



Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions

Preliminary Environmental Information Report

Volume 3

Appendix 4.1 - Onshore Substation Site Selection Report

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Glossary of Acronyms

AONB	Areas of Outstanding Natural Beauty
BRAG	Black-Red-Amber-Green
CION	Connection and Infrastructure Options Note
CWS	County Wildlife Sites
DEP	Dudgeon Extension Project
EIA	Environmental Impact Assessment
ES	Environmental Statement
EU	European Union
LNR	Local Nature Reserves
NNR	National Nature Reserve
NPS	National Policy Statements
NSIP	Nationally Significant Infrastructure Project
PEI	Preliminary Impact Assessment
SAC	Special Areas of Conservation
SEP	Sheringham Shoal Extension Project
SPA	Special Protection Areas
SPZ	Source Protection Zones
SSSI	Site of Special Scientific Interest

Glossary of Terms

The Applicant	Equinor New Energy Limited
The Dudgeon Offshore Wind Farm Extension Project (DEP)	The Dudgeon Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure.
PEIR boundary	The area subject to survey and preliminary impact assessment to inform the PEIR, including all permanent and temporary works for DEP and SEP. The PEIR boundary will be refined down to the final DCO boundary ahead of the application for development consent.
The Sheringham Shoal Offshore Wind Farm Extension Project (SEP)	The Sheringham Offshore Wind Farm Extension site as well as all onshore and offshore infrastructure.

4.1 ONSHORE SUBSTATION SITE SELECTION

4.1.1 Introduction

1. This report outlines the onshore substation site selection activities undertaken for the proposed Dudgeon Extension Project (DEP) and Sheringham Extension Project (SEP) leading to the identification of the emerging short-list of options.
2. This report also sets out the methodology, rationale and design assumptions used to inform the site selection and assessment of alternatives process for the onshore substation.
3. Implementing a robust process for selecting appropriate sites for the required electrical infrastructure requires consideration of technical and commercial feasibility, environmental impact and stakeholder feedback. A critical part of the Environmental Impact Assessment (EIA) process is to review the alternatives considered during the evolution of the project and set out why they have been discarded in favour of preferred sites for development. The methodology for each of the key stages of the site selection process leading up to the emerging short-list options is also described in this report.

4.1.2 Legislation, Guidance and Best Practice

4. The site selection process for offshore wind farms in the UK is governed by the existing legislative, policy and guidance framework for the development of electrical infrastructure and for environmental assessment within the UK. The key pieces of legislation, policy and best practice guidance which set the framework for site selection and the assessment of alternatives for offshore wind farms in the UK, and upon which this methodology has been based, are summarised in **Table 4-1** below.

Table 4-1: Legislation, Policy and Guidance considered during the site selection and assessment of alternatives process.

Legislation, Policy & Guidance	Details
Legislation	
Environmental Impact Assessment Regulations	<p>The consideration of alternatives and major design decisions made during the development of a project has been part of EIA Legislation since the adoption of the original EIA directive in UK law under the European Union (EU) EIA Directive 85/337/EEC (as amended by Directives 97/11/EC, 2003/35/EC and 2009/31/EC).</p> <p>The Infrastructure Planning (Environmental Impact Assessment) Regulations (2009) require the applicant to provide “an outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice, considering the environmental effects”.</p> <p>The new EIA Regulations (2017) amend the wording slightly but do not significantly change the position. The new Regulations require an Environmental Statement (ES) to include “a description of the reasonable alternatives (for example in terms of</p>

Legislation, Policy & Guidance	Details
	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”.
The Electricity Act 1989	<p>Section 36 of the Electricity Act 1989 provides the legal framework for the consenting regime for offshore wind farms in the UK. Schedule 9 of The Electricity Act 1989 sets out the obligations for a generation installation to mitigate the effects on the environment, including “shall have regard to...preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest”.</p> <p>In addition, Section 9 of the Act sets out the duties of an electricity distributor that are relevant to the site selection process, including that “It shall be the duty of an electricity distributor to develop and maintain an efficient, co-ordinated and economical system of electricity distribution”.</p>
The Planning Act 2008	The Planning Act 2008 (as amended by the Marine and Coastal Access Act 2009, the Localism Act 2011, the Growth and Infrastructure Act 2013, and the Infrastructure Act 2015) is the primary legislation that established the legal framework for applying for, examining and determining applications for Nationally Significant Infrastructure Projects (NSIPs) taking into account the guidance in National Policy Statements (NPSs).
National Policy	
Overarching NPS for Energy (EN-1)	The Overarching NPS for Energy (EN-1) is clear that although “from a policy perspective this NPS EN-1 does not contain any general requirement to consider alternatives or to establish whether the proposed project represents the best option”, in the execution of a competent EIA “applicants are obliged to include in their ES, as a matter of fact, information about the main alternatives they have studied.”
Planning Inspectorate Advice Note Nine: Rochdale Envelope	The Rochdale envelope enables and facilitates a degree of flexibility within the project design at consent. Planning Inspectorate Advice Note Nine: Rochdale Envelope states “The need for flexibility is identified in a number of National Policy Statements (NPS), which suggest the Rochdale Envelope as an approach to address uncertainties inherent to the Proposed Development e.g. changing market conditions. However, Energy (EN-1), the NPS for Renewable Energy Infrastructure (EN-3) and

Legislation, Policy & Guidance	Details
	<p>the NPS for National Networks all stress the need to ensure that the significant effects of a Proposed Development have been properly assessed”.</p>
<p>Planning Inspectorate Advice Note Seven: EIA</p>	<p>The Planning Inspectorate Advice Note Seven suggest the EIA needs to explain “the reasonable alternatives considered and the reasons for the chosen option considering the effects of the Proposed Development on the environment”.</p>
Guidance	
<p>EIA Guide to Shaping Quality Development (IEMA)</p>	<p>IEMA’s EIA Guide to Shaping Quality Development states that considering the key environmental and consenting risks alongside the engineering requirements of a project can influence design in many ways. The earlier the interaction commences, the more likely it is that cost effective, positive outcomes will be achievable. This can be considered in several ways:</p> <ul style="list-style-type: none"> The review of site selection of alternative development sites to avoid key sensitive receptors; Alternating the layout to work within a site’s existing natural systems; Amending the design of a specific aspect of the development to manage impacts; Specifying construction techniques to avoid effects on receptors; and Changing materials to reduce volume and/or transport impacts
<p>The Horlock Rules</p>	<p>In order to identify the most appropriate location to site the onshore substation, National Grid’s Guidelines on Substation Siting and Design (‘The Horlock Rules’) (National Grid Company (NGC), 2006) will be taken into consideration. These guidelines document National Grid’s best practice for the consideration of relevant constraints associated with the siting of onshore substations.</p>

