point, running directly from north to south to the west of Waterlooville and through fields to the west of Purbrook and Widely until reaching the B2177 (Portsdown Hill Road). At this point the HBC Route diverts east onto London Road, re-joining the Order Limits at that point.

8.1.3. WCC ROUTE

8.1.3.1. The WCC Route follows a similar approach to the HBC Route, diverging from the Order Limits at the same point on Hambledon Road. From that point it takes a more westerly route south before splitting into two branches which provide alternative routes within the WCC Route suggested. The first of these branches heads in a south-easterly direction before -joining London Road to the north of Purbrook, re-joining the Order Limits at this point. The second of the two branches continues south, avoiding the need to run directly across Purbrook Heath SINC, across Purbrook Heath Road, before re-joining the Order Limits in a similar location to the HBC Route at London Road.

8.1.4. ECOLOGICAL CONSTRAINTS AND LIKELY IMPACTS – HBC ROUTE

8.1.4.1. Considering the HBC Route first, the route passes through or in close proximity to several ecologically designated sites with the following characteristics (see Appendix 4 of this Supplementary Chapter for figures):

- **Aldermoor Meadow Part SINC**: Comprising fens, flushes, seepages, springs, inundation grasslands etc. that support a flora and fauna characteristic of unimproved and waterlogged (seasonal or permanent) conditions;
- **Alsfordmoor Coppice SINC**: Comprising other woodland where there is a significant element of ancient semi-natural woodland surviving, noted to provide habitat for dormouse;
- **Newlands Row and Plant Row SINC**: Comprising ancient semi-natural woodlands, noted to provide habitat for dormouse;
- **Purbrook Heath SINC**: Comprising agriculturally unimproved grasslands, noted to provide habitat for dormouse;

8.1.4.2. No internationally or nationally designated sites would be directly affected by the HBC route. However, the route is within 250m of Portsdown SSSI, designated for botanical and invertebrate fauna.

8.1.4.3. In terms of the likely potential impacts, a preliminary desk-based appraisal was undertaken by the Applicant following the provision of the HBC Route. This identified that the HBC Route would be likely to have direct impacts on both of Aldermoor Meadow Part SINC and Alsfordmoor Coppice SINC as a consequence of habitat loss where trenching takes place through those sites, and as a consequence of fragmentation affecting the protected species that are noted to be located within those habitats. It was noted that with the careful application of mitigation measures it would be possible to limit those impacts, but it would not be possible to entirely avoid them.

8.1.4.4. In terms of indirect impacts, it was identified that the HBC Route would have the potential for indirect disturbance impacts in relation to Newlands Row and Plant Row SINC, Purbrook Heath SINC and Portsdown SSSI, by virtue of the proximity of the cable route to those sites, and noting the activities required to construct the development in this area, including the introduction of haul roads etc. therefore increasing the overall width of the corridor that would be required to install the Onshore Cables along the HBC Route.

8.1.5. ECOLOGICAL CONSTRAINTS AND LIKELY IMPACTS – WCC ROUTE

8.1.5.1. The WCC Route appears to be a more considered approach than the HBC Route, as can be seen on Appendix 3 where it is evident that the route has been selected so as to avoid direct interaction with ecologically designated sites in so far as is possible. In this sense the WCC Route is preferable to HBC Route, representing the HBC Route once some form of optioneering to limit the ecological impacts has been applied.

8.1.5.2. In terms of the habitats likely to be affected, and noting the similarities between the HBC Route and the WCC Route, the same ecological receptors were identified to have the potential to be impacted, albeit the impacts on the individual ecological receptor sites differ.

8.1.5.3. The easterly branch of the WCC Route crosses Newlands Row and Plant Row SINC. The westerly branch continues southwards and, after bordering Newlands Row and Plant Row SINC, crosses the easterly extent of Alsfordmoor Coppice SINC situated west of Purbrook. The route also borders Purbrook Heath SINC. To the south of Purbrook Heath Road, the route moves through further areas of floodplain grazing marsh and two stands of deciduous woodland, which are all priority habitats.

8.1.5.4. With regard to the potential impacts, it was identified that the routes had the potential to give rise to direct impacts in relation to Alsfordmoor Coppice SINC and Newland Row and Plant Row SINC. By cutting through those habitats, and noting the need for the area to be kept clear following the construction of the Onshore Cable Route so as to allow for maintenance activities, the trenching of cables through each of those protected sites would give rise to habitat loss and other impacts (through habitat loss fragmentation and direct mortality impacts) on dormouse.

8.1.5.5. It was also noted that whilst field work was not undertaken, badgers and great crested newts are known to be present within the Newlands Common area in addition to common reptile species (grass snake, slow worm), and some of those species would be expected to be identified and in turn similarly impacted by any Onshore Cable Route following either of the routes proposed by WCC.

8.1.5.6. It was also identified that as a result of the proximity of the WCC routes to the other identified protected ecological areas, indirect impacts could be expected to arise in relation to Aldermoor Meadow Part SINC, Purbrook Heath SINC and Portsdown SSSI as a result of disturbance, albeit those impacts would likely be able to be mitigated to a large extent.

8.1.6. ECOLOGICAL IMPACTS – PROPOSED DEVELOPMENT

8.1.6.1. By way of comparison from an ecological impact perspective, in this location the Proposed Development follows a route along the existing highway, which is brownfield developed land and which is not expected to give rise to any likely significant impacts on sensitive ecological receptors.

8.1.7. STERILISATION OF LAND

8.1.7.1. As noted above at paragraph 8.1.5.4, once constructed it is necessary for the land above the Onshore Cable Route to be kept clear from development and any significant vegetation, though the land may be used for grazing and recreational activities etc. Not only does that limit the ability for any ecological impacts to be residually mitigated where directly affected by trenching, it will also cause the land to be sterilised from a future development perspective.

8.1.7.2. As is stated at Table 2-1 of Chapter 2 to the ES, a key philosophy for the Proposed Development was to follow a highway route, with a key reason for this being because following that approach would limit the amount of land impacted and moreover the extent to which the land utilised for the laying of the cables is sterilised for future development.

8.1.7.3. When considering the potential sterilisation in the context of the HBC and WCC suggested Countryside Routes, and noting that the land over which the alternative routes were identified is located within the administrative boundary of WCC, the land over which both routes are located is allocated as a strategic housing site in WCC's Adopted Local Plan Core Strategy dated 2013 for the delivery of up to 3000 homes and supporting uses to the west of Waterlooville. A drawing showing the allocation is provided below at Plate 17.

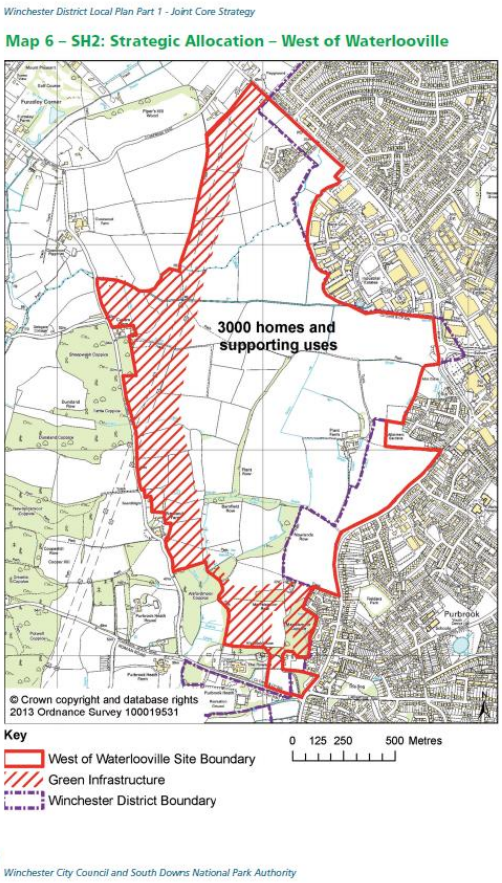


Plate 17 – Allocation of strategic housing within the Winchester District Local Plan

8.1.7.4. Whilst it is the case that the alignment of the suggested western WCC Route would mean that the part of the Onshore Cable located within the allocated area would be located in an area identified for green infrastructure along the western edge, the eastern branch towards London Road would cut directly across the strategically allocated site. This would limit the potential for major development in this area, severing the site.

8.1.7.5. In addition, the type of green infrastructure that may be provided in connection with that allocation would also potentially be limited by the presence of the Proposed Development in that location, which in light of other legal and policy requirements also has the potential to constrain the mitigations and enhancements that may be provided on that land and in turn limit the allocated site's overall development potential.

8.1.7.6. It is also noted that the area to the west of Waterlooville identified for the Countryside Route has seen housing growth in recent years, and it is by no means certain that it will not be necessary to expand the boundary of the allocated developable area in the future, where necessary to accommodate further housing growth within this local authority area.

8.1.7.7. In this regard it was noted that the Proposed Development has an anticipated period of operation of up to 40 years, which could be longer, and in turn the land above the Onshore Cables will be required to be kept free from development and any impeding vegetation for the duration of that period.

8.1.7.8. In addition to part of the WCC and HBC Routes being located through the allocated strategic housing site, and when taking into account environmental constraints, existing allocations, and the need for future housing supply, it was noted by the Applicant that the area to the west of Widley would appear to be a logical location for future development allocations (the area shown delineated red in Plate 18 below). Again, where the Onshore Cable Route is located through this area, as is the case for both of the HBC and WCC Routes, the ability to develop this area would be limited for the duration of the operation of the Proposed Development.

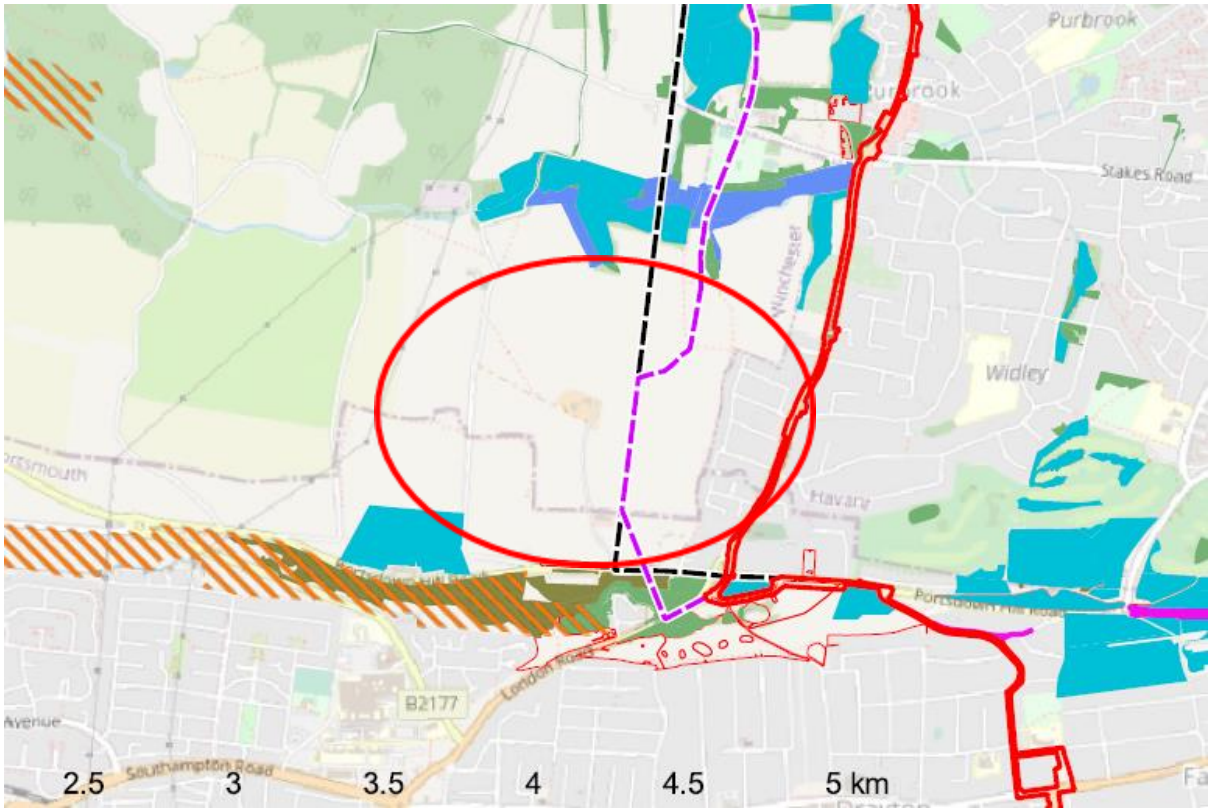


Plate 18 – Area to the west of Widley

8.1.7.9. It is further noted that the area beneath the proposed HBC and WCC routes is identified in the adopted Hampshire Minerals and Waste Plan dated October 2013 as containing bands of soft sand (pale yellow) and brick clay (brown), as is shown on Plate 19 below.

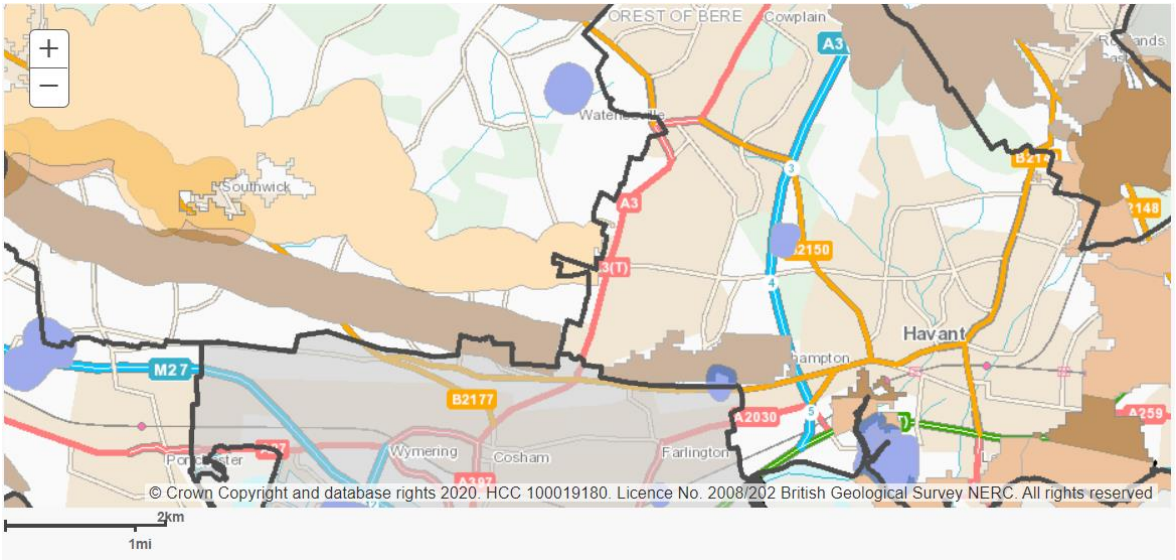


Plate 19 – Mineral deposits underneath the proposed HBC and WCC routes

8.1.7.10. The presence of the Onshore Cable Route above those deposits would limit the ability for those mineral deposits to be accessed in that location where needed in the future.

8.1.7.11. Accordingly, whilst it is noted that the routes have been identified by HBC and WCC, it was considered by the Applicant that the presence of the Onshore Cables along any of those routes would sterilise land that is needed to provide housing and supporting development in connection with existing adopted allocations, or which may be needed within the operational lifetime of the Proposed Development to provide for future housing. As stated in Table 2-1 to Chapter 2 of the ES, and as mentioned above at paragraph 8.1.7.2, the sterilisation of land where not necessary was contrary to the philosophy of the approach for the Proposed Development.

8.1.7.12. By way of comparison with the Proposed Development, the land to be impacted that would be avoided by following the Countryside Route is highway, and therefore the Onshore Cables would be installed in the highway or in land which is beneath the highway. With that in mind, it is not foreseeable that any sterilisation of land will occur as a consequence of the Onshore Cables being in that location, on the basis that it is unforeseeable any major development will occur in this already built environment such that it amends the existing and long established road network and that the Onshore Cables are equipment of the same nature as utilities laid in the highway. .

8.1.8. IMPACT ON LAND AND THE NEED TO ACQUIRE

8.1.8.1. In addition to the land being sterilised for future development for the operational lifetime of the Proposed Development where it is located beneath it, the Countryside Route would also necessitate the need to acquire additional land.

8.1.8.2. Having undertaken a preliminary review of the number of titles that would potentially be affected, it was identified that a further 22 land parcels would likely be impacted, and which it would be necessary to acquire new connection works rights over.