4.1.3 Methodology

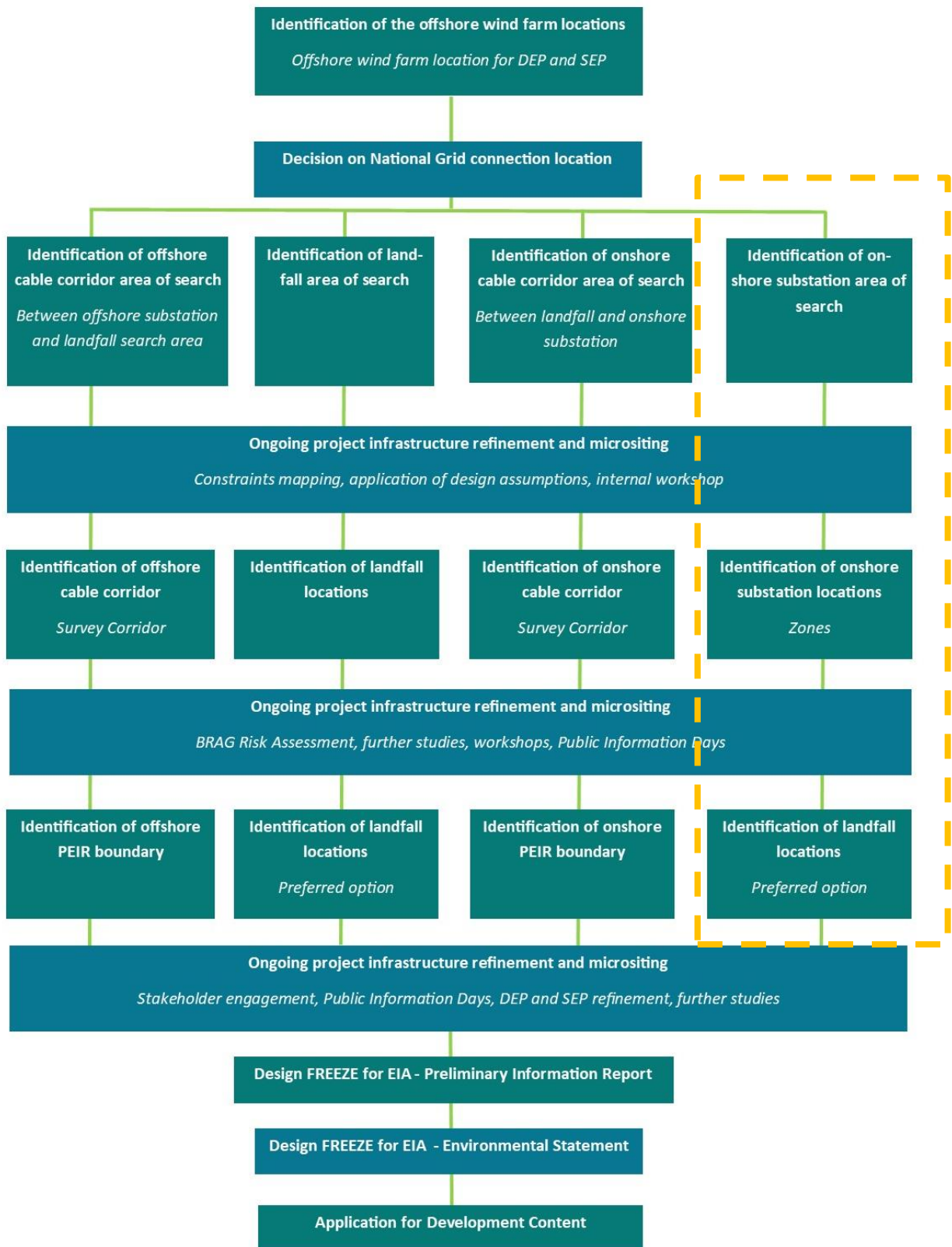
4.1.3.1 Overview

5. Site selection is an iterative process that is informed through constraints mapping, assessment and consultation providing a transparent audit trail setting out the assumptions and decisions that ultimately lead to the identification of the preferred option (both site and design) suitable for an application for development consent. To demonstrate that the site selection process is iterative and has been informed by investigative work and stakeholder consultation, some flexibility over infrastructure location must be allowed for during the initial stages of site selection to allow for further refinement during the subsequent stages of the EIA process.
6. The identification of a series of transparent design principles and engineering assumptions are necessary to govern the decisions made at each stage of the site selection process. These design principles and engineering assumptions cover environmental, physical, technical and commercial, and are set out in **Section 4.1.4** below. Each step of the process then involves gathering data from a number of different sources including environmental, engineering, land and stakeholder data and using this information to define and assess the options for each element of project infrastructure.
7. Workshops are typically held at key stages of the site selection process to collate and review the data gathered to date, and to reach cross-discipline decisions to further refine the options.
8. **Plate 4-1** outlines a flow diagram of the main steps in the site selection process. This report considers the work leading up to the emerging short-list options only.

4.1.3.2 National Grid connection offer

9. National Grid is responsible for operating the electricity transmission network in England and Wales. The Connection and Infrastructure Options Note (CION) Process is the mechanism used by National Grid to evaluate potential transmission options to identify the connection point in line with their obligation to develop and maintain an efficient, coordinated and economical system of the electricity transmission network. As part of the economic assessment, the CION considers the total life cost of the connection – assessing both the capital and projected operational costs to the onshore network (over a project's lifetime) to determine the most economic and efficient design option.
10. Following the completion of the CION process National Grid made a grid connection offer in April 2019 for connection at Norwich Main National Grid Substation that would accommodate both DEP and SEP. This offer was accepted in May 2019, and the location of Norwich Main forms the starting point for the site selection work progressed by Equinor.
11. DEP and SEP will require the construction of an onshore substation that would accommodate both Projects and will also include the electrical infrastructure National Grid requires to connect to the existing electricity transmission network.
12. Some of the onshore substation infrastructure would be shared between DEP and SEP and the number of buildings required would be the same whether one or both projects are progressed. In addition, the infrastructure required by National Grid would be the same for one or two projects (a single bay connection).

Plate 4-1: Site Selection Process (orange dash line indicates substation site selection stages considered within this report)



4.1.3.3 Comparative Analysis

13. At various stages in the site selection process it is necessary to undertake a comparative analysis of options that have been identified.
14. Two approaches have been used:
 - Ranking all options against one another against a range of criteria; and
 - Black-Red-Amber-Green (BRAG) assessment.

4.1.3.3.1 Ranking all options

15. At the initial stages of site selection, when considering large zones rather than individual sites, it is beneficial to rank these zones across a range of criteria from least preferred to most preferred. This provides a simple means to focus on areas with the greatest potential to accommodate the proposed infrastructure during the subsequent stages of the site selection.

4.1.3.3.2 BRAG assessment

16. Once options have been developed within the preferred zones it is necessary to provide greater definition to the criteria for comparative analysis of individual sites. A BRAG assessment provides a way to compare each option based on defined consenting risks. Higher risk options are given a red rating, whilst those with medium risks are coded amber and those with the least risk are assigned green. Black options are those which are not feasible from an engineering or environmental perspective. The aim is to ascertain which option carries the least risk with respect to the assessment criteria applied and based upon the professional judgement. A summary of the option classification system is provided below:



17. Once the BRAG assessments are completed for each criteria, they provide an aid to the decision-making process of site selection and will ultimately help inform the options which may be discounted from the site selection process, and which options should be taken forward for further consideration. The BRAG assessment also identifies areas where further work and information may be required in order to feed into the decision-making process.
18. An example of the typical criteria used within each BRAG assessment is provided in **Table 4-2**.

Table 4-2: An indicative table for EIA Topic ‘Traffic and Transport’ to demonstrate some of the early key constraints associated with the site selection and design considerations.

Topic	Criteria	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6
Traffic and Access	Highway network constraints (Red - road not wide enough for two vehicles unable to widen; Amber - road generally not wide enough for two vehicle potential to widen; Green - Road generally wide enough for two vehicles to pass)	Few constraints assuming access direct from XX Road	No suitable access	No suitable access	No suitable access	Few constraints assuming access direct from the B Road	Few constraints assuming access direct from XX Road
	Access constraints (Red - Access not achievable; Amber - Achievable with accommodation works; Green - Existing access available)	No suitable access location direct from XX Road	n/a	n/a	n/a	Possible with accommodation works	Possible with accommodation works
	Sensitive receptors (Red - High concentrations of sensitive receptors Amber - low concentrations of sensitive receptors Green - Few sensitive receptors)	n/a	n/a	n/a	n/a	Route to option passes a number of high sensitive receptors	Route to Options 6 passes a number of high sensitive receptors
	Road safety (Red - More than three collisions clustered Amber - Three collisions clustered Green - No existing collision clusters)	n/a	n/a	n/a	n/a	No issues	No issues
	Summary	No suitable highway access options available, therefore alternative access would need to be identified	No suitable highway access options available, therefore alternative access would need to be identified	No suitable highway access options available, therefore alternative access would need to be identified	No suitable highway access options available, therefore alternative access would need to be identified	Highway network constraints and access constraints limited but passes through a high sensitive area	Highway network constraints and access constraints limited but passes through a high sensitive area

19. The BRAG assessment methodology is an effective tool for comparing a number of different factors which need to be considered during the site selection process where:
 - Each discipline has the opportunity to assess the key risks and opportunities;
 - The ranking process itself is a clear process by which it is possible to compare factors between each site; and
 - It provides a consistent and repeatable framework in which to make decisions.
20. Furthermore, it is important to note:
 - Each decision is led by expert opinion and applying professional judgement in for the different assessments; and
 - The decision at key stages of the site selection process to date will be led by a workshop to bring together the different workstreams to make sure and ground truth and test the decisions being made.
21. The outcome of this process is:
 - An initial identification of a ‘lowest risk’ options based on the balance of risks.

- The identification of further studies that are required to support the conclusions reached through the BRAG assessment.

4.1.4 Onshore substation design principles and engineering assumptions

22. The site selection process is underpinned by a series of design assumptions and site selection principles which are used as a transparent framework for making site selection decisions at each stage of the site selection process.
23. Design assumptions:
 - Construction compound footprint – up to 2.25ha;
 - Operational compound footprint – up to 6.5ha¹;
 - Building height – up to 15m; and
 - External equipment height – up to 30m.
24. Site selection principles:
 - Avoid residential titles (including whole garden) where possible;
 - Avoid direct significant impacts to internationally and nationally designated areas;
 - Minimise significant impacts to the special qualities of Areas of Outstanding Natural Beauty (AONB);
 - Avoid mature woodland and historic woodland;
 - Avoid areas that fall within Flood Zone 3;
 - Areas of local amenity value, important existing habitats and landscape features including ancient woodland, historic hedgerows, surface and ground water sources and nature conservation areas should be protected as far as reasonably practicable (specific wording from Horlock Rules);
 - Locations should take advantage of the screening provided by land form and existing features and the potential use of site layout and levels to keep intrusion into surrounding areas to a reasonably practicable minimum (specific wording from Horlock Rules);
 - Options should keep the visual, noise and other environmental effects to a reasonably practicable minimum (specific wording from Horlock Rules); and
 - The space required should be limited to the area required for development consistent with appropriate mitigation measures and to minimise the adverse effects on existing land use and Public Rights of Way (specific wording from Horlock Rules).

¹ Currently operational compound footprint is anticipated to be up to 6.25ha

25. For substation site selection, reference will be made to National Grid’s Guidelines on Substation Siting and Design (‘The Horlock Rules’) (**Table 4-3**) when approaching the process to identify an appropriate site or sites. These guidelines document National Grid’s best practice for the consideration of relevant constraints associated with the siting of electricity network infrastructure. The site selection process needs to support the overriding principle of The Horlock Rules which state that:

“Consideration must be given to environmental issues from the earliest stage to balance the technical benefits and capital cost requirements for new developments against the consequential environmental effects in order to keep adverse effects to a reasonably practicable minimum....Consideration at an early point of the study should be given to placing the electrical infrastructure as close as possible to the existing National Grid connection point (if feasible) in order to minimise the landscape and visual effects associated with introducing new electricity infrastructure to the environment.” (NGC, 2006).

Table 4-3: Horlock Rules

National Grid’s Approach to Design and Siting Substations (Overall System Options and Site Selection)	Onshore substation considerations for the project
<p>In the development of system options including new substations, consideration must be given to environmental issues from the earliest stage to balance the technical benefits and capital cost requirements for new developments against the consequential environmental effects, in order to keep adverse effects to a reasonably practicable minimum.</p>	<p>Environmental constraints and opportunities will be considered throughout the site selection phase.</p>
Amenity, Cultural or Scientific Values of Sites	
<p>The siting of new National Grid Company substations, sealing end compounds and line entries should as far as reasonably practicable seek to avoid altogether internationally and nationally designated areas of the highest amenity, cultural or scientific value by the overall planning of the system connections.</p>	<p>Internationally and nationally designated sites will be avoided (where possible), for example, some of the designations which will be considered include National Parks; AONB; Heritage Coasts; World Heritage Sites; Ramsar Sites; Site of Special Scientific Interests (SSSIs); National Nature Reserves (NNRs); Special Protection Areas (SPAs); and/or; Special Areas of Conservation (SACs). In addition, consideration will also be given to historic sites with statutory protection (such as onshore archaeology and cultural heritage).</p>

National Grid’s Approach to Design and Siting Substations (Overall System Options and Site Selection)	Onshore substation considerations for the project
Local Context, Land Use and Site Planning	
<p>Areas of local amenity value, important existing habitats and landscape features including ancient woodland, historic hedgerows, surface and ground water sources and nature conservation areas should be protected as far as reasonably practicable</p>	<p>Areas of local amenity value in the location of the onshore substation will be protected as far as reasonably practicable as part of the site selection process. Consideration will be given to existing habitats and landscape features including ancient woodland historic hedgerows, surface and ground water sources and nature conservation areas (e.g. County Wildlife Sites).</p>
<p>The siting of substations, extensions and associated proposals should take advantage of the screening provided by land form and existing features and the potential use of site layout and levels to keep intrusion into surrounding areas to a reasonably practicable minimum.</p>	<p>The onshore substation locations will consider the benefits from enclosed or discreet landform or relatively substantial existing hedgerows and woodland blocks within the local area which can provide a level of mitigation of landscape and visual effects from the outset and can be strengthened with planting proposals during the construction phases of the proposed project to ensure robust screening.</p>
<p>The proposals should keep the visual, noise and other environmental effects to a reasonably practicable minimum.</p>	<p>Visual, noise and other environmental effects will be minimised as far as possible through the site selection process. For example, consideration will be given to existing screening and locating the onshore substations away from built up and residential areas.</p>
<p>The land use effects of the proposal should be considered when planning the siting of substations or extensions.</p>	<p>The effects on land use will be considered as part of the site selection process, with modified landscapes being considered as more favourable sites than natural or semi-natural landscapes.</p>
Design	
<p>In the design of new substations or line entries, early consideration should be given to the options available for terminal towers, equipment, buildings and ancillary development appropriate to individual locations, seeking to</p>	<p>Landscape and visual impact will be minimised by avoiding the use of tall structures and buildings and exploring options to introduce mitigation measures wherever possible. The onshore project substation will be subject to detailed design post consent.</p>

National Grid's Approach to Design and Siting Substations (Overall System Options and Site Selection)	Onshore substation considerations for the project
keep effects to a reasonably practicable minimum.	
Space should be used effectively to limit the area required for development consistent with appropriate mitigation measures and to minimise the adverse effects on existing land use and rights of way, whilst also having regard to future extension of the substation.	The permanent footprint for the onshore project substation is based on maximum preliminary layouts for purposes of assessment. More space-efficient solutions may be developed during the detailed design process; if so, this would reduce the area required for development.
The design of access roads, perimeter fencing, earth shaping, planting and ancillary development should form an integral part of the site layout and design to fit in with the surroundings.	The design of access roads, perimeter fencing, earth shaping, planting and ancillary development will be subject to final detailed design, however these will be designed in accordance with principles of a Design and Access Statement (DAS) and will look to reflect the character of the local landscape as best as practically possible.
Line Entry	
In open landscape especially, high voltage line entries should be kept, as far as possible, visually separate from low voltage lines and other overhead lines to avoid a confusing appearance.	All cables to the connection point will be buried underground. The design approach taken would be confirmed at detailed design phase, post consent but would be in keeping with the existing substation design.

4.1.5 Identification of Potential Substation Zones

26. Following the identification of Norwich Main as the connection point an exercise was undertaken to identify areas with the greatest potential to accommodate the proposed permanent above ground infrastructure, taking into account the design assumption and site selection principles outlined in [Section 4.1.4](#) combined with environmental constraints mapping based on publicly accessible environmental datasets, including environmental receptors and in some instances associated buffers.
27. The guiding principles for locating the onshore substation were to identify an economic and efficient connection (i.e. as close as possible to the connection point) whilst taking into account environmental constraints and available space.

28. A 3km buffer around the grid connection offer at Norwich Main was initially identified. Within this 3km buffer the following constraints were mapped:
- Residential properties + 250m buffer;
 - SPA;
 - SAC;
 - Ramsar sites;
 - AONB;
 - SSSI;
 - Local Nature Reserves (LNR);
 - NNR;
 - County Wildlife Sites (CWS);
 - Registered Parks and Gardens;
 - Ancient Woodland;
 - RSBP reserves;
 - National Trust land;
 - Common land;
 - Public Rights or Way;
 - Main Rivers;
 - Flood Zones 2 & 3;
 - Scheduled Monuments;
 - Conservation Areas;
 - Listed buildings;
 - Historic Environment Records;
 - Historic landfill sites;
 - Source Protection Zones (SPZ);
 - Existing National Grid infrastructure inc. overhead lines; and
 - The DCO limits of other's NSIP's (including Hornsea Project Three).
29. A 250m buffer was applied to residential properties to give a visual understanding of areas of where the better opportunities might be for the potential positioning of the onshore substation, i.e. areas with the greatest distance of separation to properties. **Figure 1** in **Annex 1** shows the 3km buffer surrounding the existing Norwich Main substation with these constraints mapped.
30. Those areas with the least constraints and in effect the greatest potential to avoid impacts were identified as potential substation zones for further consideration. Nine zones in total were identified within the 3km buffer (A-I) and these are presented on **Figure 2** in **Annex 1**.

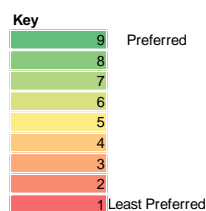
31. A comparative assessment of these zones was then undertaken to further determine which zones had the greatest potential to accommodate the proposed infrastructure to support the initial visual exercise undertaken based on the constraints mapping. This considered the maximum and minimum distance of separation from the nearest properties and other sensitive receptors that could be achieved for each substation zone, as well as associated engineering constraints such as the maximum and minimum total length of buried cabling required to connect the substation to Norwich Main and the how many challenging crossings (roads, railways, rivers, etc) might be required to achieve connections within each zone. The nine zones were ranked from least preferred to most preferred on a scale of 1 to 9.
32. The categories and rankings are presented in **Table 4-4** and **Table 4-5**. This exercise identified that zones A, B, C, D and E had relatively greater opportunity to accommodate the proposed infrastructure compared to zones F, G, H and I.
33. The subsequent exercise to identify potential substation sites for assessment then focussed on Zones A, B, C, D and E.

Table 4-4: Substation Zone proximity to various mapped constraints

Topic	Considerations	Zone A	Zone B	Zone C	Zone D	Zone E	Zone F	Zone G	Zone H	Zone I
Costs	Length (km) cabling from edge of substation search area to substation zone	1.78	2.59	3.46	4.29	3.03	0.84	4.15	6.2	5.61
Costs	Length (km) cabling from substation zone to Norwich Main Substation	1.4	0.3	0.18	1.5	1.95	2.95	1.45	1.97	1.72
Transport	Number of major road crossings - motorways and A roads (based on cable route distance above)	0	0	0	0	0	0	1	2	1
Transport	Number of total road crossings (based on cable route distance above)	2	2	3	4	3	1	4	6	5
Transport	Number of rail crossings (based on cable route distance above)	0	0	0	0	0	0	1	0	1
Public Rights of Way (PRoW)	Number of ProW crossings (based on cable route distance above)	3	5	6	6	5	1	7	7	7
Main River Crossings	Number of EA main river crossings (based on cable route distance above)	1	1	1	1	1	1	1	1	2
Other watercourses/drains	Number of other watercourse crossings (based on cable route distance above)	2	2	2	2	2	2	3	2	6
Noise/Visual	Minimum potential distance (m) from nearest residential property	18	2	1	17	2	13	1	367	1
Noise/Visual	Maximum potential distance (m) from nearest residential property	521	696	649	867	665	615	619	888	931
Cultural heritage	Min distance (m) from nearest scheduled monument	1920	652	638	14	1837	2064	956	0	0
Cultural heritage	Max distance (m) from nearest scheduled monument	3154	2229	1966	1061	2753	2709	1906	603	2713
Cultural heritage	Min distance (m) from nearest listed building	108	47	64	46	2	44	81	511	27
Cultural heritage	Max distance (m) from nearest listed building	826	877	646	1061	753	676	725	1033	1011
Cultural heritage	Min distance (m) from nearest Conservation Areas	106	959	1542	2421	673	102	157	802	213
Cultural heritage	Max distance (m) from nearest Conservation Areas	1326	2683	2195	3988	1809	962	1302	1676	1730
European Nature Conservation Designated Sites	Min proximity (m) to SPAs, SACs, Ramsar sites	3828	4723	5516	6336	3323	4467	5112	6196	6051
European Nature Conservation Designated Sites	Max proximity (m) to SPAs, SACs, Ramsar sites	4885	6100	6378	7422	4910	5320	6307	6759	7648
National Nature Conservation Designated Sites	Min proximity (m) to SSSIs, Ancient Woodlands, National Nature Reserves	2715	2055	2692	1498	1875	2151	597	861	125
National Nature Conservation Designated Sites	Max proximity (m) to SSSIs, Ancient Woodlands, National Nature Reserves	3442	3349	3872	2996	3103	3186	1819	1842	2090
Local Nature Conservation Designated Sites	Min proximity (m) to Local Nature Reserves	1938	573	687	330	1475	2467	486	307	241
Local Nature Conservation Designated Sites	Max proximity (m) to Local Nature Reserves	3191	2297	2018	1442	2445	3445	1449	910	2444
Local Nature Conservation Designated Sites	Min proximity (m) to County Wildlife Sites	263	550	0	291	770	0	462	0	0
Local Nature Conservation Designated Sites	Max proximity (m) to County Wildlife Sites	1459	1714	1064	1376	1891	465	1437	292	1254
Agricultural Land Classification	Presence of ALC 1, 2 or 3b (Amber - Grade 1 and 2, Green - 3)	<i>All within ALC grade 3</i>								
Flooding	Min proximity (m) to Flood Zones 2 and 3	638	587	707	164	902	0	0	0	58
Flooding	Max proximity (m) to Flood Zones 2 and 3	1819	1832	1684	1319	1760	612	980	452	1565