8.1.8.3. The location and extent of the land onshore affected by the Proposed Development and which would potentially need to be acquired by compulsion has been carefully considered, with the Onshore Cable Corridor designed to cause as little disruption and take the minimum amount of land possible required for the Proposed Development. This approach was taken in accordance with guidance issued by the Department for Communities and Local Government related to procedures for the compulsory acquisition of land[5], which requires the Applicant to demonstrate to the satisfaction of the Secretary of State that all reasonable alternatives to compulsory acquisition (including modifications to the scheme) have been explored.

[5] Department of Communities and Local Government: Planning Act 2008 – Guidance related to procedures for the compulsory acquisition of land – September 2013.

8.1.8.4. It is evidently possible to proceed with the Proposed Development without the need to acquire any rights over the land which would be affected by the Countryside Route.

8.1.8.5. Whilst it is noted that the Application does seek to acquire new rights in connection with the construction, operation and maintenance of the Proposed Development beneath the stretch of highway for in the event the depth of the cables is below the vertical plane of land that constitutes the highway, and that the need for this would be avoided where the Countryside Route is followed (should the Proposed Development be buried at a depth below the land which forms the highway), given the highway status of the land to be impacted by the Proposed Development, it is considered that the impact of potentially needing to acquire rights over land which is beneath the extent of the land that forms part of the highway is preferable from an alternatives perspective than acquiring rights over undeveloped land in private ownership with a wider range of potential future uses.

8.1.9. IMPACTS ON WATERCOURSES

8.1.9.1. A number of watercourse crossings or works directly adjacent to the cable routes would be required and would have the potential to impact the 3 Main Rivers listed below:

- Old Park Farm;
- River Wallington; and
- North Purbrook Heath

8.1.9.2. In addition, a number of ordinary watercourses are crossed by the WCC and HBC Countryside Routes, including ordinary watercourses, overland flow paths, rural/agricultural drains and ponds.

8.1.9.3. Risks associated with crossing such watercourses relate to both works within a watercourse itself, and also works directly adjacent to a watercourse. Some aspects of both the HBC and WCC Countryside Routes pass through areas which are designated as Flood Zones 2 and 3, the extent of which is displayed in Appendix 3. In both instance, it was identified that the following impacts could potentially arise:

- Impacts on conveyance of the watercourse and on flood risk upstream and downstream during both construction and operation;
- Impacts from working within and adjacent to watercourses and the associated impacts to construction workers;
- Impacts from working within and adjacent to watercourses and the associated impact on water quality resulting from pollutants linked to construction activities and impacts to aquatic ecology and other surface water receptors;

- Impacts on hydrodynamic evolution of watercourses during operation and the potential future impact on flood risk; and
- Impacts from open cut activities and vegetation clearance, causing riverbed and bank erosion.

8.1.9.4. These impacts could largely be managed through technical design, by assessing the most suitable form of crossing such as HDD (where feasible), open trenching or bridging over watercourses, as appropriate, to ensure no significant, or at least limited, impacts occur. In addition it was identified that various consents and exemptions would be required, depending on the technical design used in each location.

8.1.9.5. Where non-HDD crossings are used, there may be a need for:

- Fish rescue and turbidity monitoring during open-cut activities;
- Reinstatement of the riverbed with natural substrate mix to avoid compaction of the bed materials, which could otherwise disrupt connectivity within the hyporheic zone; and

8.1.9.6. Reinstatement of riparian vegetation on the riverbanks following the completion of works.

8.1.9.7. Surface watercourses are likely to be in direct connectivity with groundwater, therefore there is potential for pollution incidents within any surface watercourses to impact groundwater. However, it was noted that it would be possible to remove this risk through appropriate design and/or identification of other mitigation measures.

8.1.9.8. Any temporary diversions or works adjacent to the aforementioned Main Rivers and ordinary watercourses also have the potential to impact on nearby sensitive ecological features. A number of SINCs are located close to the potential watercourse crossings, including Purbrook Heath SINC, Alsfordmoor Coppice SINC and Aldermoor Meadow Part SINC, with the latter two also supporting Ancient Woodland, for which a minimum setback distance of 15 m from any works would be required, in line with standard guidance[6].

8.1.10. CHANGES TO THE PROPOSED DEVELOPMENT

8.1.10.1. Whilst the Proposed Development would remain largely the same where the Countryside Route is followed, there would be some changes in terms of construction with regard to the working areas required, the addition of the need for haul roads and the need to create accesses to the land. In addition, there would also be some changes to the permanent infrastructure required in connection with the Countryside Route when compared to the extent of the Proposed Development which follows the highway in this location.

8.1.10.2. A temporary haul road would be required to be installed alongside the Countryside Route where it is identified the land is not suitable for the relevant wheel loads, which would be expected on such greenfield land (nominally 5m wide). Additional working width would also be required for drainage and for storage of excavated subsoil and topsoil during construction, with excavated soil and topsoil always stored adjacent to the trench from which it has been excavated to eliminate the risk of cross contamination. Plate 20 below provides a cross-sectional drawing of the of the likely required working area, which amounts to a width of approximately 23 metres.

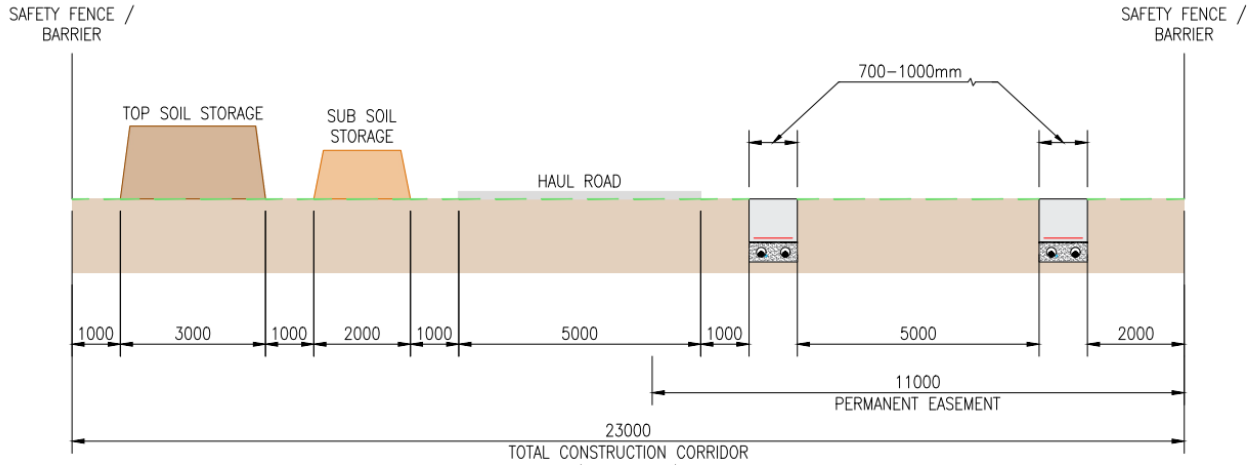


Plate 20 – Cross section of working area

8.1.10.3. In terms of permanent surface and above ground infrastructure that would be required, it is anticipated there would be a need for surface mounted pits for link boxes, which are used to test the integrity of the cable sheaths during maintenance periods, and marker posts at the edges of fields and at all joint bays which would be required to be installed along the Countryside Route. Whilst these are relatively minor structures in the landscape, they would nonetheless be noticeable from a visual perspective.

8.1.11. ANTICIPATED DURATION OF THE WORKS TO CONSTRUCT THE COUNTRYSIDE ROUTE

8.1.11.1. The approximate length of the WCC Countryside Route, which as stated due to the manner in which it has been refined to seek to avoid sensitive ecological receptors is preferable to the HBC Countryside Route, which avoids the need to route along London Road is approximately 4.5km in length. It is anticipated that both cable circuits would be able to be installed simultaneously along this length, and therefore a single duration for both cable circuits is provided rather than per circuit.

[6] https://www.gov.uk/guidance/ancient-woodland-and-veteran-trees-protection-surveys-licences

8.1.11.2. It would be anticipated the enabling works, including stripping of soils and the provision of the temporary haul road would take approximately 6 weeks to undertake for the length of the WCC Countryside Route. The rate of installation of ducts along the Countryside Route would be anticipated at 50m per day, or 250m per week. Along the 4.5km length, it would therefore be anticipated that the duct installation would take 18 weeks for both cable circuits. Further to this, the time required to undertake the cabling works, being the installation of joint bays, the pulling of the cables and their jointing would be anticipated to take a further 18 weeks. It would then be anticipated that it would take 6 weeks to reinstate the land along the length of the route. Accordingly, the approximate time taken to install both cable circuits, the required joint bays, to pull the cables and to reinstate the land following construction would be anticipated to be 48 weeks.

8.1.12. ENVIRONMENTAL IMPACTS OF THE PROPOSED DEVELOPMENT

8.1.12.1. Having considered the Countryside Route and the potential environmental and other related impacts as a consequence of following it, it was also necessary for the Applicant to compare this to the selected route for the Proposed Development along the highway in this location.

8.1.12.2. In this regard the main impact that it was noted the Countryside Route would avoid was the temporary disturbance to traffic along the affected stretch of the highway where the Proposed Development is located. Whilst the construction of the Onshore Cables will be managed by traffic management measures, and further controlled via restrictions contained in the Framework Traffic Management Strategy (the 'FTMS') (APP-449) so as to ensure unacceptable levels of cumulative impacts do not arise, there will inevitably be a level of traffic disruption associated with the carrying out works in the highway, as would be the case for any similar roadworks in connection with similar apparatus.

8.1.12.3. Based on the worst case durations stated for the installation of the ducts for each of the cable circuits stated within the FTMS, and disregarding section 4.5 on the basis that this relates to a section of Portsdown Hill Road that would not be avoided where the Countryside Route is followed, the period for installation would be 58 weeks, and 116 weeks for both circuits. Within Section 4 however, taking into account its 5.4km length, there are opportunities to install parts of the cable circuits in parallel without giving rise to an unacceptable level of cumulative impacts. Taking into account the restrictions contained in the FTMS in this regard, it is anticipated that it would take approximately 50% of the total stated duration for the installation of both cable circuits separately to install the ducts for both cable circuits due to works being carried out in parallel, being approximately 58 weeks.

8.1.12.4. In addition, based on the number indicative joint bays located along the relevant parts of the section, which is 6 joint bays for both cable circuits, the time taken to install the joint bays was anticipated to be 24 weeks. Further to this, the time taken to pull the cables through the installed ducts and to joint the cables would be circa 24 weeks. Again works in different locations can be carried out in parallel, meaning the estimated time these works would take along this section of Section 4 of the Onshore Cable Route would be circa 24 weeks.

8.1.12.5. Accordingly, the total approximate time estimated for the installation of the cable circuits along this stretch of highway is 82 weeks.

8.1.12.6. The traffic management it had been identified would likely need to be provided to mitigate the temporary impacts on the highway during construction based on the assessment undertaken at that time was as follows:

- shuttle working traffic signals on B2150 Hambledon Road between Closewood Road and Milton Road;
- single lane closures on B2150 Hambledon Road and A3 Maurepas Way between Milton Road and A3 London Road;
- single lane closure on all parts of the A3 London Road where a bus lane is present; and
- shuttle working traffic signals on all parts of A3 London Road where there is not a bus lane, except between Post Office Road and Rocking Horse Nursery where a full road closure would be required.

8.1.12.7. Whilst it was noted that there would be temporary traffic impacts for the duration of the installation activities, taking into account the sectional construction methodology to be employed generally, and noting that works in one location would be restricted so as not to cumulatively cause an unacceptable impact with works being carried out in another location as part of the proposed mitigation package, it was and it remains the view of the Applicant that the Proposed Development may be constructed in this location without an unacceptable level of temporary impact, and with very minimal to no permanent impacts.

8.1.12.8. The position with regards to sterilisation of land and the need to acquire land in connection with the routing of the Proposed Development in this location by comparison to the Countryside Route has already been discussed above, with it being noted the route of the Proposed Development does not give rise to the impacts that the Countryside Route would.

8.1.13. CONCLUSION

8.1.13.1. Whilst the temporary impacts of the construction of the Proposed Development along the highway on traffic were noted, and it was acknowledged that the installation of the cable circuits along the Countryside Route would provide for a quicker installation timeframe (which would have been a benefit for the Applicant by reducing he overall timescale to construct the Onshore Cable Route), balancing the various identified impacts against one another for each of the chosen route and the Countryside Route, the Applicant concluded that the benefit of avoiding the temporary impacts on traffic whilst the works in the highway were carried out were outweighed by the potential temporary impacts associated with construction of the Countryside Route and the sterilisation of the land for the duration of the lifetime of the development where the Countryside Route is followed.

8.1.13.2. Noting the existing development allocations for the land on which the Countryside Route is located, and the potential for this land to accommodate additional future development, principally housing, it was also considered that seeking to route the cable circuits along the Countryside Route would have presented a potentially significant consenting risk for the Proposed Development. It is not possible to mitigate the sterilisation of land where the cable circuits are laid along the proposed Countryside Route.

8.1.13.3. It was also noted that it was evidently possible for the Proposed Development to proceed without needing to be located along the Countryside Route. Therefore it was not considered that it would necessarily be possible to justify any potential compulsory acquisition of the rights required over the land where the Countryside Route is located, as the Applicant had already identified a viable alternative to the need to do so.

8.1.13.4. For those reasons the Applicant reasonably concluded that it did not wish to pursue the alternative Countryside Route suggested by HBC and WCC.

9. CONCLUSION

9.1.1.1. This supplementary chapter to Chapter 2 of the ES (APP-117) has explained more fully the considerations with regard to the following alternatives matters that were studied by the Applicant in relation to the Proposed Development:

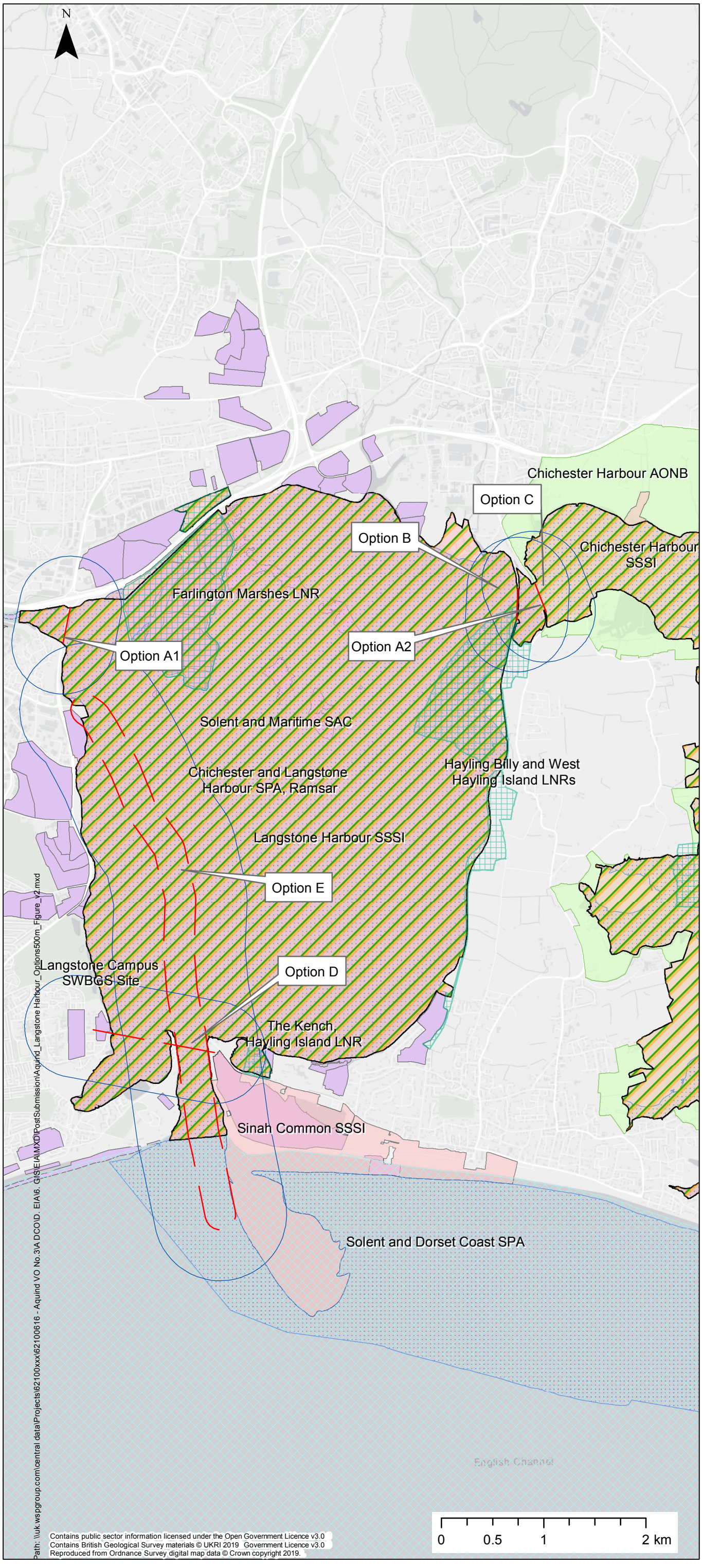
- initial project technical feasibility (Section 4);
- the grid connection point, being the substation locations where the Proposed Development may connect to the NETS (Section 5);
- the utilisation of Langstone Harbour / Hayling Island (Section 6);
- the selection of the corridor for the Onshore Cables (Section 7); and
- consideration of the Countryside Route (Section 8).