Table 4-5: Substation Zone proximity to various mapped constraints (ranking from most preferred to least preferred)

Topic	Considerations	Zone A	Zone B	Zone C	Zone D	Zone E	Zone F	Zone G	Zone H	Zone I
Costs	Length (km) cabling from edge of substation search area to substation zone	8.00	7.00	5.00	3.00	6.00	9.00	4.00	1.00	2.00
Costs	Length (km) cabling from substation zone to Norwich Main Substation	7.00	8.00	9.00	5.00	3.00	1.00	6.00	2.00	4.00
Transport	Number of major road crossings - motorways and A roads (based on cable route distance above)	4.00	4.00	4.00	4.00	4.00	4.00	2.00	1.00	2.00
Transport	Number of total road crossings (based on cable route distance above)	7.00	7.00	5.00	3.00	5.00	9.00	3.00	1.00	2.00
Transport	Number of rail crossings (based on cable route distance above)	3.00	3.00	3.00	3.00	3.00	3.00	1.00	3.00	1.00
Public Rights of Way (PRoW)	Number of ProW crossings (based on cable route distance above)	8.00	6.00	4.00	4.00	6.00	9.00	1.00	1.00	1.00
Main River Crossings	Number of EA main river crossings (based on cable route distance above)	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00
Other watercourses / drains	Number of other watercourse crossings (based on cable route distance above)	3.00	3.00	3.00	3.00	3.00	3.00	2.00	3.00	1.00
Noise/Visual	Minimum potential distance (m) from nearest residential property	8.00	4.00	1.00	7.00	4.00	6.00	1.00	9.00	1.00
Noise/Visual	Maximum potential distance (m) from nearest residential property	1.00	6.00	4.00	7.00	5.00	2.00	3.00	8.00	9.00
Cultural heritage	Min distance (m) from nearest scheduled monument	8.00	5.00	4.00	3.00	7.00	9.00	6.00	1.00	1.00
Cultural heritage	Max distance (m) from nearest scheduled monument	9.00	5.00	4.00	2.00	8.00	6.00	3.00	1.00	7.00
Cultural heritage	Min distance (m) from nearest listed building	8.00	5.00	6.00	4.00	1.00	3.00	7.00	9.00	2.00
Cultural heritage	Max distance (m) from nearest listed building	5.00	6.00	1.00	9.00	4.00	2.00	3.00	8.00	7.00
Cultural heritage	Min distance (m) from nearest Conservation Areas	2.00	7.00	8.00	9.00	5.00	1.00	3.00	6.00	4.00
Cultural heritage	Max distance (m) from nearest Conservation Areas	3.00	8.00	7.00	9.00	6.00	1.00	2.00	4.00	5.00
European Nature Conservation Designated Sites	Min proximity (m) to SPAs, SACs, Ramsar sites	2.00	4.00	6.00	9.00	1.00	3.00	5.00	8.00	7.00
European Nature Conservation Designated Sites	Max proximity (m) to SPAs, SACs, Ramsar sites	1.00	4.00	6.00	8.00	2.00	3.00	5.00	7.00	9.00
National Nature Conservation Designated Sites	Min proximity (m) to SSSIs, Ancient Woodlands, National Nature Reserves	9.00	6.00	8.00	4.00	5.00	7.00	2.00	3.00	1.00
National Nature Conservation Designated Sites	Max proximity (m) to SSSIs, Ancient Woodlands, National Nature Reserves	8.00	7.00	9.00	4.00	5.00	6.00	1.00	2.00	3.00
Local Nature Conservation Designated Sites	Min proximity (m) to Local Nature Reserves	8.00	5.00	6.00	3.00	7.00	9.00	4.00	2.00	1.00
Local Nature Conservation Designated Sites	Max proximity (m) to Local Nature Reserves	8.00	5.00	4.00	2.00	7.00	9.00	3.00	1.00	6.00
Local Nature Conservation Designated Sites	Min proximity (m) to County Wildlife Sites	5.00	2.00	1.00	6.00	9.00	1.00	7.00	1.00	1.00
Local Nature Conservation Designated Sites	Max proximity (m) to County Wildlife Sites	7.00	8.00	3.00	5.00	9.00	2.00	6.00	1.00	4.00
Flooding	Min proximity (m) to Flood Zones 2 and 3	7.00	6.00	8.00	5.00	9.00	1.00	1.00	1.00	4.00
Flooding	Max proximity (m) to Flood Zones 2 and 3	8.00	9.00	6.00	4.00	7.00	2.00	3.00	1.00	5.00
SCORE		149.00	142.00	127.00	127.00	133.00	113.00	86.00	87.00	91.00
RANK		1	2	4	4	3	6	9	8	7



4.1.6 Long list of options

4.1.6.1 Identifying potential options

34. Within each of the five preferred zones (A-E) a visual form of the ranking presented in **Table 4-5** was produced to better identify areas within each zone that were comparatively more or least preferred. Using this as a guide, and in combination with aerial imagery to better understand the locations of field boundaries etc, substation footprints (up to 6.5ha²) were then located within each zone. An example of this process is presented for substation zone B below.

Plate 4-2: Zone B with constraints mapped

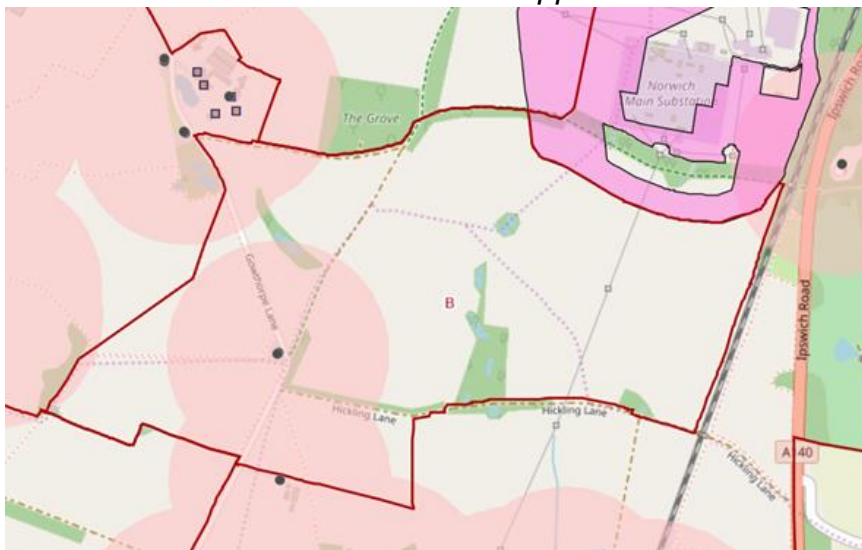


Plate 4-3: Zone B with constraints and combined ranking visually presented - dark green (most preferred) to red (least preferred)