9.1.1.2. It is the view of the Applicant that it has extensively explored the available options for the Proposed Development over a significant period of time, taking into account relevant technical, environmental and cost considerations, in addition to taking into account feedback received to two public consultation's carried out and amending the proposals in response to feedback received. Further, in considering the reasonable alternatives as outline the Applicant has very clearly considered the potential need for compulsory acquisition of land and the alternatives to this as part of that exercise, and has limited the need to acquire land and rights over land in so far as is possible through the careful selection of options and refinement of the Proposed Development.

9.1.1.3. In doing so, and in determining the final selected option for the Proposed Development, it is the view of the Applicant that it has considered and balanced the relevant considerations in relation to the alternatives studied, guided by the relevant policy requirements provided for by the NPS and guidance in relation to the compulsory acquisition of land, and has reached reasonable and logical conclusions.

9.1.1.4. Whilst there is no requirement for an applicant to consider whether a proposed project represents the best option from the alternatives which were studied and to demonstrate this, it is the view of the Applicant that when balancing all relevant considerations in relation to the reasonable alternatives, it has selected an optimal final option for the Proposed Development.

Appendix 1 – Environmental Constraints Map at Langstone Harbour



Key

- Option A - Fixing to an existing bridge (from Portsea Island or Hayling Island)
- Option B - Fixed to the former Hayling-Billy Line (former railway bridge structure)
- Option C - HDD adjacent to existing bridge (from Hayling Island)
- Option D - HDD across Langstone Harbour entrance channel from Hayling Island to Portsea Island)
- Option E - Cable lay through Langstone Harbour entrance channel
- 500m Buffer
- Local Nature Reserve (LNR)
- Special Protection Area (SPA)
- Ramsar Site - Wetland of International Importance
- Special Area of Conservation (SAC)
- New Special Protection Areas (SPA)
- Site of Special Scientific Interest (SSSI)
- Solent Waders and Brent Goose Strategy (SWBGS) Sites 2017
- Areas Outstanding Natural Beauty (AONB)

The Infrastructure Planning (Applications: Prescribed Forms and Procedures) Regulations 2017 – Regulation 5(2)(l)(iii)

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01	09/06/2020	HJ	FINAL	CM	CM

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WSP House, 70 Chancery Lane, London, WC2A 1AF,
T+ 44 (0) 020 7314 5000
wsp.com

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Figure 1
Environmental Constraints Map
Langstone Harbour

SCALE AT A1	CHECKED:		APPROVED:
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Appendix 2 – Royal Haskoning DHV Note

Note / Memo

HaskoningDHV UK Ltd.
Transport & Planning

To:	AQUIND Ltd.
From:	Royal HaskoningDHV
Date:	09 September 2020
Copy:	
Our reference:	PB9446TPNT2005111016
Classification:	Project related FINAL F1.0
Checked by	Andrew Ross

Subject: **AQUIND - Traffic and Transport Review of Alternative Options**

1.1 Introduction

1.1.1 This note has been produced by Royal HaskoningDHV to support of an appraisal of potential alternative options for the Onshore Cable Corridor route and Converter Station location associated with the proposed AQUIND Interconnector.

1.2 Background

1.2.1 AQUIND Ltd. (The Applicant) is proposing to construct and operate an electricity interconnector between France and the UK known as AQUIND Interconnector ('the Project').

1.2.2 The Project briefly comprises a new marine and onshore High Voltage Direct Current (HVDC) cable transmission link between Normandy in France and Eastney, Hampshire, Converter Stations in both England and France and infrastructure necessary to facilitate the import and export of electricity.

1.2.3 The purpose of this note is to consider the transport impact of alternative options for the location of the Converter Station and route of the onshore HVDC cable transmission link (the Onshore Cable Corridor) within the UK. Having established the impacts for alternative options, a comparison is made with the Proposed Development.

1.2.4 The Project currently includes an Onshore Cable Corridor between Eastney and a Converter Station adjacent to the existing Lovedean Substation (to the north west of Waterlooville). Two alternative options are proposed, these include:

- An alternative onshore cable corridor between the Lovedean Substation and East Wittering (referred to hereafter as Option A Cable Corridor and Option A Cable Route); and
- An alternative Converter Station location near to the existing Bramley Substation (north west of Bramley) and an associated alternative onshore cable corridor (referred to hereafter as **Option B Cable Corridor and Option B Cable Route**).

1.2.5 Option A and Option B Cable Corridors and Cable Routes will be collectively referred to as 'Alternative Cable Corridors' and 'Alternative Cable Routes' as appropriate.

1.2.6 Following this introduction, this note outlines the proposed methodology to provide a high-level appraisal of the potential traffic and transport impacts of these Alternative Cable Corridors, and a summary of the appraisal findings.

2 Methodology

2.1 Introduction

2.1.1 The assessment of traffic and transport impacts of the Proposed Development is set out within Chapter 22 of the Environmental Statement (ES)[1]. This note closely follows the same methodology to enable direct comparison.

2.1.2 The assessment presented within the ES has been undertaken in accordance with the Guidelines for the Environmental Assessment of Road Traffic[2] (GEART) and the Design Manual for Roads and Bridges[3] (DMRB).

2.1.3 The ES considers the potential for construction impacts to arise in connection with the Proposed Development on the following potential areas of impact:

- Severance;
- Traffic Delay;
- Pedestrian and Cyclist Amenity;
- Fear and Intimidation;
- Accidents and Safety; and
- Hazardous and Dangerous/ Abnormal Loads.

2.2 Scope

2.2.1 The traffic and transport operational impacts of the Proposed Development have been scoped out of the ES and are therefore not considered further within this note.

2.2.2 The ES considers the impacts associated with the increases in construction traffic from the Proposed Development, and also the impacts associated with undertaking road works to install the onshore HVDC cables within the public highway.

2.2.3 There would be no change in the proposed location of the Converter Station between that assessed within the ES and Option A, therefore, for Option A the appraisal considers the impacts associated with the installation of the Option A Cable Route only.

2.2.4 For Option B, there would be no material change in the numbers of construction traffic movements associated with the construction of a Converter Station at Bramley as opposed to at Lovedean.

2.2.5 Lovedean and Bramley substations are both accessed via narrow country lanes (1km and 300m respectively), followed by routes through more built-up areas (3.0km and 3.5km respectively) with concentrations of sensitive receptors including residential properties, shops, and parks. It is reasoned that impacts would be broadly similar between both sites as the routes between the

[1] Environmental Statement – Volume 1 - Chapter 22 – Traffic and Transport, Document Ref: 6.1.22. AQUIND Ltd. 14 November 2019
[2] Guidelines for the Environmental Assessment of Road Traffic. 1993. Institute of Environmental Management and Assessment
3 Design Manual for Roads and Bridges, Volume 11, Part 8/9 Environmental Assessment. Department for Transport

substations and the main A road network are of a similar length and sensitivity. This note therefore does not consider the impacts associated with the construction of the Converter Station.

2.2.6 The following construction traffic parameters (taken from the ES) have been used to inform the potential impacts associated with the installation of the onshore HVDC cables:

- 2 two-way employee car movements (4 in total) per day, per cable gang; and
- 4 two-way HGV movements (8 in total) per day, per cable gang;
- 6 two-way total vehicle movements (12 in total) per day, per gang.

2.2.7 It can be noted that the numbers of construction vehicle movements are expressed per 'gang'. In total, the ES outlines that there could be up to six gangs working at any one time. Due to the increased length of both Alternative Cable Routes (Option A: 35km, Option B: 66km) when compared to the Proposed Development (21km) it is likely that more than six gangs would be required to work simultaneously to deliver the Alternative Cable Routes.

2.2.8 Notwithstanding, the nature of the construction activities would likely dictate that these gangs would however be spread along the Onshore Cable Corridor to maximise progression and minimise local impacts. It is reasoned that the quantum of vehicle movements (per day associated with the installation of the Onshore Cable Routes is considered to be significantly below GEART screening thresholds used to delimit the scope of assessment, namely:

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

2.2.9 Therefore, this review does not include consideration of the potential impacts arising from the additional construction traffic required for the construction of the Alternative Cable Routes.

2.2.10 The appraisal presented herein is therefore limited to the impacts associated with undertaking road works to install the Onshore Cable Route within the public highway. The impacts presented herein are 'primary impacts' i.e. prior to the introduction of further mitigation. It is assumed that WSP will apply their mitigation strategy to the primary impacts to determine residual impacts.

2.3 Traffic Management

2.3.1 To quantify the potential impacts associated with undertaking road works to construct the Alternative Cable Routes within the public highway it is first necessary to define the types of traffic management measures that could be used. The types of traffic management can be broadly categorised into the following categories:

- TM1A Single lane closure – A lane of the road will be closed, with traffic controlled by either traffic signals, stop go boards or give take;
- TM1B Single lane closure – A lane of the dual carriageway will be closed, allowing one lane to remain open;
- TM2 Road closure – The road would be closed to all vehicular traffic. Pedestrian and cyclist access may be maintained;

- TM3 Narrow lanes – Traffic lanes may be narrowed to still allow for two-way traffic flows.

2.3.2 To determine the type of traffic management that may be required, the entire Alternative Cable Corridors has been divided into sections, referred to as links. These links comprise of roads with similar characteristics.

2.3.3 Online mapping, including 'Google Earth' and 'Google Streetview', has been used to measure and estimate the width of roads, footway/cycleways and any verges and apply the form of traffic management.

2.3.4 The ES identifies that the installation of the cables will typically require a working width of 4.0m but that this can be reduced to between 2.0 - 3.0m at pinch points. With regards to working off the carriageway, either on the verge or within an adjacent footway/ cycleway, the ES identifies that a 2.0m working area would be required, with a 3.0m working area on the adjacent carriageway for loading.

2.3.5 The following guidance taken from Chapter 8 of the Traffic Signs Manual[4] (Chapter 8) has been applied to the working area:

- To allow a vehicle to pass road works, an absolute minimum road width of 3.0m must be provided with a lateral safety clearance between the edge of the works and the live lane of 0.5m.
- To allow for pedestrian access an absolute minimum width of 1.0m should be provided.

2.3.6 To inform this high-level appraisal, the following assumptions have been applied:

- The worst-case form of traffic management has been applied to each section based upon the narrowest part of the link.
- In the absence of utility information, it is not possible to determine if the onshore HVDC cables can be located within the adjacent highway verge or footway/cycleway. Therefore, as a worst case it is assumed that the cables will be installed within the carriageway.
- A minimum width of road works of 2.5m has been assumed (2.0m working area and 0.5m lateral safety clearance). This further assumes that smaller vehicles are used for loading e.g. dumpers.

2.3.7 It can therefore be calculated that the minimum widths that would be required for each traffic management scenario would be:

- To allow works to be completed under narrow lanes there would be a requirement for a road of at least 8.5m in width (two lanes at 3.0m wide, a working area of 2.0m and a lateral safety clearance of 0.5m).
- To allow works to be completed under a single lane closure, there would be a requirement for a road of at least 5.5m in width (3.0m wide lane, a 2.0m working area and a 0.5m lateral safety clearance).

2.3.8 Any road less than 5.5m wide would therefore require a full road closure to allow the cables to be safely installed. Pedestrian/cycle access will be maintained.

[4] *Chapter 8 Traffic Signs Manual, Traffic Safety Measures and Signs for Road Works and Temporary Situations, Part 1: Design. 2009. Department for Transport.*

2.3.9 Where a road is less than 3.5m wide, pedestrian/ cycle access would also be closed. The rationale for this being that as a minimum there would need to be a 2.0m working area, a lateral safety clearance of 0.5m and an absolute minimum footway width of 1.0m.

2.4 Impact Appraisal Methodology

2.4.1 The following sections outline the proposed methodology (derived from the ES) for assessing potential impacts associated with undertaking road works to install the onshore HVDC cables within the public highway.

Severance, Pedestrian and Cycle Amenity and Fear and Intimidation

2.4.2 Severance is 'the separation of residents from facilities and services they use within their community caused by new or improved roads or by changes in traffic flows' and pedestrian and cyclist amenity is the 'relative pleasantness of a journey.'

2.4.3 The approach to assessment of the impact of fear and intimidation is similar to that of pedestrian and cyclist amenity, however, the GEART guidance suggests that fear and intimidation assessments consider additional factors such as perceived protection from traffic.

2.4.4 GEART provides broad thresholds for assessing the potential levels of severance, amenity and fear and intimidation that could be experienced due to forecast changes in traffic flows. The increase in construction traffic numbers however are not considered within this note and as such only impacts associated with undertaking road works to install the onshore HVDC cables within the public highway are considered.

2.4.5 The ES defines broad categories for defining the levels of severance and amenity that users could experience as a result of traffic management associated with disruption related to undertaking road works to install the onshore HVDC cables within the public highway. The definitions are similar for both potential areas of impact and therefore **Table 1** provides a single definition for the assessment of severance, amenity and fear and intimidation.

Table 1: Magnitude of Change for Severance, Amenity and Fear and Intimidation

Magnitude of Change	Definition
Negligible	Limited impact on existing routes, for example through temporary narrowing of existing provision.
Low	Where there is an increase in traffic on roads that have provisions for Non-Motorised Users (NMUs) or where NMUs are required to use temporary crossing facilities, located away from existing provisions or short diversion routes.
Medium	Where a closure of a shared-use path or footway and a diversion onto the other side of the carriageway is required, resulting in a severance of desire lines and additional crossings of the road.
High	Constitutes a full closure of a route to pedestrians/cyclists and a circuitous detour

2.4.6 Having derived the magnitude of change for each link it is necessary to forecast the significance of the potential impacts. The impact significance is derived by combining the magnitude of change (**Table 1**) with the sensitivity of adjacent receptors (**Table 2**). **Table 2** outlines the definitions of sensitivity (taken from the ES) that have been applied to each of the links.

Table 2: Sensitivity of Receptors

Receptors	Receptor Sensitivity
Schools, colleges, playgrounds, retirement homes, hospitals and GP surgeries, junctions operating over capacity.	High
Congested junctions, shops / businesses, pedestrians / cyclists, public transport users, areas of ecological and nature conservation value, residential properties close to the carriageway.	Medium
Sites of tourist / visitor attraction, places of worship, residential areas setback for the highway with screening, junctions operating within capacity	Low
Those people and places located away from the affected highway link	Negligible

2.4.7 **Table 3** sets out a matrix for determining the significance of effects by combining the initial magnitude of change assessment derived from the assessment framework (presented in **Table 1**) with the sensitivity of receptors to change (**Table 2**).

Table 3: Matrix for classifying the significance of effects

		Sensitivity of receptor/receiving environment to change			
		High	Medium	Low	Negligible
Magnitude of change	High	Major	Major to Moderate	Moderate	Negligible
	Medium	Major to Moderate	Moderate	Minor to Moderate	Negligible
	Low	Moderate	Minor to Moderate	Minor	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

Traffic Delay

2.4.8 The ES assesses the impact of driver delay at critical junctions (defined during scoping discussions with the local highway authority) and where temporary traffic management may be used along the Onshore Cable Corridor.

2.4.9 To assess the potential impacts, modelling software has been used in the ES to forecast the likely change in delays that may be experienced. However, in order to provide a proportionate assessment, **Table 4** provides broad definitions for magnitude of effect and the rationale for adopting these thresholds.

Table 4: Magnitude of Change for Traffic Delay

Magnitude of change	Description	Rationale
Low	Works undertaken under narrow lanes	There may be a requirement to slow due to narrow lanes or temporary speed limits but drivers would experience minimal disruption or queuing.
Medium	Traffic signal control would be required; however, existing background traffic flows are less than 900 vehicles per hour.	Chapter 8 identifies that exceptional delays may result where a flow exceeds 900 vehicles per hour. Therefore, it is reasoned that flows of less than 900 vehicles per hour would not be expected to result in significant delays.
High	Traffic signal control would be required, and existing background traffic flows would be	Where drivers are required to take an alternative diversion route or where flows would be above 900 vehicles per hour

Magnitude of change	Description	Rationale
	greater than 900 vehicles per hour; or A road closure would be required.	delays could become significant.

2.4.10 To inform a judgement regarding the levels of traffic per hour, open source data from the Department for Transport (DfT) has been extracted[5]. This data covers the majority of the A road links considered and is expressed as annual average daily traffic flows (AADT). Peak hour flows have been estimated from these daily flows by assuming approximately 10% of the daily traffic flows occur within the peak hour (taken from the DMRB[6]). Where traffic flows are not published, flows have been estimated based upon the nearby DfT counts and using professional judgment.

Accidents and Safety

2.4.11 The ES considers the impact of increases in construction traffic upon accidents and safety through an examination of existing collision cluster sites (sites where there are concentrations of collisions) and the use of COBALT (Cost and Benefit to Accidents – Light Touch) software, which forecasts potential changes in collision rates based upon changes in factors such as, road geometry and traffic flows.

2.4.12 The impacts of increases in traffic are not considered within this study and therefore the use of COBALT would not be appropriate.

2.4.13 The introduction of traffic management measures associated with the Onshore Cable Corridor would provide a controlled highway environment, e.g. warning signs, temporary speed limits, traffic signals, cones, etc. Consequently, a review of existing collision patterns and trends would not be appropriate to forecast future trends. This review therefore does not include an assessment of accidents and safety.

Hazardous and Dangerous/ Abnormal Loads

2.4.14 The ES outlines that it is anticipated that the Project will not generate any hazardous or dangerous loads and the only forecast abnormal indivisible loads (AILs) would be associated with the delivery of transformers to the Converter Station.

2.4.15 The ES presents an assessment of potential impacts related to the movements of AILs informed by an AIL study. The Converter Station for Option A would be within the same location as assessed within the ES and so would not result in additional impacts.

2.4.16 The Converter Station for Option B would also be located close to an existing substation, it would therefore be assumed that similar measures as proposed within the ES (e.g. the use of specialist trailers, removal of street furniture, vegetation clearance) to manage the passage of these AILs via the local highway network would be appropriate. The size of AILs would dictate that the transformers would need to be imported from the nearest port (most likely Southampton or Portsmouth). Whilst the Converter Station for Option B would be located further from

[5] *Road Statistics. Department for Transport. Accessed 14.05.2020. Available from: https://roadtraffic.dft.gov.uk/#6/55.254/-6.053/basemap-regions-countpoints*
[6] *Design Manual for Roads and Bridges, TA 46/97, Traffic flows ranges for use in the assessment of new rural roads. February 1997. Department for Transport*

Southampton or Portsmouth than the Converter Station for the Proposed Development, this extra distance would all be via either motorways or dual carriageways and as such it is not anticipated that additional accommodation works would be required.

3 Appraisal Findings

3.1.1 This section provides a summary of the findings of the high-level appraisals of both Alternative Cable Corridors in accordance with the methodology outlined within **Section 2**.

3.1.2 **Table 5** and **Table 6** provide details of the appraisals of Option A and B respectively. Each Alternative Cable Corridor is broken down in to links and for each link the following detail is provided:

- Details of the link, including a description, the length and its characteristics;
- The proposed form of traffic management;
- Details of the sensitive receptors;
- Pedestrian severance and amenity impacts; and
- Traffic delay impacts.

3.1.3 In addition to providing a breakdown of impacts per link, **Table 5** and **Table 6** also provide a high level summary of the overall Alternative Cable Corridors respectively.

3.1.4 To aid comparisons between the Alternative Cable Corridors to that of the Proposed Development, a similar link breakdown is provided in **Table 7**. An appraisal summary of all options is presented in **Section 4**.

Table 5: Appraisal Findings – Option A Cable Corridor

Section No.	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
									Magnitude of impact	Impact	
1	B2198	From Landfall to junction with Clappers Lane	0.68	23 - 38 days	Urban Road Typically 5.5m road width (with centre line). Two footways for entire section length.	Less than 10,000 AADT	TM 1A	High Nursery Restaurants Shops Public Transport Residential properties set close to carriageway	Low Existing pedestrian access maintained. Temporary and Short Term.	Moderate	Medium TM with signals and less than 900 one-way vehicle flows. Temporary and Short Term.
2	B1298	From junction with Clappers Lane to Cherry Tree Farm Shop	0.90	30 - 60 days	Urban Road Typically 5.5m road width (with centre line). At least one footway for majority of section length.	Less than 10,000 AADT	TM 1A	Medium Hotel Shops Public Transport Users Residential properties set close to carriageway	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
3	B1298	From Cherry Tree Farm Shop to junction with Tile Barn Lane	0.79	26 - 44 days	Rural Road Typically 5.5m road width (with centre line). No footway along section length.	Less than 10,000 AADT	TM 1A	Low Residential properties set back from the carriageway	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
4	B1298	From Barn Lane to A286 roundabout	1.21	40 - 67 days	Urban Road Minimum 5.5m road width (with centre line). At least one footway for majority of section length.	Less than 10,000 AADT	TM 1A	Medium Shops Public Transport Users Pedestrians / cyclists	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
5	A286	From B1298 roundabout to junction with Sidlesam Lane	1.34	45 - 74 days	Main 'A' Road Minimum 5.5m road width (with centre line). At least one footway for majority of section length.	14,815 AADT (2018)	TM 1A	Medium Public Transport Users Pedestrians / cyclists Shops	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than one way vehicle flow average of 519 per hour. Temporary and Short Term.
6	A286	From junction with Sidlesam Lane to junction with Dell Quay Road	3.14	105 - 174 days	Main 'A' Road Minimum 5.5m road width (with centre line). Minimal footways for length of section.	14,815 AADT (2018)	TM 1A	Medium Shops Public Transport Users	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than one way vehicle flow average of 519 per hour. Temporary and Short Term.

Section No.	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
									Magnitude of impact	Impact	
7	Dell Quay Road	From junction with A268 to junction with Appledram Lane South	0.19	6 - 11 days	Rural Road Typically 5.5m road width (with centre line). No footway along section length.	Less than 10,000 AADT	TM 1A	Low Residential properties set back from the carriageway	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
8	Appledram Lane South	From junction with Dell Quay Road to junction with unnamed track	1.60	54 - 90 days	Rural Road Typically 5m road width (with centre lines). No footways along section length.	Less than 10,000 AADT	TM 2	Low Residential properties set back from the carriageway	Medium Full road closure with continued NMU access along section length via on-road temporary provisions. Temporary and Short Term.	Minor	High Diversion route required. Temporary and Short Term.
9	Appledram Lane South	From junction with unnamed track to junction with A259	0.37	12 21 days	Rural Road Typically 5m road width (with centre lines). At least one footway for majority of section length.	Less than 10,000 AADT	TM 1A	Low Residential properties set back from the carriageway	Medium Full road closure with continued NMU access along section length via on-road temporary provisions. Temporary and Short Term.	Minor	High Diversion route required. Temporary and Short Term.
10	A259	From junction with Un-named Access Track to eastern Fishbourne Village extents	0.34	11 - 19 days	Main 'A' Road Minimum 7m road width (with centre line). At least one footway for majority of section length.	Less than 10,000 AADT	TM 1A	Low Church No residential access	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
11	A259	From eastern Fishbourne village extents to junction with western Fishbourne village extents	1.33	44 - 74 days	Main 'A' Road (through Fishbourne) Minimum 5.5m road width (with centre line). Majority of two footway on each verge along section length.	Less than 10,000 AADT	TM 1A	High GP Surgeries Residential properties set close to carriageway	Low Existing pedestrian access maintained. Temporary and Short Term.	Moderate	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
12	A259	From western Fishbourne village extents to junction with Walton Lane	1.26	42 - 70 days	Main 'A' Road Minimum 7m road width (with centre line). At least one footway for majority of section length and	Less than 10,000 AADT	TM 1A	Low Residential properties set back from the carriageway	Low Existing pedestrian access maintained. Temporary and Short	Minor	Medium TM with signals and less than 900 one way vehicle flows.

Section No.	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
									Magnitude of impact	Impact	
					on road marked cycle lanes.				Term.		Temporary and Short Term.
13	A259	From junction with Walton Lane to junction with the B2146	0.51	17 - 28 days	Main 'A' Road Minimum 7m road width (with centre line). At least one footway for majority of section length	Less than 10,000 AADT	TM 1A	Low Residential properties set back from the carriageway	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
14	B2146	From junction with the A259 to northern Broadbridge village extents	0.32	11 - 18 days	Urban Road Typically 4.5m minimum road width (without centre line). At least one footway for majority of section length.	Less than 10,000 AADT	TM 1A	Medium Shops Residential properties set close to carriageway Railway Station	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
15	B2146 - Ratham Lane	From northern Broadbridge village extents to junction with B2146 - Clay Lane	0.89	30 - 49 days	Rural Road 4.5m minimum road width (without centre line). Typically wide verges. No footway along section length.	Less than 10,000 AADT	TM2	Low No residential access	Medium Full road closure with continued NMU access along section length via on-road temporary provisions. Temporary and Short Term.	Minor	High Diversion route required. Temporary and Short Term.
16	B2146	From junction with B2146 - Ratham Lane to the junction with Southbrook Road	0.68	22 - 38 days	Rural Road 4.5m minimum road width (without centre line). Majority of wide verges. No footway along section length.	Less than 10,000 AADT	TM2	Low Residential properties set back from the carriageway Holiday home site.	Medium Full road closure with continued NMU access along section length via on-road temporary provisions. Temporary and Short Term.	Minor	High Diversion route required. Temporary and Short Term.
17	Southbrook Road	From junction with the B2146 to the junction with West Ashling Road	0.84	28 - 47 days	Rural Road 4m minimum road width (without centre line). Mixture of wide verges/ high hedgerows. No footway along section length.	Less than 10,000 AADT	TM2	Residential properties set back from the carriageway	Medium Full road closure with continued NMU access along section length via on-road temporary provisions. Temporary and Short Term.	Minor	High Diversion route required. Temporary and Short Term.

Section No.	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
									Magnitude of impact	Impact	
18	West Ashling Road	From junction with Southbrook Road to junction with Cheesemans Lane	1.39	46 - 77 days	Rural Road 5.5m minimum road width (with centre line). Mixture of wide verges/ high hedgerows. Minimal footway along section length.	Less than 10,000 AADT	TM 1A	Low Residential properties set back from the carriageway	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
19	Cheesemans Lane	From junction with West Ashling Road (east) to junction with West Ashling Road (west)	0.05	1.5 - 2.5 days	Rural Road 7m minimum road width (with centre line). One footway along northern verge of section length.	Less than 10,000 AADT	TM 1A	Low No residential access	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
20	West Ashling Road	From junction with Cheesemans Lane to eastern residential extents	1.13	4 - 7 days	Rural Road 6.3m minimum road width (with centre line). No footway along section length.	Less than 10,000 AADT	TM 1A	Low No residential access	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
21	West Ashling Road Woodmancote Lane	From eastern residential extents to junction with Marlpit Lane	0.82	27 - 46 days	Rural Road 5m minimum road width (without centre line). No footway along section length.	Less than 10,000 AADT	TM2	Medium Residential properties set close to carriageway Public Transport	Medium Full road closure with continued NMU access along section length via on-road temporary provisions. Temporary and Short Term.	Moderate	High Diversion route required. Temporary and Short Term.
22	Woodmancote Lane	From junction with Marlpit Lane eastern Woodmancote village extents	0.57	19 - 32 days	Rural Road 4.5m minimum road width (without centre line). No footway along section length.	Less than 10,000 AADT	TM2	Low No residential access	Medium Full road closure with continued NMU access along section length via on-road temporary provisions. Temporary and Short Term.	Minor	High Diversion route required. Temporary and Short Term.
23	Woodmancote Lane	From eastern Woodmancote village extents to junction with South Lane	0.38	13 - 21 days	Rural Road 4.5m minimum road width (without centre line). No footway along section length.	Less than 10,000 AADT	TM2	Medium Residential properties set close to carriageway Public Transport	Medium Full road closure with continued NMU access along section length via	Moderate	High Diversion route required. Temporary and Short Term.

Section No.	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
									Magnitude of impact	Impact	
								Public House	on-road temporary provisions. Temporary and Short Term.		
24	South Lane	From junction with Woodmancote Lane to junction with Cemetery Lane	0.41	14 - 23 days	Rural Road 4.5m minimum road width (without centre line). No footway along section length.	Less than 10,000 AADT	TM2	Low Residential properties set back from the carriageway	Medium Full road closure with continued NMU access along section length via on-road temporary provisions. Temporary and Short Term.	Minor	High Diversion route required. Temporary and Short Term.
25	South Lane / Old Farm Lane	From junction with Cemetery Lane to junction with eastern Westbourne village extents	1.31	44 - 73 days	Rural Road 5.5m - 7m road width (with centre line). One footway set back from carriageway along section length.	2,743 AADT (2009)	TM 1A	Low No residential access	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
26	Whitechimney Row	From eastern Westbourne village extents to junction with the B2147	0.43	14 - 24 days	Urban Road through Westbourne. 3.5m - 5.5m road width (with/without centre line). Minimal footway on/off carriageway along section length.	Less than 10,000 AADT	TM2	Medium Residential properties set close to carriageway Public Transport recreational facilities Pedestrian / Cyclists	Medium Full road closure with continued NMU access along section length via on-road temporary provisions. Temporary and Short Term.	Moderate	High Diversion route required. Temporary and Short Term.
27	East Street / The Square/ Westbourne Road	From junction with the B2147 to the junction with Southleigh Row	0.89	30 - 50 days	Urban Road through Westbourne. 4.5m - 8m road width (with/without centre line). Minimal footway on/off carriageway along section length.	Less than 10,000 AADT	TM 1A and TM2	High GP Surgery Residential properties set close to carriageway Public Transport Shops Pedestrians / Cyclists	Medium Full road closure with continued NMU access along section length via on-road temporary provisions. Temporary and Short Term.	Moderate	High Diversion route required. Temporary and Short Term.
28	Southleigh Road	From junction with Southleigh Row to junction B2148 - Horndean Road	0.80	27 - 45 days	Urban Road through New Brighton 6.5m - 8.5m road width (with centre line). Two footways on each verge along section length.	Less than 10,000 AADT	TM 1A	Medium Residential properties set close to carriageway Public Transport Pedestrian / Cyclists	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short

Section No.	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
									Magnitude of impact	Impact	
					On road marked cycle lane.						Term.
29	B2148	From junction with Southleigh Road to the junction with Prospect Lane	2.46	82 - 137 days	Rural Road Typically 5.5m to 7m road width (with centre line). With localised 5m wide pinch points. One footway along northern verge of section length.	Less than 10,000 AADT	TM 1A and TM2	Low No residential access	Medium Partial road closures at pinch points with continued NMU access along section length via on-road and dedicated provisions. Temporary and Short Term.	Minor	High Diversion route required. Temporary and Short Term.
30	B2148	From junction with Prospect Lane to junction with Durrants Road	0.67	22 - 37 days	Rural Road through Durrants Village. 5.5m minimum road width (with centre line). At least one footway along urban area of section length.	Less than 10,000 AADT	TM 1A	High School Residential properties set close to carriageway Shops Pedestrians / Cyclists	Low Existing pedestrian access maintained. Temporary and Short Term.	Moderate	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
31	B2149	From junction with Durrants Road to the junction with Castle Road	0.87	29 - 48 days	Rural Road through Durrants Village. 5.5m minimum road width (with centre line). Minimal footway provision along urban area of section length.	Less than 10,000 AADT	TM 1A	Low Residential properties set back from the carriageway	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
32	B2149	From the junction with Castle Road to the junction with Dell Piece E	2.21	73 - 123 days	Rural Road 5.5m minimum road width (with centre line). Minimal footway provision along urban area of section length. No footways in rural section.	Less than 10,000 AADT	TM 1A	Low No residential access	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
33	Dell Piece E(including A3M grade separated junction)	From junction with B2149 to the Junction with Dell Piece W	0.62	21 - 35 days	Urban Road 7.5m minimum road width (with centre line) One footway on northern verge set back from carriageway.	Less than 10,000 AADT	TM 1A	Low No residential access	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
34	B2149	From junction with A3M roundabout junction to the junction with A3	0.53	18 - 30 days	Urban Road 7.5m minimum road width (with centre line) One footway on northern	Less than 10,000 AADT	TM 1A	Low No residential access	Low Existing pedestrian access maintained.	Minor	Medium TM with signals and less than 900 one way vehicle

Section No.	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
									Magnitude of impact	Impact	
					verge set back from carriageway.				Temporary and Short Term.		flows. Temporary and Short Term.
35	Catherington Lane	From junction with the A3 to the junction with Stonechat road	0.79	26 - 44 days	Urban Road 5.5m to 7.5m road width (with centre line) Majority of two footways on each verge. Partial marked on road cycleway.	Less than 10,000 AADT	TM 1A	Medium Residential properties set close to carriageway Public Transport Pedestrian / Cyclists	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
36	Catherington Lane	From junction with the A3 to the junction with Crouch Lane	0.29	10 - 16 days	Urban road. 5.5m minimum road width (with centre line). Wide verges At least one footway along section length.	Less than 10,000 AADT	TM 1A	High Playground set back from carriageway Residential properties set back from carriageway	Low Existing pedestrian access maintained. Temporary and Short Term.	Moderate	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
37	Crouch Lane / Coldhill Lane	From junction with Catherington Lane to junction with Lovedean Lane	1.17	39 - 65 days	Rural narrow lane 2.5m minimum road width High verges no footways along length	Less than 10,000 AADT	TM 2	Low Minimal residential access	High Full road closure for all vehicles and NMU access along section length Temporary and Short Term.	Moderate	High Diversion route required. Temporary and Short Term.
38	Lovedean Lane	From junction with Coldhill Lane to junction with Day Lane	0.21	7 - 12 days	Rural Road 5.5m minimum road width (without centre line). Typically wide verges. No footway along section length.	Less than 10,000 AADT	TM 1A	Low Residential properties set back from the carriageway	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
39	Day Lane	From junction with Lovedean Lane to junction with Broadway Lane and Lovedean Substation	0.83	29 - 48 days	Rural Road 5m minimum road width (without centre line). Typically wide verges. No footway along section length.	Less than 10,000 AADT	TM 2	Low No residential access	Medium Partial road closures at pinch points with continued NMU access along section length via on-road and dedicated provisions. Temporary and Short Term.	Minor	High Diversion route required. Temporary and Short Term.