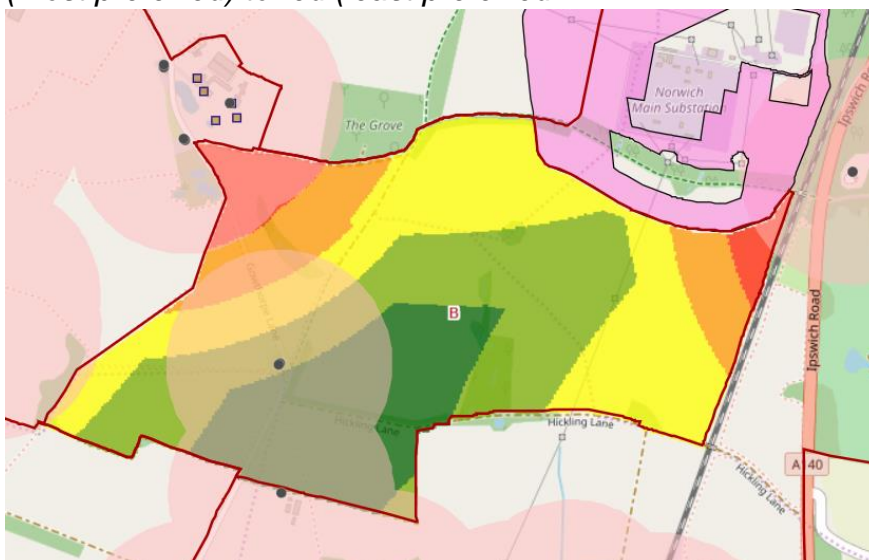
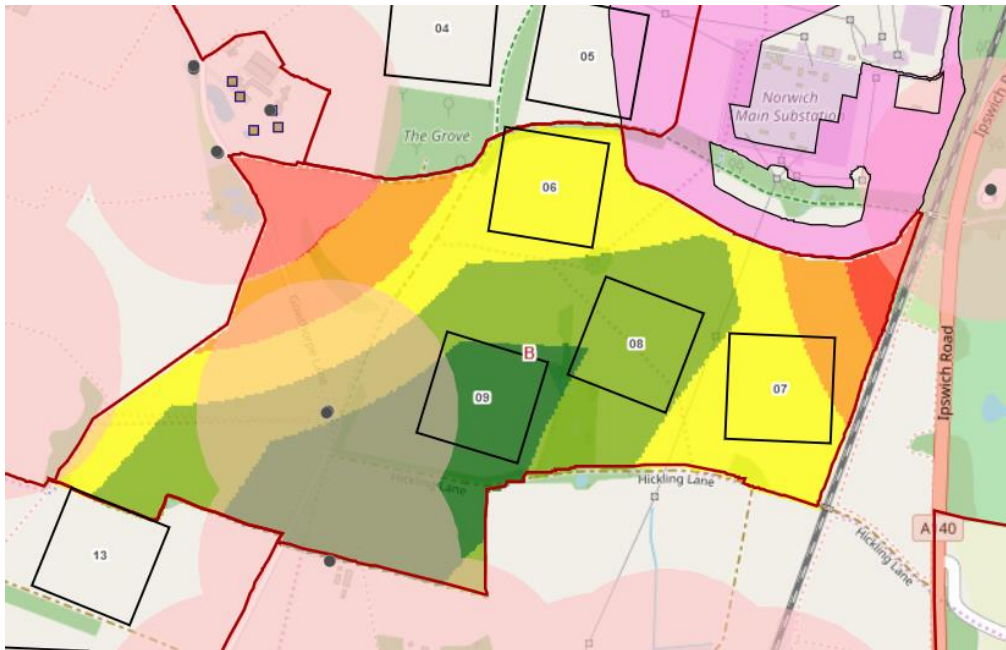


Plate 4-4: Zone B with substation options added

² Currently anticipated to be up to 6.25ha



35. This process resulted in the identification of a long-list of 17 substation options across the five preferred zones A-E. These 17 substation options are presented on **Figure 3** in **Annex 1**.

4.1.6.2 BRAG Assessment of long-list options

36. A BRAG assessment was undertaken for the 17 substation options using defined BRAG criteria to identify the risks and opportunities associated with each field option. Higher risk options were given a red rating, whilst those with medium risks were coded amber and those with the least risk are assigned green. Black options are those which are not feasible from an engineering or environmental perspective. The aim was to ascertain which options carry the least risk with respect to the assessment criteria applied and based upon professional judgement.
37. As part of the BRAG assessment for each option, the following was undertaken:
- Review of the relevant datasets and development considerations;
 - Define the criteria to be used in the BRAG, and the scoring system to classify the BRAG for each;
 - Populate the BRAG assessment spreadsheet giving each long list option a BRAG classification for each development consideration identified and a brief explanation within each cell – a copy of the assessment spreadsheet is included as **Annex 2**; and
 - A short written summary, which is presented within this section, to provide a narrative and context to support the information presented in the BRAG spreadsheet.

4.1.6.2.1 *Landscape and Visual*

38. Onshore substation option 1 is considered to have a high (red) landscape risk as it is located within the Tas Rural River Valley and could change the areas open character and long valley views. It would conflict with the development considerations which are to ensure that the northern part of the Tas Valley is not further degraded by large scale infrastructure developments. The site is open and exposed to the valley and visible from across the valley due to the open nature of the valley and would be seen beyond the existing pylons road. Option 1 would also conflict with several local landscape policies related to the Rural River Valley landscape type Southern Bypass Protection Zone, which are also considered to represent high consenting risks.
39. Onshore substation option 2 is located Tas Tributary Farmland and close to the edge of the Tas Rural River Valley. This option could potentially be visible on the Tas Rural River Valley and Venta Icenorum, although seen beyond the existing overhead pylons. It also has the potential to conflict with local landscape policies, which represent a medium (amber) risk in relation to landscape and visual impacts.
40. Substation options 13 to 17 have the potential to impact on the quality, character and setting various landscape character areas including: Tas Tributary Farmland; Wymondham Settled Plateau Farmland; Yare Tributary Farmland with Parkland, and are considered to represent medium (amber) risks.
41. Substation options 3-12 are not considered to have any potential conflict with local landscape policy or the potential to impact on the quality, character and setting of any landscape character areas and are considered to be low (green) risks.
42. In terms of visual receptors, none of the options are considered to represent a high (red) risk. Options 3-9, 13-15 and 15 are classified as medium risks due to their proximity to existing public rights of way. The remaining sites are all low (green) risks for visual receptors.

4.1.6.2.2 *Archaeology*

43. All options have a high potential for archaeological remains to be present; however mitigation options would be available.
44. Options 1-4, 9-12 and 14-17 all have a high potential for impacts associated with the setting of designated assets (scheduled monuments and listed buildings). These sites are all classified as a high (red) risk in the BRAG for this category.
45. Options 5-8 and 13 have only a moderate potential for impacts associated with the setting of designated assets (scheduled monuments and listed buildings) as a result of the increased distance of separation. These sites are all classified as medium (amber) risk in the BRAG for this category.

4.1.6.2.3 *Noise*

46. Proximity to nearby noise sensitive receptors was the determining criteria for this review. Only one of the substation options are within 200m of residential properties (option 9 at 175m) and therefore present an amber (medium) or green (low) consenting risk. Sites 1, 5, 6, 7 and 8 represent the lowest consenting risk as they are in excess of 400m from the nearest properties.

4.1.6.2.4 *Traffic and Transport*

47. Options 1 and 2 have no significant constraints related to access to given their proximity to the A140. Both options have received a 'green' classification in the BRAG.
48. Option 3 to 9 should be accessible via the A140 and then Mangreen Lane (currently part of the operational access to Norwich Main), with a new permanent access road needed to link up with Mangreen Road. Depending upon where access to Mangreen Road is taken, widening of the road may be required to allow for two-way traffic. These options have been classified as 'amber' in the BRAG on this basis. However, if access were not possible taking this route then all these options would require junction improvement works at the B1113 and A140 junction, widening of Gowthorpe Lane and potential impacts upon the community of Swardeson. This alternative access arrangement is considered a high consenting risk and would be classified as a high 'red' risk
49. Access to onshore substation options 10, 11, 12, 13, 16 and 17 would require construction traffic to pass through the village of Swainsthorpe which is highly sensitive in increases in traffic. In addition, Church Road would require localised road widening potentially requiring land acquisition. The route would also require construction traffic to pass over the level crossing. Network Rail would need to be consulted to ensure this would be acceptable before this route is selected. The additional complexity of these accesses is classified as a high consenting risk and scores as a 'red' in the BRAG.

4.1.6.2.5 *Engineering*

50. Options 3 to 9 have the shortest cable lengths for the onward 400kV connection to Norwich Main, which are all less than 1km and assigned as 'green' within the BRAG. Options 11, 16 and 17 are greater than 2km and considered to be the least preferable.
51. All the options include some road, rail and river crossings for their associated cabling with no option being identified as more or less favourable in terms of complex crossings.
52. Overall sites 5-9 are considered the preferred options from an engineering perspective as they represent the closest locations to the onward connection to Norwich Main.

4.1.6.2.6 *Emerging short-list options*

53. Options 5, 6, 7, 8 and 9 are considered the options with the fewest risks due to the distance of separation between them and the nearest residential properties (in excess of 400m for sites 5, 6, 7 and 8) and other visual receptors, and the relatively short distance for onward cabling to Norwich Main (all five options).

54. Whilst indicative substation footprints (up to 6.5ha³) were used to provide a visual aid to the site selection exercise up to this point, the assessment is effectively a reflection of the potential of each plot of land within which the indicative footprints were placed. Further investigative work and micro-siting will be undertaken at the field scale to identify a preferred location for the operational substation. The five fields taken forward for further consideration (5, 6, 7, 8 and 9) are presented on **Figure 4** in **Annex 1**.

4.1.7 Next steps

55. The following activities should be undertaken to inform the assessment of short-list options:
- Zone of Theoretically Visibility for short-list substation options;
 - Buildability study;
 - Accessibility study;
 - EIA surveys;
 - Stakeholder, community and landowner engagement.
56. These further studies and engagement will support the BRAG Assessment work and refinement of the short-list options.

4.1.7.1 Stakeholder and community engagement

57. Stakeholder and community engagement are an integral part of the site selection process and ensures that the views and recommendations of stakeholders and the local community are incorporated into the site selection process. Stakeholder engagement is crucial to ensuring that the output of the site selection process is robust and stands the best chance of being accepted at the consenting stage of the project.

4.1.7.2 Updated BRAG assessment and identification of preferred option(s)

58. An update to the BRAG assessment will be undertaken once the further studies have been completed.
59. Two proffered onshore substation sites will be consulted on at Preliminary Impact Assessment (PEI) stage while more detailed environmental and engineering information is obtained and consulted upon, with a final single preferred option being selected prior to DCO submission. A decision on the exact nature of the final project design to be taken forward to ES stage will be made during the site selection process based on the findings of the environmental and engineering reviews undertaken through the process.
60. Site selection and design refinement is an ongoing process and following the selection of a project design for the next stage of EIA, refinement will continue, if required, up to DCO submission. Any further design refinement beyond that detailed in this methodology will be subject to further discussion with stakeholder would be captured within the Environmental Statement 'Site Selection and Assessment of Alternatives' chapter provided with the ES submitted as part of the DCO application.