Section No.	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
									Magnitude of impact	Impact	
						Entire Route	23.3km of the route would require a single lane closure and 12.0km of the route would require a full road closure	3.9km of the route would be of high sensitivity, 10.1km of medium sensitivity and 21.2km of low sensitivity	The majority of the route 28.6km would experience minor adverse impacts, 6.7km would experience moderate impacts. No Major impacts were identified.		The majority of the route (22.9km) would experience medium effects and 12.3km high effects.
Notes											
#	*Forecast duration assuming a rate of progress of 18 -30m per day*										
##	*TM1A = Single lane closure controlled by traffic signals, stop-go boards, give-take* *TM1B = Single lane closure of a dual carriageway* *TM2 = Full road closure* *TM3 = Narrow lanes*										

Table 6: Appraisal Findings – Option B Cable Corridor

Section No.	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
									Magnitude of impact	Impact	
1	Catherington Lane	From junction with Crouch Lane to White Dirt Lane	1.3km	43 - 72 days	Rural Road Typically 5.5m road width (with centre line). At least one footway for majority of section length.	Less than 10,000 AADT	TM 1A - with continued dedicated NMU facilities.	High Primary School Day Nurseries	Low Existing pedestrian access maintained. Temporary and Short Term.	Moderate	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
2	Catherington Lane	From junction with White Dirt Lane to junction with Downhouse Road	0.49km	16 - 27 days	Rural Road Typically less than 5m road width (without centre lines). No footways along section length.	Less than 10,000 AADT	TM 2 - with continued provision for NMU access.	Medium Residential properties set close to the carriageway	Low Full road closure with continued NMU access along section length via on-road temporary provisions. Temporary and Short Term.	Moderate	High Diversion route required. Temporary and Short Term.
3	Downhouse Road	From junction with Catherington Lane to junction with Red Horse Lane	0.98km	32 - 54 days	Rural Road Typically 5.5m road width (with centre line). At least one footway for majority of section length.	Less than 10,000 AADT	TM 1A - with continued dedicated NMU facilities.	Low Residential properties set back from the carriageway	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short

Section No.	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
									Magnitude of impact	Impact	
											Term.
4	Red House Lane	From junction with Downhouse Road to junction with Hambledon Road	0.39km	13 - 22 days	Rural Road Typically less than 4m road width (without centre lines). No footways along section length.	Less than 10,000 AADT	TM 2 - with continued provision for NMU access.	Low No residential access from link	Medium Full road closure with continued NMU access along section length via on-road temporary provisions. Temporary and Short Term.	Minor	High Diversion route required. Temporary and Short Term.
5	Hambledon Road	From junction with Red House Lane to junction with Old Mill Lane	1.67km	55 - 92 days	Rural Road Typically 5.5m road width (with centre line). Wide verge. No footways along section length.	Less than 10,000 AADT	TM 1A	Low No residential access from link	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
6	East Street	From junction with Old Mill Lane to junction with Brook Lane	2.28km	76 - 127 days	Rural Road Typically 5.5m road width (with centre line). Wide verge. No footways along section length.	Less than 10,000 AADT	TM 1A	Low Minimal residential access from link	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
7	Brook Lane	From junction with East Street to junction with the B2150	2.1km	70 - 116 days	Rural Road Typically 5m road width (with/without centre line). Intermittent verges/high hedgerows. No footways along section length.	Less than 10,000 AADT	TM 2 - with continued provision for NMU access.	Low Minimal residential access from link	Medium Full road closure with continued NMU access along section length via on-road temporary provisions. Temporary and Short Term.	Minor	High Diversion route required. Temporary and Short Term.
8	B2150	From junction with Brook Lane to the junction with Long Road	1.34km	45 - 74 days	Rural Road Typically 5.5m road width (with centre line). Intermittent verges/high hedgerows. No footways along section length.	3,593 AADT (2009)	TM 1A	Low Minimal residential access from link	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
9	B2150	From junction with Long Road to junction with	1.82km	60 - 101 days	Rural Road Typically 5.5m road width (with centre line).	3,593 AADT (2009)	TM 1A	Low Minimal residential	Low Existing pedestrian	Minor	Medium TM with signals and less

Section No.	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
									Magnitude of impact	Impact	
		Watton Lane			Narrow verges both sides of carriageway. No footways along section length.			access from link	access maintained. Temporary and Short Term.		than 900 one way vehicle flows. Temporary and Short Term.
10	B2150	From junction with Watton Lane to junction with A32	0.52km	17 - 29 days	Rural Road Typically 5.5m road width (with centre line). Narrow verges both sides of carriageway. No footways along section length.	Less than 10,000 AADT	TM 2 - with continued provision for NMU access.	Low Minimal residential access from link	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
11	A32	From junction with B2150 to the junction with the B3035	1.41km	47 - 78 days	Main 'A' Road Minimum of 5.5m road width (with centre lines) Majority of section with narrow verges/high hedgerows. No footways along section length	6,953 AADT (2018)	TM 1A	Low Minimal residential access from link	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
12	A32	From junction with the B3035 to the outskirts of village Exton	0.77km	30 - 50 days	Main 'A' Road through village centres Minimum of 5.5m road width (with centre lines) At least one footway for majority of section length.	6,953 AADT (2018)	TM 1A	Medium Shops Pedestrian/ cyclists residential properties set close to carriageway	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
13	A32	From the outskirts of Village Exton to the junction with Wheely Down Road	2.33km	78 - 129 days	Main 'A' Road Minimum of 5.5m road width (with centre lines) Mixture of wide and narrow verges/high hedgerows. No footways along section length	Less than 10,000 AADT	TM 1A	Low Minimal residential access from link	Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
14	A32	From junction with Wheely Down Road to speed limit change at eastern village extents.	0.69km	23 - 38 days	Main 'A' Road through village centre (Warnford) Minimum of 5.5m road width (with centre lines) Intermittent single footway along section length.	Less than 10,000 AADT	TM 1A	Medium Public House Pedestrian/ cyclist activity residential properties set close to carriageway	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
15	A32	From speed limit change at eastern Warnford village	1.34km	45 - 74 days	Main 'A' Road Minimum of 5.5m road width (with centre lines)	Less than 10,000 AADT	TM 1A	Low Minimal residential	Low Existing pedestrian	Minor	Medium TM with signals and less

Section No.	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
									Magnitude of impact	Impact	
		extents to West Meon western speed limit change village extents			majority of wide verges No footways along section length			access from link	access maintained. Temporary and Short Term.		than 900 one way vehicle flows. Temporary and Short Term.
16	A32	From speed limit change at western West Meon village extent to speed limit change at eastern West Meon village extents	0.57km	22 - 37 days	Main 'A' Road through village centre (West Meon) Typical 5.5m road width (with centre lines) At least one single narrow footway along section length.	Less than 10,000 AADT	TM 1A	Medium Public House, Shops, Pedestrian/ cyclist activity residential properties set close to carriageway	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
17	A32	From speed limit change at eastern West Meon village extents to the junction with the A272	1.97km	65 - 109 days	Main 'A' Road Minimum of 5.5m road width (with centre lines) Majority of wide verges No footways along section length	6,969 AADT (2018)	TM 1A	Low Minimal residential access from link	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
18	A32	From junction with the A272 to the junction with Sages Lane	3.58km	119 - 198 days	Main 'A' Road Minimum of 5.5m to 7m road width (with centre lines) Majority of wide verges No footways along section length	Less than 10,000 AADT	TM 1A	Low Minimal residential access from link	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
19	A32	From junction with Sages Lane to junction with Petersfield Road	2.21km	74 - 123 days	Main 'A' Road Minimum of 5.5m to 7m road width (with centre lines) Majority of narrow verges No footways along section length	Less than 10,000 AADT	TM 1A	Low Minimal residential access from link	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
20	A32	From junction with Petersfield Road to Junction with East Tisted Access Road	2.34km	78 - 130 days	Main 'A' Road Minimum of 5.5m road width (with centre lines) Intermittent wide / narrow verges No footways along section length	7,917 AADT (2018)	TM 1A	Low Minimal residential access from link	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term..
21	A32	From junction East Tisted Access	2.9km	96 - 161 days	Main 'A' Road Minimum of 5.5m road width (with	7,917 AADT (2018)	TM 1A	Low	Low	Minor	Medium

Section No.	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
									Magnitude of impact	Impact	
		Road to junction with Brightstone Lane			centre lines) Intermittent wide / narrow verges No footways along section length			Minimal residential access from link	Existing pedestrian access maintained. Temporary and Short Term.		TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
22	A32	From junction with Brightstone Lane to Junction with Woodside Lane	0.45km	15 - 25 days	Main 'A' Road through village centre (Lower Farringdon) Typical 5.5m road width (with centre lines) Majority of link has two footways along section length.	Less than 10,000 AADT	TM 1A	Medium Public House, Shops, Pedestrian/ cyclist activity residential properties set close to carriageway	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
23	A32	From junction with Woodside Lane to junction with the A31	2.11km	70 - 117 days	Main 'A' Road Minimum of 5.5m road width (with centre lines) Intermittent wide / narrow verges No footways along section length	Less than 10,000 AADT	TM 1A	Low Minimal residential access from link	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
24	Northfield Lane / Chawton Park Road	From junction with the A31 to the junction with Leisure Centre Car Park	0.68km	22 - 38 days	Rural Road Typically less than 4m road width (without centre lines). No footways along section length.	Less than 10,000 AADT	TM 2 - with continued provision for NMU access.	Medium Pedestrians / Cyclists Cricket Club Leisure Centre	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	High Diversion route required. Temporary and Short Term.
25	Chawton Park Road	From junction with leisure Centre Car Park to the junction with the A339	0.79km	26 - 43 days	Urban Road Typically 6m wide (with/without centrelines. At least one footway along section On road marked cycle lane.	Less than 10,000 AADT	TM 1A	High Pedestrians / Cyclists Cricket Club Leisure Centre Doctors	Low Existing pedestrian access maintained. Temporary and Short Term.	Moderate	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
26	A339	From junction with Chawton Park Road to junction with the B3349	0.85km	25 - 47 days	Urban Road Typically 6m to 7m wide (with centre lines) At least a single footway along built up areas.	Less than 10,000 AADT	TM 1A	Medium Shops Pedestrian/ cyclists residential properties set close to carriageway	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
27	A339	From junction with the B3349 to the	3.1km	103 - 172 days	Main 'A' Road Typically 5.5m - 6.5m road width (with	10,300 AADT (2018)	TM 1A	Low	Low	Minor	Medium

Section No.	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
									Magnitude of impact	Impact	
		junction with Well Lane			centre lines) Intermittent wide / narrow verges No footways along section length			Minimal residential access from link	Existing pedestrian access maintained. Temporary and Short Term.		TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
28	A339	From junction with Well Lane to junction with Village Street	1.79km	59 - 99 days	Main 'A' Road Typically 5.5m - 6.5m road width (with centre lines) Intermittent wide / narrow verges No footways along section length	Less than 10,000 AADT	TM 1A	Low Minimal residential access from link	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
29	A339	From junction with Village Street to junction with The Avenue	3.25km	108 - 180 days	Main 'A' Road Typically 5.5m - 6.5m road width (with centre lines) Intermittent wide / narrow verges No footways along section length	Less than 10,000 AADT	TM 1A	Low Minimal residential access from link	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
30	A339	From junction with The Avenue to junction with The Street	1.63km	54 - 91 days	Main 'A' Road Typically 6.5m - 7.5m road width (with centre lines) Intermittent wide / narrow verges No footways along section length	Less than 10,000 AADT	TM 1A	Low Minimal residential access from link	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
31	A339	From junction with The Street to junction with Longrodan Lane	3.14km	104 - 174 days	Main 'A' Road Minimum of 5.5 road width (with centre lines) Majority of narrow verges one footway for approximately 1km along southern section length	Less than 10,000 AADT	TM 1A	Low Minimal residential access from link	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
32	A339	From junction with Longroden Lane to junction with Dickens Lane	3.31km	110 - 184 days	Main 'A' Road Typically 6m - 6.5m road width (with centre lines) Intermittent wide / narrow verges No footways along section length	Less than 10,000 AADT	TM 1A	Low Minimal residential access from link	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
33	A339	From junction with Dickens Lane to junction with Grove	0.38km	13 - 21 days	Main 'A' Road - Urban Minimum 6m road width (with centre lines)	11,432 AADT (2018	TM 1A	Minimal residential access from link	Low Existing pedestrian	Minor	High TM with signals and more

Section No.	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
									Magnitude of impact	Impact	
		Road.			Wide verges with at least one footway along section length				access maintained. Temporary and Short Term.		than 900 one way vehicle flows Temporary and Short Term.
34	A339	From Junction with Grove Road to junction with A30	0.48km	16 - 27 days	Main 'A' Road Dual Carriageway - Urban Minimum 6.5m two lane carriageway width With at least one footway along section length	11,432 AADT (2018	TM 1B	Medium Pedestrian/ cyclists residential properties set close to carriageway	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	High TM with signals and more than 900 one way vehicle flows Temporary and Short Term.
35	A30	From junction with A339 to junction slipway south filter lane	1.26km	42 - 70 days	Main 'A' Road Dual Carriageway - Urban Minimum 6.5m two lane carriageway width. No footways along section length	30,507 AADT (2018)	TM 1B	Low Minimal residential access from link	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM to include 1 lane closure of dual carriageway with average one way lane flows of more than 1100 vehicles per hour. Temporary and Short Term.
36	A339	From slipway south filter lane to A3010 off-ramp slipway	0.38km	13 - 21 days	Main 'A' Road Dual Carriageway - Urban Minimum 14m four lane carriageway width. No footways along section length	60,052 AADT (2018)	TM 1B	Low No residential access from link	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM to include 1 lane closure of two lane dual carriageway with average one way flows of more than 2380 vehicles per hour. Temporary and Short Term.
37		From A3010 off-ramp slipway to roundabout junction with Norn Hill	1.23km	41 - 68 days	Main 'A' Road Dual Carriageway - Urban Minimum 7m wide two lane carriageway width. No footways along section length	58,039 AADT (2018)	TM 1B	Low No residential access from link	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM to include 1 lane closure of two lane dual carriageway with average one way flows of more than 2094 vehicles per hour. Temporary and Short Term.
38	A33	From Norn Hill junction to junction	1.11km	37 - 62 days	Main 'A' Road Dual Carriageway - Urban	37,214 AADT (2018)	TM 1B	Low	Low	Minor	Medium

Section No.	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
									Magnitude of impact	Impact	
		with Carpenters Down			Minimum 7m two lane carriageway width. Footways set back from carriageway along section length			No residential access from link	Existing pedestrian access maintained. Temporary and Short Term.		TM to include 1 lane closure of two lane dual carriageway with average one way flows of more than 1262 vehicles per hour. Temporary and Short Term.
39	Crockford Lane	From junction with A33 to the junction with Lime Tree Way	0.96km	32 - 53 days	Urban Road Typically 6.5m wide (with centrelines) One shared pedestrian/cycle footway along section.	Less than 10,000 AADT	TM 1A	Industrial and business estate	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
40	Lime Tree Way	From junction with Crockford Lane to junction with Crockford Lane	0.92km	31 - 51 days	Urban Road Typically 6.5m wide (with centrelines) One shared pedestrian/cycle footway along section and opposite verge footway.	Less than 10,000 AADT	TM 1A	Low Industrial and business estate	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
41	Crockford Lane	From junction with Lime Tree Way to junction with National Cycle Route 23	0.48km	16 - 27 days	Rural Road Typically 4.3m to 5.5m road width (without centre lines). No footways along section length.	Less than 10,000 AADT	TM 2 - with continued provision for NMU access.	Low No residential access from link	Medium Full road closure with continued NMU access along section length via on-road temporary provisions. Temporary and Short Term.	Minor	High Diversion route required. Temporary and Short Term.
42	National Cycle Route 23	From junction with Crockford Lane to junction with Cufuada Lane	0.48km	16 - 27 days	Off road route utilising National Cycle Route 23	Less than 10,000 AADT	TM 2 - closure off of road section of National Cycle Route 23	Low No residential access from link	High Full NCR 23 closure with diverted NMU access along parallel road section on Cufuada Lane. Temporary and Short Term.	Moderate	Low No vehicular traffic delay
43	Cufuada Lane (NCR 23)	From junction with off-road NCR 23 to junction with	3km	100 - 167 days	Narrow rural road Typically 3m to 4.5m road width (without centre lines).	Less than 10,000 AADT	TM 2 - closure of road section including National	Low Minimal residential	High Full NCR 23 closure with	Moderate	High Diversion route required.

Section No.	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
									Magnitude of impact	Impact	
					No footways along section length.		Cycle Route 23	access from link	long diversion route required. Temporary and Short Term.		Temporary and Short Term.
44	The Street (NCR 23)	From junction with Cufuada Lane to junction with Minchens Lane	0.7km	23 - 39 days	Rural Road Typically 5.5m road width (with centre line). At least one footway for majority of section length.	Less than 10,000 AADT	TM 1A	Medium Pedestrian/ cyclists residential properties set close to carriageway	Low Existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
45	Minchens Lane (NCR 23)	From junction with The Street to junction with Bramley Substation Access Lane	0.25km	8 - 14 days	Rural Road Typically 5m to 5.5m road width (with centre line). At least one footway for majority of section length.	Less than 10,000 AADT	TM 1A	Medium Pedestrian/ cyclists residential properties set close to carriageway	High Full NCR 23 closure with diversion route required. Temporary and Short Term.	Major	High Diversion route required. Temporary and Short Term.
						Entire Route	**53.1km of the route would require a single lane closure, 4.5km of the route would require a lane closure and 8.1km of the route would require a full road closure**	**2.1km of the route would be of high sensitivity, 5.9km of medium sensitivity and 57.7km of low sensitivity**	**The majority of the route 59.4km would experience minor adverse impacts, 6.1km would experience moderate impacts and 0.3km major adverse impacts.**		**The majority of the route, 57km would experience medium effects, 8.3km high effects and 0.5km low effects.**

Notes	
#	*Forecast duration assuming a rate of progress of 18 - 30m per day*
##	*TM1A = Single lane closure controlled by traffic signals, stop-go boards, give-take* *TM1B = Single lane closure of a dual carriageway* *TM2 = Full road closure* *TM3 = Narrow lanes*

Table 7: Appraisal Findings – Proposed Development

Section No.	Sub-Section	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
										Magnitude of impact	Impact	
1	a	Cross Country Section 1	From Lovedean Substation to Un-named Road	0.88	29 - 48 days	n/a	n/a	TM 2 - for Cable Crossing of Un-named Road	Low	Low Temporary and Short Term.	Minor	High Diversion route required on Un-named Road Temporary and Short Term.
2	a	Cross Country Section 2	From Un-named Road to Anmore Lane	1.22	40 - 67 days	n/a	n/a	TM 2 - for Cable Crossing of Anmore Road	Low	Medium Diversion or crossing strategy required for Footpath 13 which runs between Edney's Lane and Anmore Dell Temporary and Short Term.	Minor	High Diversion route required on Un-named Road Temporary and Short Term.
3	a	Cross Country Section 3 (Option 3a)	From Un-named Road to the B2150 Hambledon Road	0.66	22 - 37 days	n/a	n/a	TM 2 - with continued provision for NMU access.	Medium Residential properties set close to the carriageway	Medium Full road closure with continued NMU access along section length via on-road temporary provisions. Temporary and Short Term.	Moderate	High Diversion route required. Temporary and Short Term.
3	b	Anmore Road (Option 3b)	From Cross Country Section 2 to Cross Section 3	0.10	3 - 6 days	Urban Road Typically 4.5m wide (without centrelines) One pedestrian footway along southern verge of section.	Less than 10,000 AADT	TM 2 - with continued provision for NMU access.	Medium Residential properties set close to the carriageway	Medium Full road closure with continued NMU access along section length via on-road temporary provisions. Temporary and Short Term.	Moderate	High Diversion route required. Temporary and Short Term.
3	c	B2150 Hambledon Road	From point of Cross Country Section 3 to junction with Soake Road	0.17	6 - 9 days	Urban Road Typically 7m wide (with centrelines) One shared pedestrian/cycle footway along northern verge of section.	Less than 10,000 AADT	TM 1A	Low No residential access from link	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
4	a	B2150 Hambledon Road	From the junction with Soake Road to the junction with Auger Row	0.39	13 - 22 days	Urban Road Typically 7m wide (with centrelines) One shared pedestrian/cycle footway along northern verge of section.	Less than 10,000 AADT	TM 1A	Low No residential access from link	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
4	b	B2150 Hambledon Road	From the junction with	0.95	32 - 53 days	Urban Road Typically 7m wide (with	Less than	TM 1A	Medium	Low	Minor	Medium

Section No.	Sub-Section	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
										Magnitude of impact	Impact	
			Auger Row to the junction with Milton Road			centrelines) With at least one footway along section length	10,000 AADT		Shops Pedestrian/ cyclists	Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.		TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
4	c	B2150 Hambledon Road A3	From the junction with Milton Road to the junction with Rockville Drive	0.97	32 - 54 days	Urban Road - Dual Carriageway Typically 7m wide (with centrelines) Intermittent footways and shared pedestrian/cycle facilities along section length	18,899 AADT (2018)	TM 1B	Medium Shops Pedestrian/ cyclists	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM to include 1 lane closure of dual carriageway with average one way lane flows of 680 vehicles per hour. Temporary and Short Term.
4	d	A3	From the junction with Rockville Drive to the junction with Campbell Crescent	1.20	40 - 67 days	Urban Road - two lane carriageway with additional shared bus and cycle lane in both directions Typically 13.5m wide (with centrelines) At least one footway along section length	18,899 AADT (2018)	TM 1B	Medium Residential properties set close to the carriageway Pedestrian/ cyclists	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM to include 1 lane closure of dual carriageway with average one way lane flows of 680 vehicles per hour. Temporary and Short Term.
4	e	A3	From the junction with Campbell Crescent to junction with Purbrook Heath Road	0.52	17 - 29 days	Urban Road Typically 6.5m wide (with centrelines) At least one footway along section length	18,899 AADT (2018)	TM 1A	Medium Residential properties set close to the carriageway Pedestrian/ cyclists Shops	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
4	f	A3	From the junction with Purbrook Heath Road to the junction with Park Avenue	0.85	28 - 47 days	Urban Road - two lane carriageway with additional shared bus and cycle lane in both directions Typically 13.5m wide (with centrelines) At least one footway along section length	18,899 AADT (2018)	TM 1B	Medium Residential properties set close to the carriageway Pedestrian/ cyclists Shops	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM to include 1 lane closure of carriageway with average one way lane flows of 680 vehicles per hour. Temporary and Short Term.
4	g	A3	From the junction with Park Avenue to the junction	0.24	8 - 13 days	Urban Road Typically 9.5m wide (with centrelines) On-road cycle lanes	18,899 AADT (2018)	TM 1A	Medium Residential properties set close to the	Low Limited impact on existing routes with existing	Minor	Medium TM with signals and less than 900 one way vehicle

Section No.	Sub-Section	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
										Magnitude of impact	Impact	
			with The Brow			At least one footway along section length			carriageway Pedestrian/ cyclists	pedestrian access maintained. Temporary and Short Term.		flows. Temporary and Short Term.
4	h	A3	From the junction with The Brow to the junction with the B2177	0.41	14 - 23 days	Urban Road - two lane carriageway with at least one additional shared bus and cycle lane. Typically, 10.5m minimum width (with centrelines) At least one footway along section length	18,899 AADT (2018)	TM 1B	Medium Residential properties set close to the carriageway Pedestrian/ cyclists Shops	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
4	j	B2177	From the junction with the A3 to the junction with Farlington Avenue	0.59	20 - 33 days	Urban Road Typically 6.5m wide (with centrelines) With at least one footway along section length	Less than 10,000 AADT	TM 1A	Low	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
4	k	Farlington Avenue	From the junction with Farlington Avenue to the junction with private drive (60m west of Burnham Avenue)	0.40	13 - 22 days	Urban Road Typically 6.5m wide (with centrelines) With at least one footway along section length	Less than 10,000 AADT	TM 1A	Low Minimal residential access from link	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
5	a	Farlington Avenue	From the junction with private drive (60m west of Burnham Avenue) to junction with Evelegh Road	0.59	20 - 32 days	Urban Road Minimum 5.5m wide (with centrelines) Footway along both verges along section length	Less than 10,000 AADT	TM 1A	Medium Residential properties set close to carriageway	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
5	b	Evelegh Road	From the junction with Evelegh Road to undeveloped land.	0.15	5 - 8 days	Urban Road Minimum 5.5m wide (with centrelines) Footway along both verges along section length	Less than 10,000 AADT	TM 1A	High School	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Moderate	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.

Section No.	Sub-Section	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
										Magnitude of impact	Impact	
5	c	Undeveloped Parcel of Land	From Evelegh Road to A2030	0.13	4 - 7 days	n/a	n/a	n/a	n/a	n/a	n/a	n/a
5	d	A2030	From junction with Farlington Avenue to the junction with Eastern Road	0.17	5 - 8 days	Urban Road - Dual Carriageway Typically 6m wide (with centrelines) At least one footway along section length	23,864 AADT (2017)	TM 1A	Medium Residential properties set close to carriageway	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	High TM with signals and more than 900 one way vehicle flows. Temporary and Short Term.
5	e	A2030	From Junction with Havent Road to midpoint of Eastern Road	0.33	11 - 18 days	Urban Road - Dual Carriageway Typically 6m wide (with centrelines) Footways on both verges along section length	20,829 AADT (2018)	TM 1B	Low No residential access from link	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM to include 1 lane closure of dual carriageway with average one way lane flows of no more than 784 vehicles per hour. Temporary and Short Term.
6	a	A2030 Fitzherbert Road	From midpoint of Eastern Road (A2030) onto Fitzherbet Road to junction with Sainsburys Car Park	0.32	11 - 18 days	Main 'A' Road - Dual Carriageway Typically 6m wide (with centrelines) Footways on both verges along section length	20,829 AADT (2018)	TM 1A and TM 1B	Medium Pedestrian/ cyclists Shops	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	High TM with signals and no more than 784 average one way vehicle flows per hour. Interfering with major signalised junction. Temporary and Short Term.
6	b	Sainsburys Car Park	From Junction with Fitzherbert Road to Railway Line	0.33	11 - 18 days	Within Sainsburys Car Park	Less than 10,000 AADT	TM 1A	Medium Pedestrian/ cyclists Shops	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
7	a	Cross Country Section 4	From Railway Line to A2020 close to junction with Anchorage Road	1.71	56 - 94 days	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7	b	A2030	From Junction	0.60	20 - 33 days	Urban Road - Mix of four	32,500	TM 1B	Low	Low	Minor	Medium

Section No.	Sub-Section	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
										Magnitude of impact	Impact	
			with Anchorage Road to the Junction with the Airport Service Road.			lane single carriageway and Dual Carriageway Minimum 12.8m wide (with centrelines) Footways on both verges along section length	AADT (2018)		No residential access from link	Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.		TM to include 1 lane closure of dual carriageway with average one way lane flows of no more than 1289 vehicles per hour. Temporary and Short Term.
8	a	A2030	From junction with Airport Service Road to junction with Burrfields Road	0.52	17 - 29 days	Urban Road - Four lane single carriageway Minimum 6.5m wide (with centrelines) At least one footway along section length	32,500 AADT (2018)	TM 1B	Low No residential access from link	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM to include 1 lane closure of dual carriageway with average one way lane flows of no more than 1289 vehicles per hour. Temporary and Short Term.
8	b	A2030	From junction with Burrfields to junction with junction with East Shore Way	1.71	56 - 94 days	Urban Road - Dual Carriageway Typically 6.5m wide (with centrelines) At least one footway along section length	32,500 AADT (2018)	TM 1B	Low Minimal residential access from link	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM to include 1 lane closure of dual carriageway with average one way lane flows of no more than 1289 vehicles per hour. Temporary and Short Term.
8	c	A2030	From junction with East Shore Way to junction with Eastern Avenue	0.26	9 - 14 days	Main 'A' Road - Single Carriageway Road. Typically 12m wide (with centrelines) At least one footway along section length	32,500 AADT (2018)	TM 1B	Low Minimal residential access from link	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM to include 1 lane closure of dual carriageway with average one way lane flows of no more than 1289 vehicles per hour. Temporary and Short Term.
8	d	Eastern Avenue	From junction with A2030 to junction with Moorings Way	0.25	8 - 14 days	Urban Road Typically 5.0m wide (with centrelines) Footway along both verges along section	Less than 10,000 AADT	TM 2 - with continued provision for NMU access.	Medium Residential properties set close to carriageway	Medium Full road closure with continued NMU access along section length via on-road	Moderate	High Diversion route required. Temporary and Short Term.

Section No.	Sub-Section	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
										Magnitude of impact	Impact	
						length				temporary provisions. Temporary and Short Term.		
8	e	Moorings Way	From junction with Eastern Avenue to junction with Furze Lane Bus Link.	0.75	25 - 42 days	Urban Road Minimum 7.2m wide (with centrelines) Footway along both verges along section length	Less than 10,000 AADT	TM 1A	Medium Residential properties set close to carriageway	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
8	f	Cross Country Section 5	From A2030 to Moorings Way	0.85	28 - 47 days	n/a	n/a	n/a	n/a	n/a	n/a	n/a
9	a	Furze Lane Bus Link and Furze Lane	From junction with Moorings Way to junction with Locksway Road	0.52	17 - 29 days	Bus Lane Single Lane at 3m width with traffic calming pinch points on Furze Lane Footway set back from bus lane.	Less than 10,000 AADT	TM2	High Leisure and recreational Parks	Medium Full road closure with continued NMU access along section length via footway set back from bus lane. Temporary and Short Term.	Major	High Diversion route required. Temporary and Short Term.
9	b	Locksway Road and Thatched House public house car park	From junction with Furze Lane	0.16	5 - 8 days	Urban Road Typical 4.8m wide (with centrelines) At least one footways along section length	Less than 10,000 AADT	TM2	High Business Pedestrians	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Moderate	High Diversion route required. Temporary and Short Term.
9	c	Cross Country Section 6	From Thatched Cottage public house car park to Kingsley Road	0.48	16 - 27 days	n/a	n/a	n/a	n/a	n/a	n/a	n/a
9	d	Kingsley Road and Yeo Road	From Cross Country Section 5 to into Yeo Road to Cross Country Section 7	0.20	7 - 11 days	Urban Road Typical 5.2m wide (without centrelines) Wide northern verge At least one footways along section length	Less than 10,000 AADT	TM2 with access only for residents	Medium Residential properties set close to carriageway	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	High Diversion route not possible due to dead end of road. Access only for residents. Temporary and Short Term.
9	e	Cross Country Section 7	From Yeo Road to Bransbury Road	0.38	12.7 - 21.1	n/a	n/a	n/a	High Leaisure and recreational Parks	Medium Diversion or crossing strategy required for Footpaths through Bransbury Park	Major	n/a

Section No.	Sub-Section	Highway Links inc. within section	Section (to/from)	Section length (km)	Construction duration #	Link description	Traffic flows	Proposed traffic management ##	Link sensitivity	Pedestrian severance and amenity		Traffic Delay Impacts
										Magnitude of impact	Impact	
										Temporary and Short Term.		
10	a	Henderson Road	From Bransbury Park to junction with Fort Cumberland Road	0.32	10 - 18 days	Urban Road Typical 9.2m wide (without centrelines) On road vehicle parking, both verges. Two footways along section length	Less than 10,000 AADT	TM 1A	Medium Residential properties set close to carriageway	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
10	b	Fort Cumberland Road	From junction with Henderson Road to junction with Fraser Range Access Road	0.30	10 - 17 days	Urban Road Typical 6.2m wide (without centrelines) On road vehicle parking, both verges. Two footways along section length	Less than 10,000 AADT	TM 1A	Medium Residential properties set close to carriageway	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
10	c	Fraser Range Access Road and Fort Cumberland Car Park. Leading to HDD Land Fall Site	From junction with Henderson Road to junction with Fraser Range Access Road	0.30	10 - 17 days	Urban Road Typical 6.2m wide (without centrelines) On road vehicle parking, both verges. Two footways along section length	Less than 10,000 AADT	TM 1A	Medium Residential properties set close to carriageway	Low Limited impact on existing routes with existing pedestrian access maintained. Temporary and Short Term.	Minor	Medium TM with signals and less than 900 one way vehicle flows. Temporary and Short Term.
					Entire Route			**13.7km of the route would require a single lane closure and 4km of the route would require a full road closure**	**7.1km of the route would be of high sensitivity, 9.4km of medium sensitivity and 1.2km of low sensitivity**	**The majority of the route 15.5km would experience minor adverse impacts, 1.3km would experience moderate impacts and 0.3km major adverse impacts.**		**12.9km of the route would experience medium effects and 4.5km high effects.**

Notes	
#	*Forecast duration assuming a rate of progress of 18 -30m per day*
##	*TM1A = Single lane closure controlled by traffic signals, stop-go boards, give-take* *TM1B = Single lane closure of a dual carriageway* *TM2 = Full road closure* *TM3 = Narrow lanes*

4 Summary

4.1.1 The following **Table 8** details the findings of the option appraisal to facilitate a high level direct comparison between the Proposed Development and the Alternative Cable Corridors.