³ Currently anticipated to be up to 6.25ha

4.1.8 References

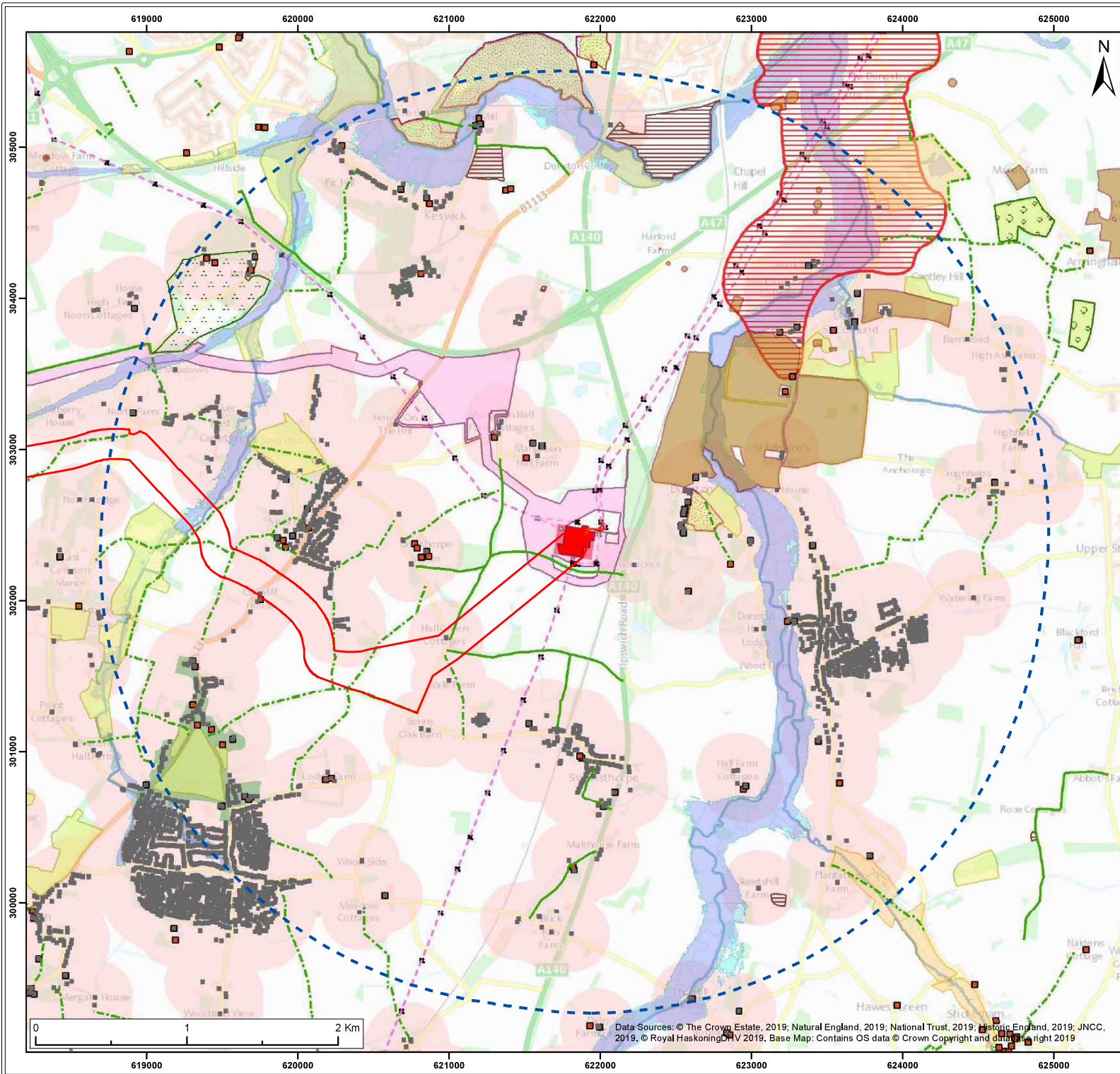
Department for Energy and Climate Change (DECC) (2011a) Overarching National Policy Statement for Energy (EN-1)

Her Majesty's Government (1989) The Electricity Act

Institute of Environmental Management and Assessment (IEMA) (2015) IEMA Environmental Impact Assessment Guide To Shaping Quality Development
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National Grid Company (NGC) (2006) Guidelines on Substation Siting and Design ('The Horlock Rules')

Annex 1 Figures



- Legend:
- Cable Corridor Route Option
 - 3km Substation Study Area
 - Residential Property
 - Residential Property - 250m Buffer
 - Listed Building
 - High Voltage Undergroud Electricity Cable
 - Electricity Transmission Overhead Lines
 - Footpath
 - Bridleway
 - Restricted Byway
 - Environment Agency Main River
 - Scheduled Monument
 - Registered Park and Garden
 - Ancient Woodland
 - Conservation Area
 - County Wildlife Site (CWS)
 - Local Nature Reserve (LNR)
 - Sites of Special Scientific Interest (SSSI)
 - Historic Landfill Site
 - Source protection zone 1
 - Flood Zone 3
 - Flood Zone 2
 - Hornsea Project Three Order Limits
 - Existing National Grid 400kV Substation

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SUI	REV	DATE	DESCRIPTION					DRW	CHK	APR

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OnSS Site Selection - Search Area

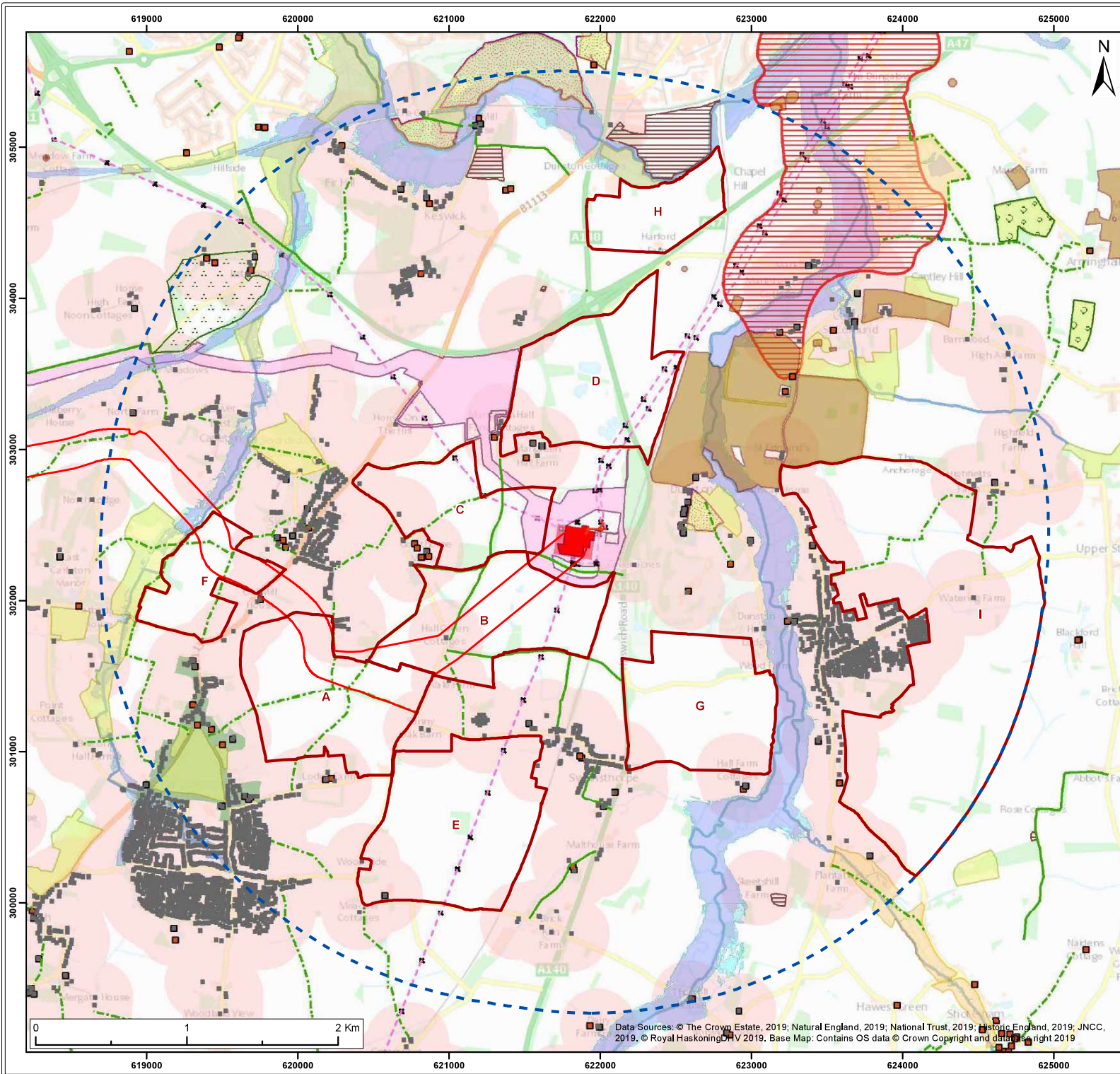
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Co-ordinate system: British National Grid	Page Size: A3	Scale: 1:25,000
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Project: Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions	Report: Substation Site Selection - Emerging short-list
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- Legend:
- Cable Corridor Route Option
 - 3km Substation Study Area
 - Proposed Substation Zone
 - Residential Property
 - Residential Property - 250m Buffer
 - Listed Building
 - High Voltage Underground Electricity Cable
 - Electricity Transmission Overhead Lines
 - Footpath
 - Bridleway
 - Restricted Byway
 - Environment Agency Main Ruffer
 - Scheduled Monument
 - Registered Park and Garden
 - Ancient Woodland
 - Conservation Area
 - County Wildlife Site (CWS)
 - Local Nature Reserve (LNR)
 - Sites of Special Scientific Interest (SSSI)
 - Historic Landfill Site
 - Source protection zone 1
 - Flood Zone 3
 - Flood Zone 2
 - Hornsea Project Three Order Limits
 - Existing National Grid 400kV Substation