4.1.2 It is noted that for Option B, the Onshore Cable Corridor would need to be linked to a landfall location. **Table 8** therefore outlines an option of either extending Option B to a suitable landfall location via either the Proposed Development Onshore Cable Corridor (Option B + Proposed Development) or via the Option A Onshore Cable Corridor (Option B + Option A).

Table 8: Summary of Cable Corridor Option Appraisal

Onshore Cable Corridor Options	Total Distance #	Proposed Traffic Management			Link Sensitivity			Pedestrian Severance and Amenity			Traffic Delays		
		Single Lane Closure (TM1A)	Lane Closure (TMA1B)	Full Road (TM2)	Low	Medium	High	Minor	Moderate	Major	Low	Medium	High
Proposed Development	21km	6.5km	7.2km	4.0km	1.2km	9.4km	7.1km	15.5km	1.3km	0.3km	0.0km	12.9km	4.5km
Option A	35km	23.3km	0.0km	12.0km	21.2km	10.1km	3.9km	28.6km	6.7km	0.0km	0.0km	22.9km	12.3km
Option B	66km	53.1km	4.5km	8.0km	57.7km	5.9km	2.1km	59.4km	6.1km	0.6km	0.5km	57.0km	8.3km
Option B + Proposed Development	87km	59.6km	11.7km	12.0km	58.9km	15.3km	9.2km	74.9km	7.4km	0.9km	0.5km	69.9km	12.8km
Option B + Option A	101km	76.4km	4.5km	20.0km	78.9km	16.0km	6.0km	88.0km	12.8km	0.6km	0.5km	79.9km	20.6km

Approximate distance

Appendix 3 – Environmental Constraints Map of the Indicative Countryside Routes

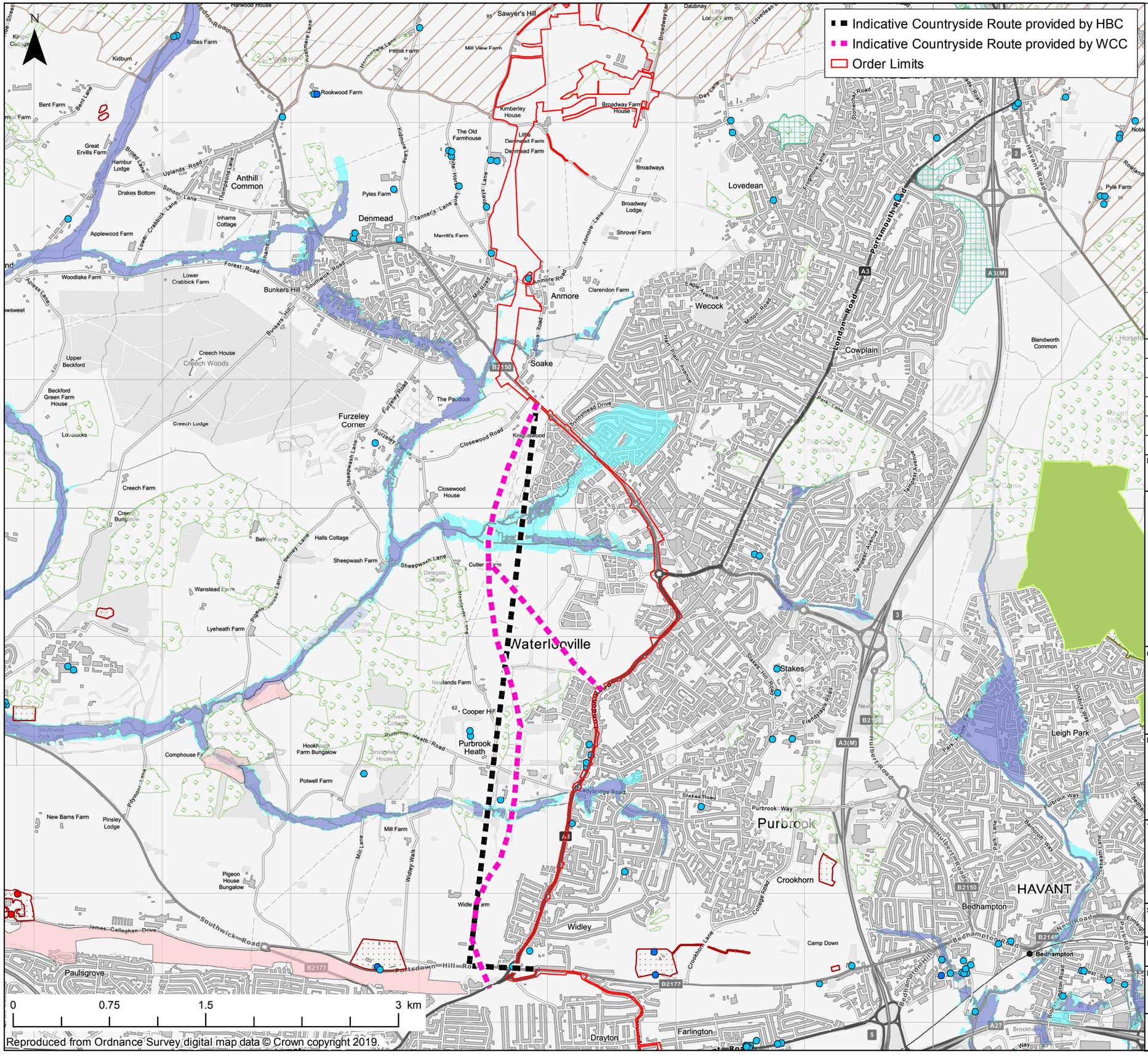

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Figure 2
Environmental Constraints Map of the Indicative Countryside Routes provided by WCC and HBC

SCALE AT A3	CHECKED:		APPROVED:
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PROJECT NO:	DESIGNED:	DRAWN:	DATE:
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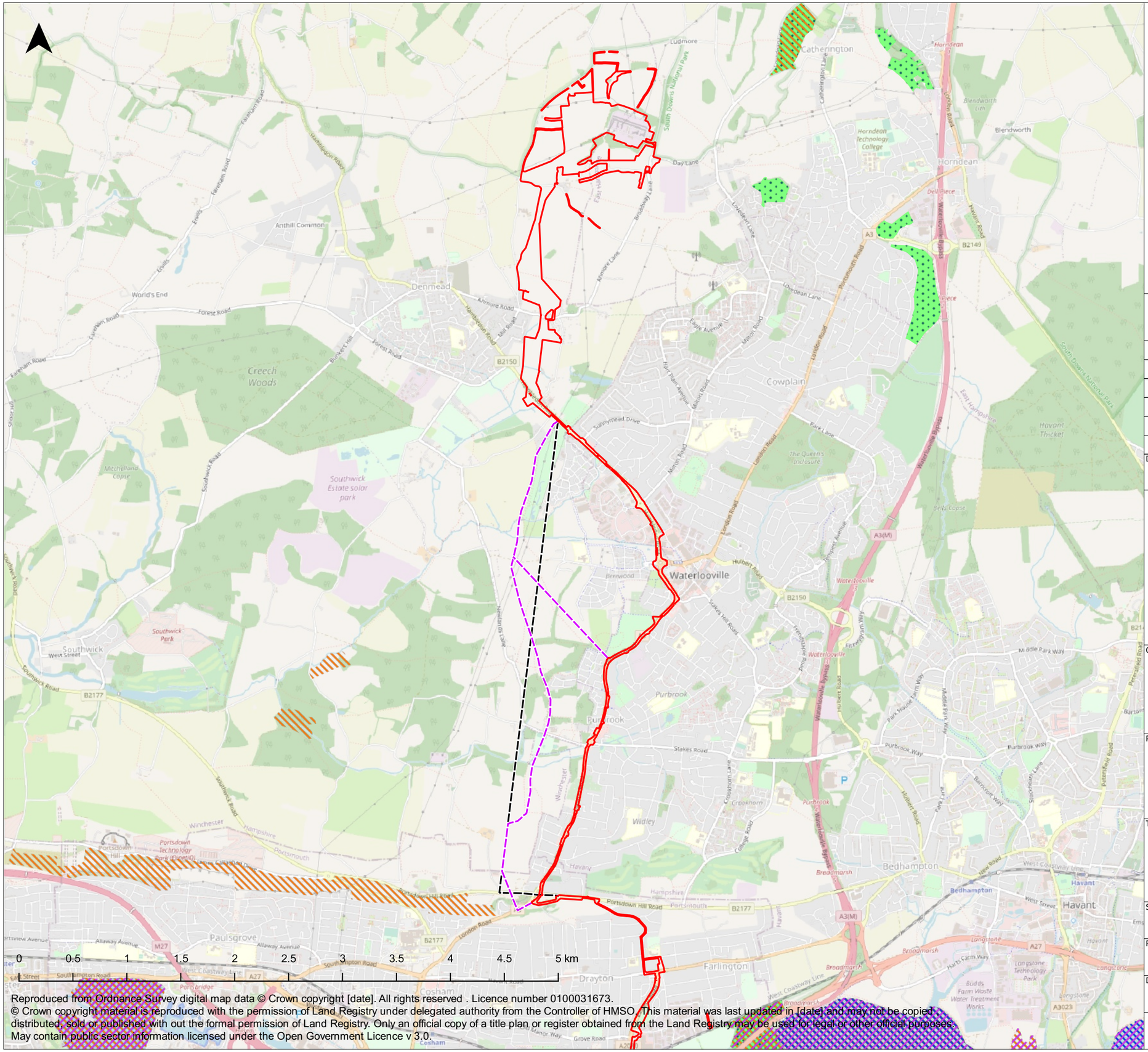
Appendix 4 – Ecological Constraints Map of the Countryside Routes



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TITLE: Figure 3
Ecological Constraints Map of the Indicative Countryside Routes Provided by WCC and HBC
Sheet 1 - Statutory Designated Sites

SCALE AT A3:	CHECKED:		APPROVED:
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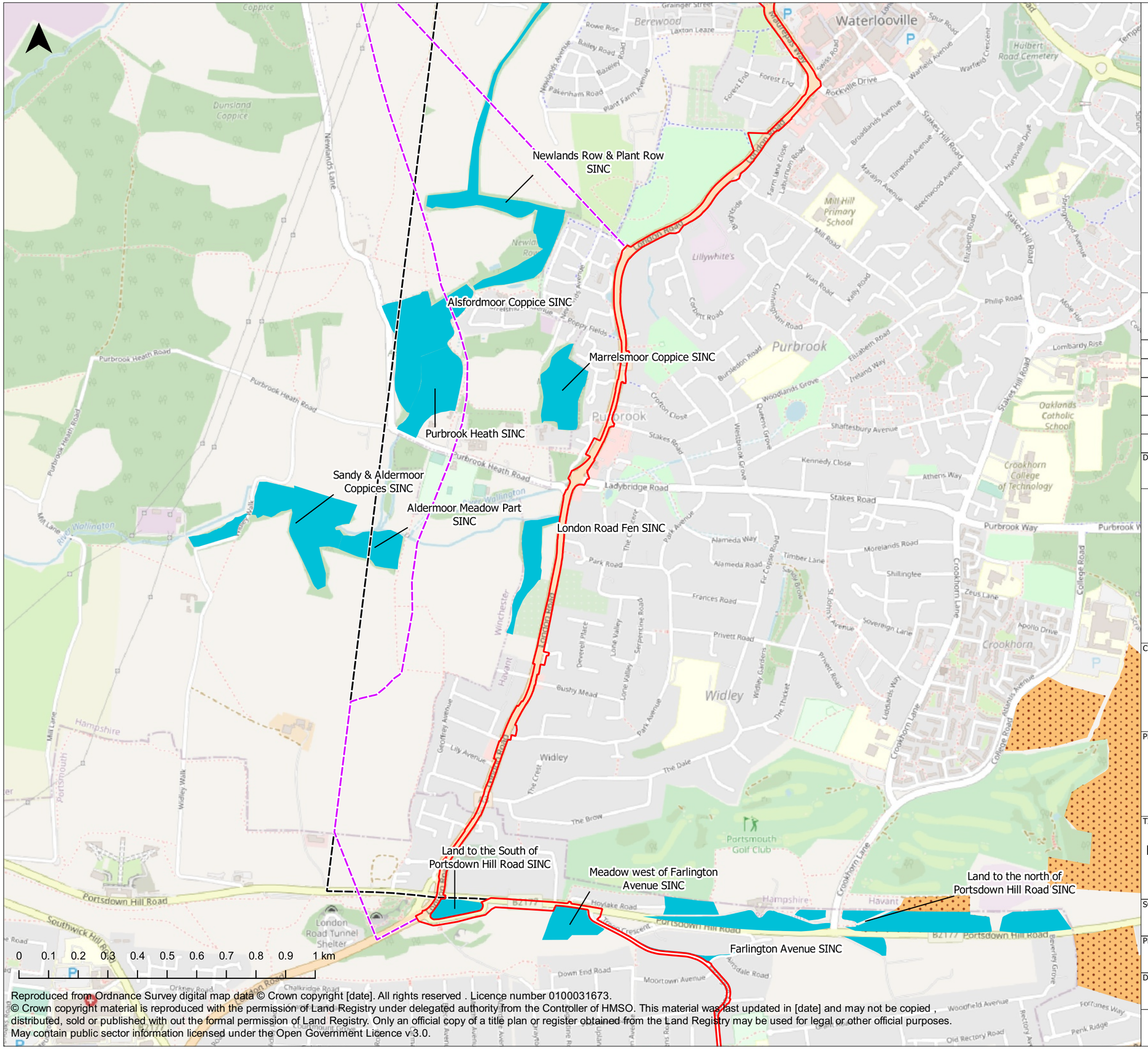
EN020022-ON-1	01



Legend

- Order Limits
- Indicative Countryside Route Provided by HBC
- Indicative Countryside Route Provided by WCC
- SINCs (100m of V7 + WCC + HBC, Labels) copy
- SWBGS Sites 2017 Revision

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TITLE:
Figure 3
Ecological Constraints Map of the Indicative Countryside Routes Provided by WCC and HBC
Sheet 2 - Non-statutory Designated Sites (1 of 4)