S1	P01	25/02/2020	Suitable for Information					AZ	JA	MW
SUI	REV	DATE	DESCRIPTION					DRW	CHK	APR

Title:
OnSS Site Selection - Substation Zones

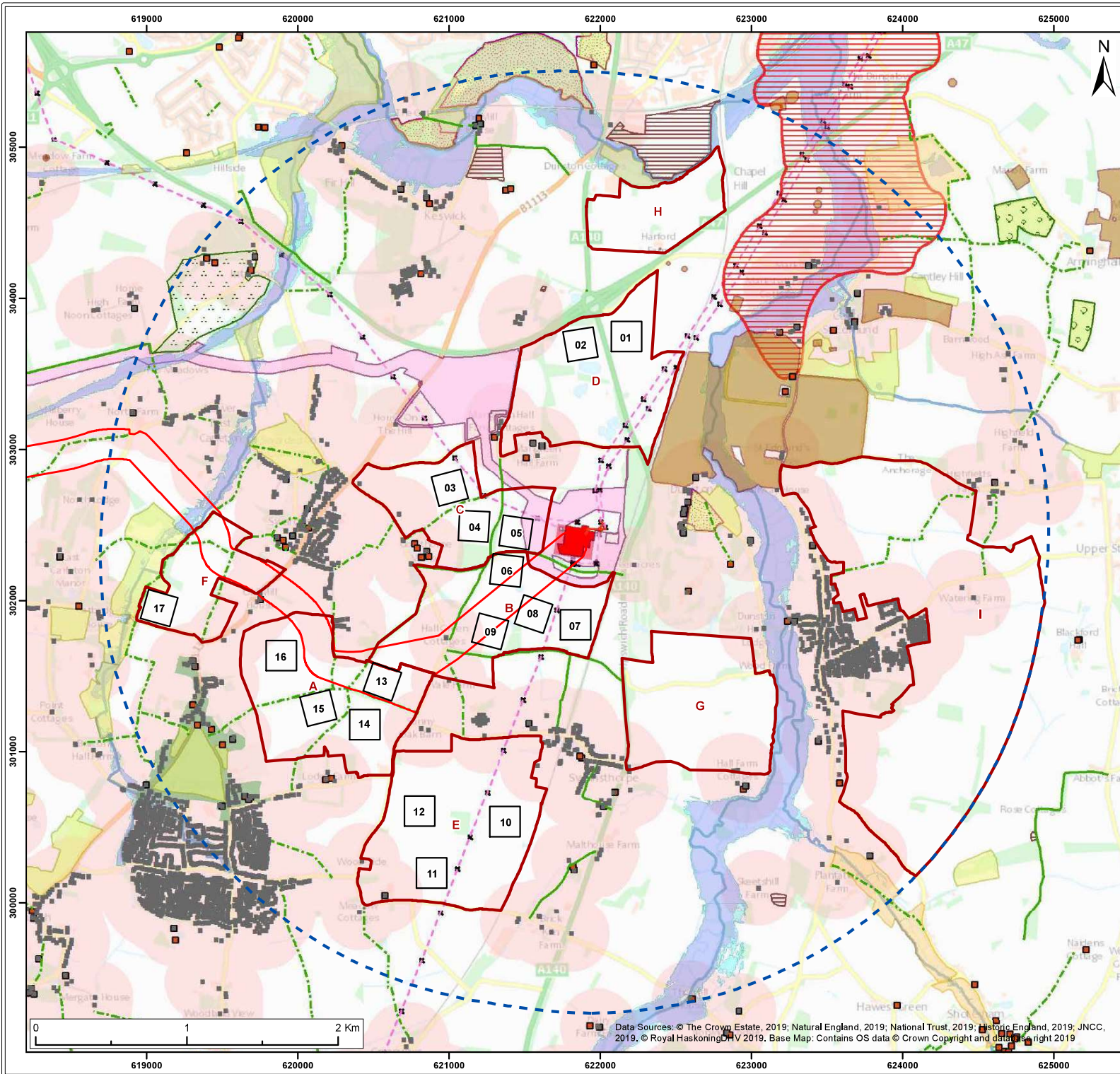
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Project: Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions	Report: Substation Site Selection - Emerging short-list
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- Legend:
- Cable Corridor Route Option
 - 3km Substation Study Area
 - Proposed Substation Site
 - Proposed Substation Zone
 - Residential Property
 - Residential Property - 250m Buffer
 - Listed Building
 - High Voltage
 - Underground Electricity Cable
 - Electricity Transmission Overhead Lines
 - Footpath
 - Bridleway
 - Restricted Byway
 - Environment Agency Main River
 - Scheduled Monument
 - Registered Park and Garden
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 - Historic Landfill Site
 - Source protection zone 1
 - Flood Zone 3
 - Flood Zone 2
 - Homsea Project Three Order Limits
 - Existing National Grid 400kV Substation

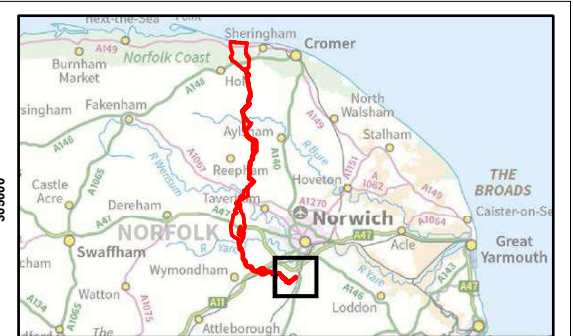
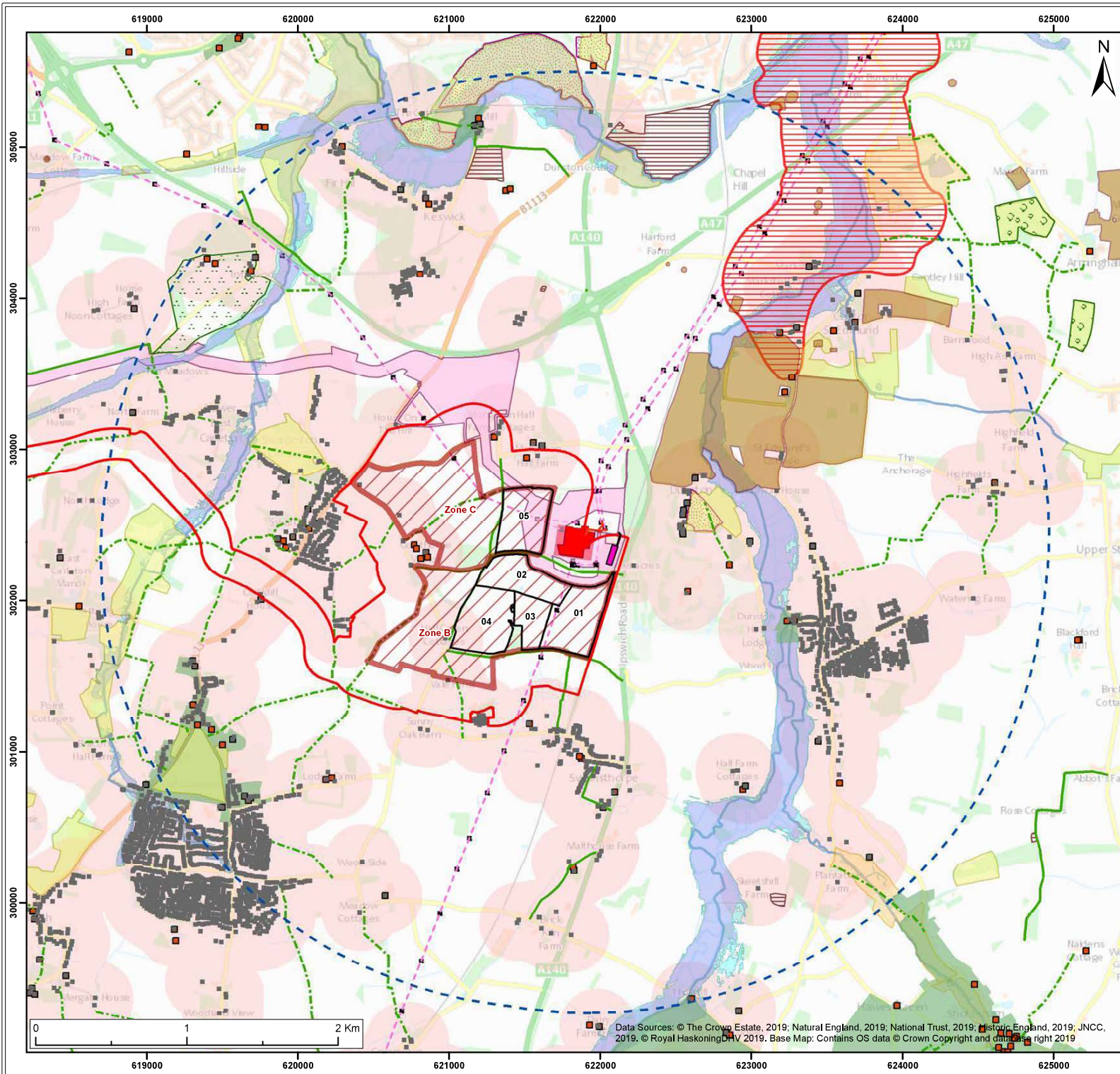
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SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR