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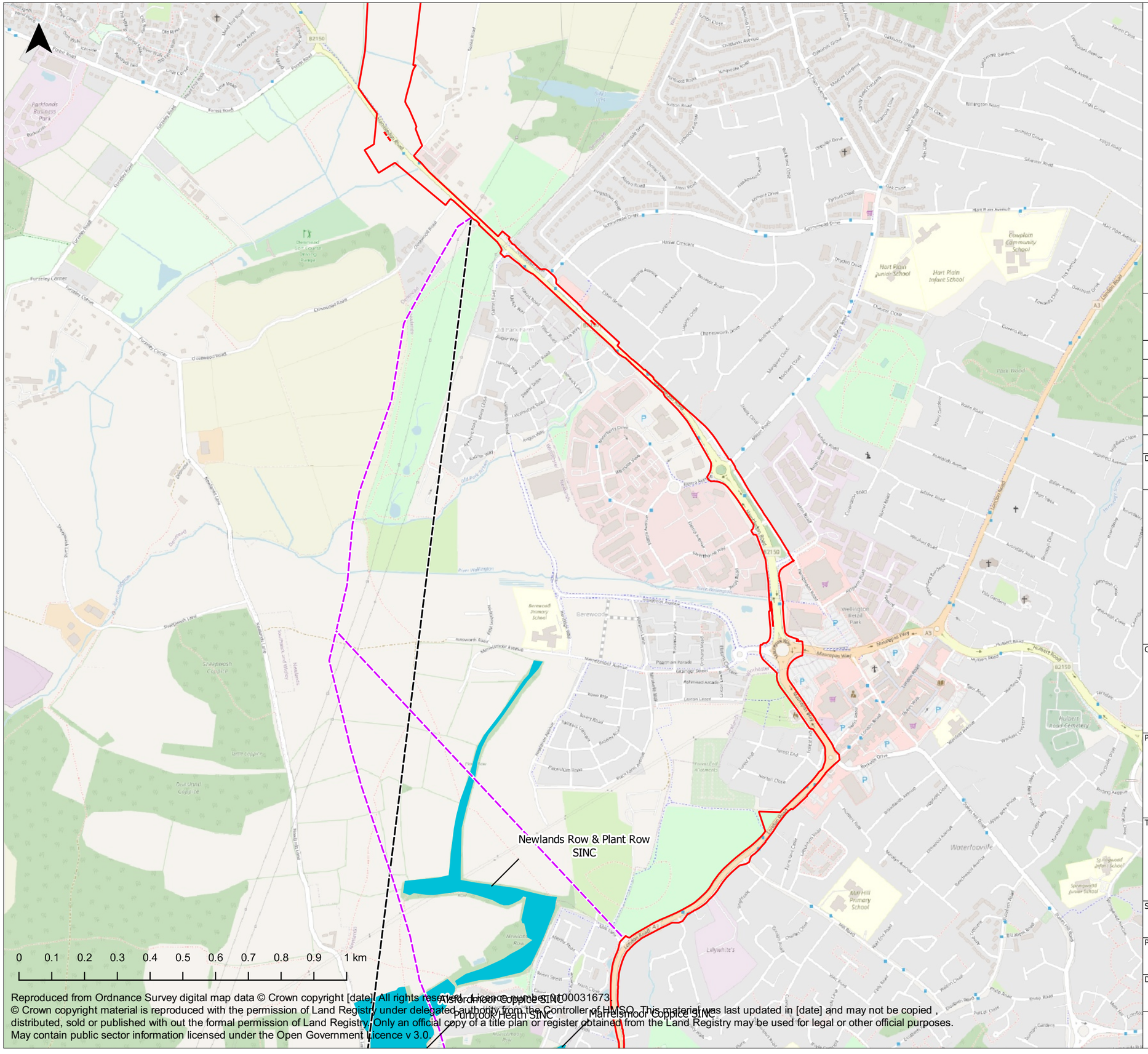

Legend

- Order Limits
- Indicative Countryside Route Provided by HBC
- Indicative Countryside Route Provided by WCC
- SINCs (100m of V7 + WCC + HBC, Labels) copy

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PROJECT: AQUIND Interconnector

TITLE: Figure 3
Ecological Constraints Map of the Indicative Countryside Routes Provided by WCC and HBC
Sheet 2 - Non-statutory Designated Sites (2 of 4)

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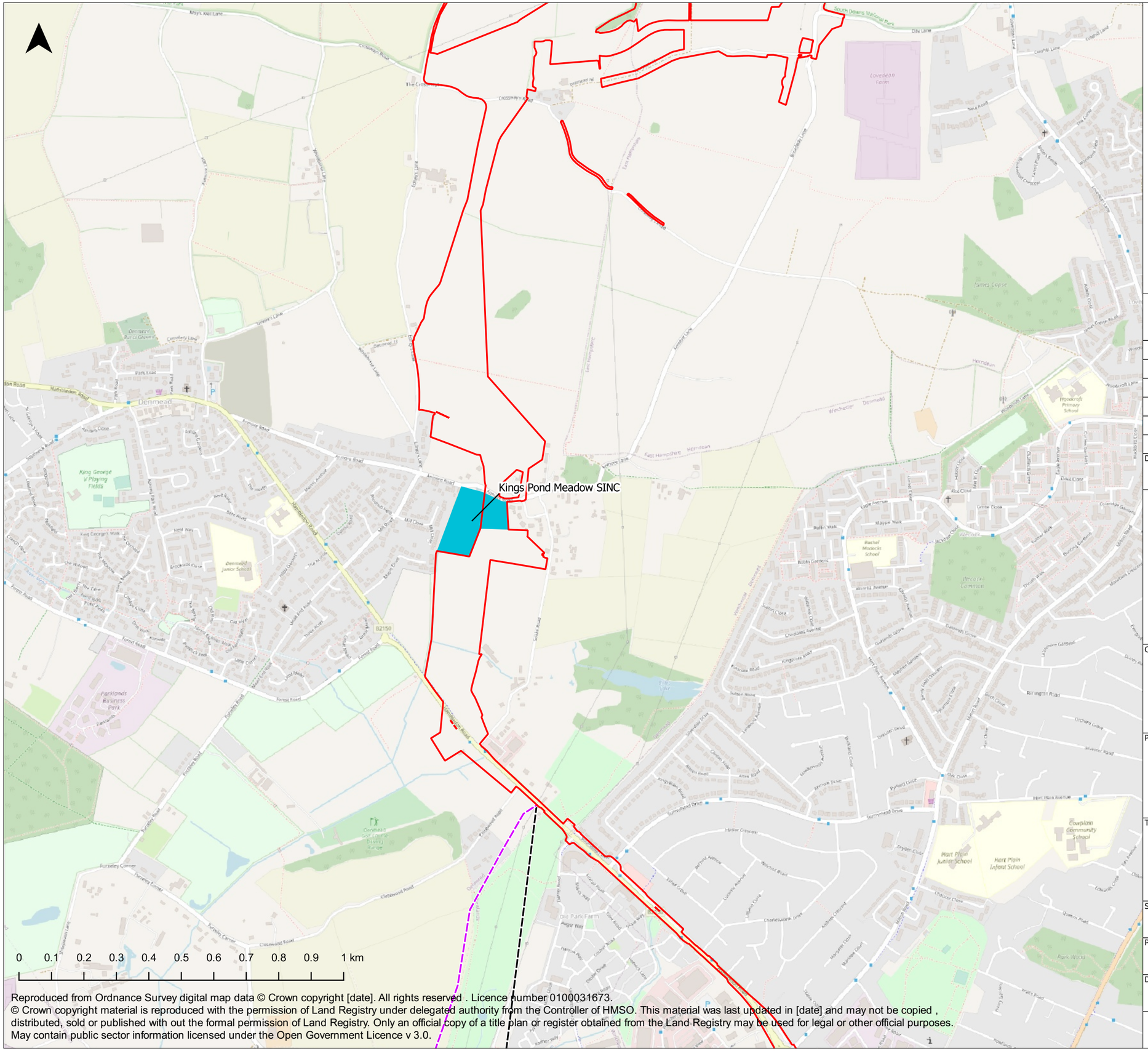

Legend

- Order Limits
- Indicative Countryside Route Provided by HBC
- Indicative Countryside Route Provided by WCC
- SINCs (100m of V7 + WCC + HBC, Labels) copy

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TITLE:
Figure 3
Ecological Constraints Map of the Indicative Countryside Routes Provided by WCC and HBC
Sheet 2 - Non-statutory Designated Sites (3 of 4)

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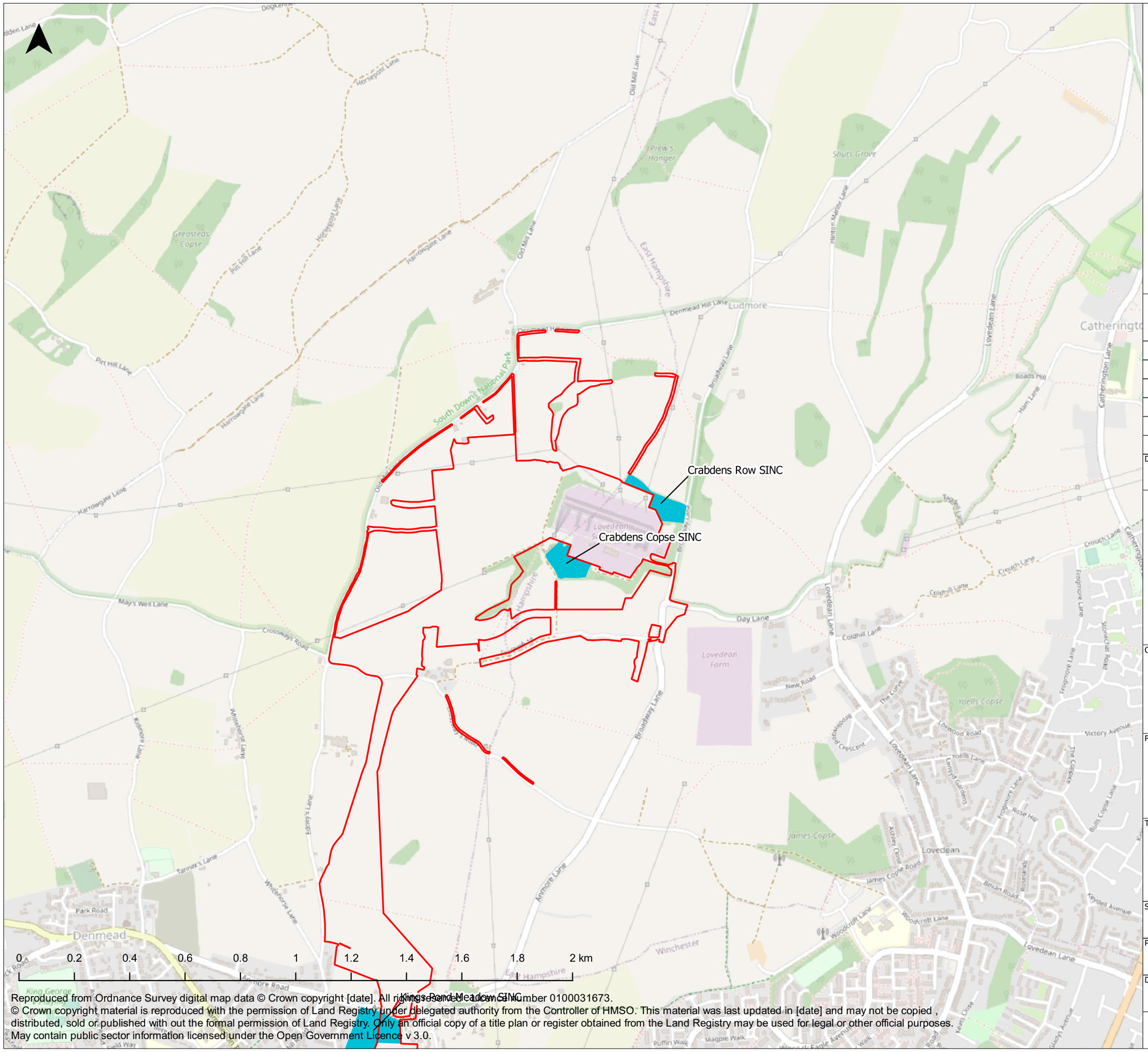

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PROJECT: AQUIND Interconnector

TITLE:
Figure 3
Ecological Constraints Map of the Indicative Countryside Routes Provided by WCC and HBC
Sheet 2 - Non-statutory Designated Sites (4 of 4)

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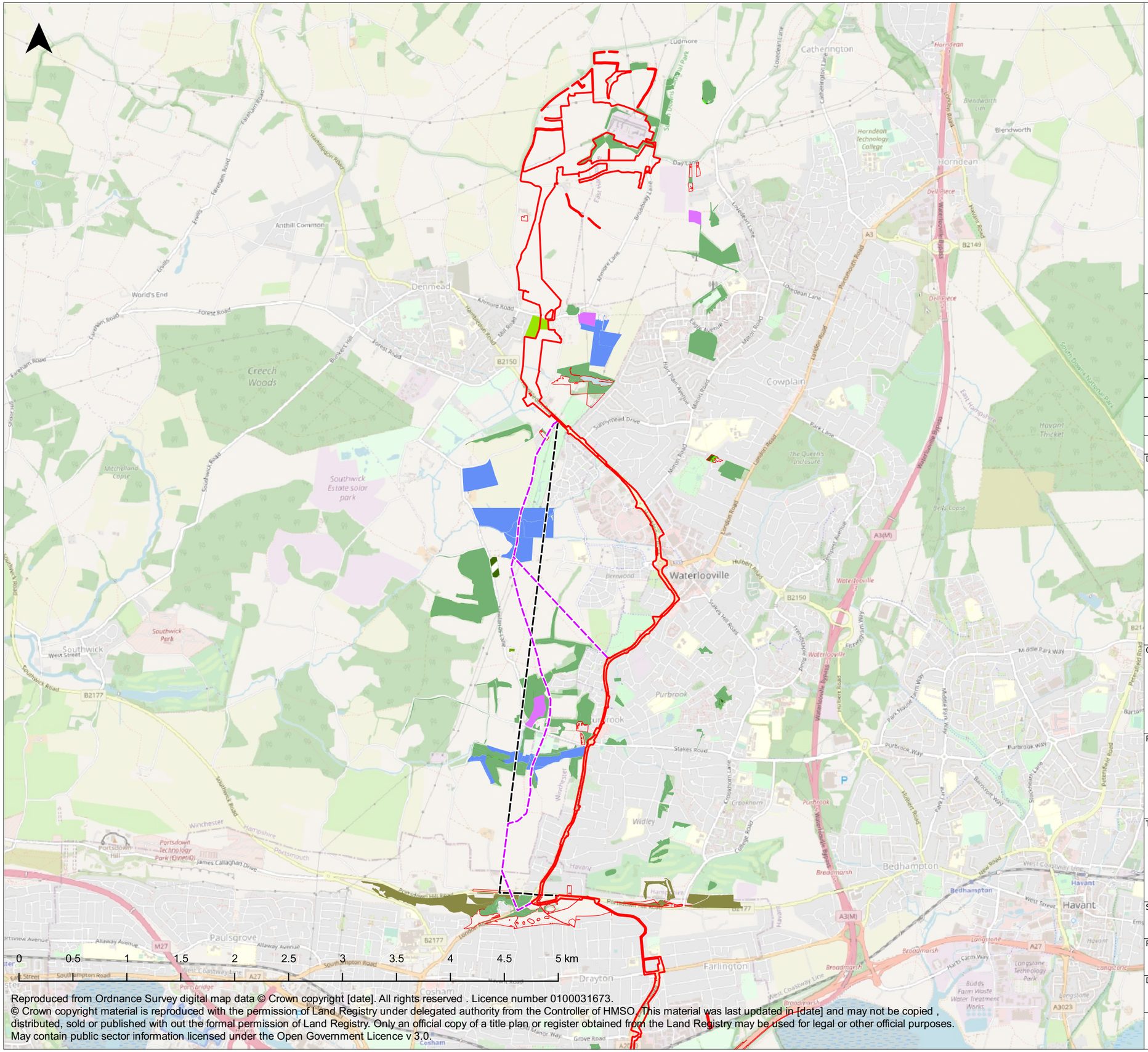

Legend

- Order Limits
- Indicative Countryside Route Provided By HBC
- Indicative Countryside Route Provided By WCC
- Coastal and Floodplain Grazing Marsh
- Deciduous Woodland
- Good Quality Semi-improved Grassland
- Lowland Calcareous Grassland
- Lowland Meadows
- No Main Habitat; Additional Habitats Present
- Traditional Orchard
- Ancient & Semi-Natural Woodland
- Ancient Replanted Woodland

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TITLE:
Figure 3
Ecological Constraints Map of the Indicative Countryside Routes Provided by WCC and HBC
Sheet 3 - Ancient Woodland and Priority Habitats

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