Title:
OnSS Site Selection - Substation Sites

Figure: 3	Drawing No: PB8164-RHD-ZZ-ON-DR-Z-0028	
Co-ordinate system: British National Grid	Page Size: A3	Scale: 1:25,000
Project: Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions	Report: Substation Site Selection - Emerging short-list	



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- Legend:**
- Study Area
 - Proposed Substation Zone
 - Shortlisted Fields
 - 3km Substation Study Area
 - Proposed Battery Storage Facility
 - Residential Property
 - Residential Property - 250m Buffer
 - Listed Building
 - High Voltage Underground Electricity Cable
 - Electricity Transmission Overhead Lines
 - Footpath
 - Bridleway
 - Restricted Byway
 - Environment Agency Main River
 - Scheduled Monument
 - Registered Park and Garden
 - Conservation Area
 - Ancient Woodland
 - County Wildlife Site (CWS)
 - Local Nature Reserve (LNR)
 - Sites of Special Scientific Interest (SSSI)
 - Source protection zone 1
 - Flood Zone 3
 - Flood Zone 2
 - Hornsea Project Three Order Limits
 - Existing National Grid 400kV Substation

S1	P01	08/07/2020	Suitable for Information	AZ	JA	MW
SUI	REV	DATE	DESCRIPTION	DRW	CHK	APR

Title:
OnSS Site Selection – Options taken forward for further consideration

Figure: 4 Drawing No: PB8164-RHD-ZZ-ON-DR-Z-0037

Co-ordinate system: British National Grid	Page Size: A3	Scale: 1:25,000
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Project: Dudgeon and Sheringham Shoal Offshore Wind Farm Extensions	Report: Substation Site Selection - Emerging short-list
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Annex 2 BRAG Assessment Spreadsheet

Topic	Considerations	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		Zone D	Zone D	Zone C	Zone C	Zone C	Zone B	Zone B	Zone B	Zone B	Zone B	Zone E	Zone E	Zone E	Zone A	Zone A	Zone A	Zone A
Costs	Length (km) cabling from edge of 3km substation search area to substation Red = >5km Amber = 2-5km Green = <2km	5.46	5.15	3.77	3.86	4.15	3.52	3.75	3.47	3.17	3.74	3.76	3.34	2.45	2.5	2.34	1.97	1.54
Costs	Length (km) cabling from substation zone to Norwich Main Substation Red = > 2km Amber = 1 -2km Green = < 1km	1.47	1.55	0.62	0.45	0.16	0.23	0.35	0.35	0.52	1.74	2.2	1.82	1.39	1.76	1.8	2.06	3.34
Transport	Number of total road crossings (based on cable route distance above) Red = >4 Amber = 2 - 4 Green = <2	5	4	3	3	3	3	3	3	3	3	3	3	2	2	2	2	1
Transport	Number of rail crossings (based on cable route distance above) Red = 2+ Amber = 1 Green = 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Public Rights of Way (PRoW)	Number of ProW crossings (based on cable route distance above) Red = >10 Amber = 3 - 10 Green = <3	6	6	6	7	8	6	6	6	6	5	5	5	5	6	4	3	2
Main River Crossings	Number of EA main river crossings (based on cable route distance above)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Other watercourses / drains	Number of other watercourse crossings (based on cable route distance above)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Noise	Distance (m) from nearest residential property Red = <100m Amber = 100 - 400m Green = > 400m	577	284	272	229	423	448	416	468	175	299	218	371	267	264	327	216	263
European Nature Conservation Designated Sites	Proximity (m) to SPAs, SACs, Ramsar sites Red = 0m Amber = 1 - 5,000m Green = >5,000	6957	6931	5892	5738	5829	5584	5532	5458	5197	4181	3614	3909	4538	4216	4158	4385	4514
National Nature Conservation Designated Sites	Proximity (m) to SSSIs, Ancient Woodlands, National Nature Reserves Red = 0m Amber = 1 - 2,000m Green = >2,000m	1736	2036	3286	2997	2766	2707	2118	2396	2570	2021	2508	2584	3088	3095	3091	2885	2177
Local Nature Conservation Designated Sites / CWS	Proximity (m) to Local Nature Reserves Red = 0m Amber = 1 - 500m Green = >500m	972	1075	1250	1101	811	1104	856	1036	1342	1945	1717	2128	2130	2373	2606	2694	3187
Landscape character and landscape capacity	What is the landscape character of the site and surrounding area and what is its capacity to accommodate the proposed development? Site is open and exposed to the valley and visible from across the valley due to the open nature of the valley. Would be seen beyond pylons and adjacent to road infrastructure.	Located within the northern part of Landscape Character Area (LCA) A1, Tas Rural River Valley. Substation at this site would have potential to adversely affect sensitivities and vulnerabilities including change as a result of its open character and long valley views. It would conflict with the stated development considerations which are to ensure that the northern part of the Tas Valley is not further degraded by large scale of infrastructure developments associated with the roads, and ensure the rural character of the area adjacent to the Norwich Southern Bypass is maintained.	Located within LCA B1 Tas Tributary Farmland close to the edge of LCA A1 Tas Rural River Valley. Substation at this site would have potential to adversely affect sensitivities and vulnerabilities including views from the Bypass. Could potentially be visible on the skyline from LCA A1 Tas Rural River Valley and Venta Icenorum, although seen beyond pylons. Located between roads and Mangreen quarry - area already characterised by infrastructure / development. Woodland to the north provides opportunity to expand upon to provide additional screening.	Located within LCA B1, Tas Tributary Farmland. No key sensitivities identified in relation to this site. Rural landscape but adjacent to double line of pylons - infrastructure already characteristic of the local landscape. Existing woodlands, tree belts and hedgerows within close proximity provide some screening and opportunities to expand upon to provide additional screening.	Located within LCA B1, Tas Tributary Farmland. No key sensitivities identified in relation to this site. Rural landscape but adjacent to double line of pylons, Norwich Main substation and Mangreen quarry - infrastructure already characteristic of the local landscape. Existing woodlands, tree belts and hedgerows within close proximity provide some screening and opportunities to expand upon to provide additional screening.	Located within LCA B1, Tas Tributary Farmland. No key sensitivities identified in relation to this site. Rural landscape but adjacent to double line of pylons, Norwich Main substation and railway line and A140 - infrastructure already characteristic of the local landscape. Existing woodlands, tree belts and hedgerows within close proximity provide some screening and opportunities to expand upon to provide additional screening.	Located within LCA B1 Tas Tributary Farmland quite close to the edge of LCA A1 Tas Rural River Valley. No key sensitivities identified in relation to LCA B1, but potential for substation to be visible on the skyline from LCA A1 which is sensitive to this type of change. Rural landscape but close to pylons, Norwich Main substation, railway line and A140 - infrastructure already characteristic of the local landscape. Existing woodlands, tree belts and hedgerows within close proximity provide some screening and opportunities to expand upon to provide additional screening.	Located within LCA B1, Tas Tributary Farmland. No key sensitivities identified in relation to this site. Rural landscape but adjacent to pylons and railway line - infrastructure already characteristic of the landscape. Woodland block to the west provides opportunity to expand upon to provide additional screening.	Located within LCA B1, Tas Tributary Farmland. No key sensitivities identified in relation to this site. Rural landscape but adjacent to pylons and Norwich Main substation - infrastructure already characteristic of the landscape but not within the immediate vicinity of this site.	Located within LCA B1, Tas Tributary Farmland. No key sensitivities identified in relation to this site. Rural landscape but quite near pylons - infrastructure already characteristic of the landscape but not within the immediate vicinity of this site. Woodland block to the east provides opportunity to expand upon to provide additional screening.	Located within LCA D1 Wymondham Settled Plateau Farmland. Potential to impact on views of skyline which is a sensitivity of the LCA. Rural and relatively flat and open landscape but quite near pylons - infrastructure already characteristic of the landscape but not within the immediate vicinity of this site. Woodland block to the south provides opportunity to expand upon to provide additional screening.	Located on the edge LCA B1 Tas Tributary Farmland adjacent to LCA D1 Wymondham Settled Plateau Farmland. Potential to impact on views of skyline which are sensitivities of both LCAs. Rural landscape not close to existing infrastructure. Woodland block to the west provides opportunity to expand upon to provide additional screening.	Located on the boundary between LCAs B1, Tas Tributary Farmland and D1 Wymondham Settled Plateau Farmland. Potential to impact on views of skyline which are sensitivities of both LCAs. Rural and relatively flat and open landscape but adjacent to pylons - infrastructure already characteristic of the landscape.	Located on the edge LCAs B1, Tas Tributary Farmland and D1 Wymondham Settled Plateau Farmland. Potential to impact on views of skyline which are sensitivities of both LCAs. Rural landscape not close to existing infrastructure. Woodland blocks to north and south provide opportunity to expand upon to provide additional screening.	Located on the edge LCA D1 Wymondham Settled Plateau Farmland adjacent to LCA C1 Yare Tributary Farmland with Parkland. Potential to break up the skyline and intrude upon the sense of openness which is a sensitivity of LCA D1. Open rural landscape not close to existing infrastructure. No woodland adjacent to the site to expand upon to provide screening.	Located on the edge LCA C1 Yare Tributary Farmland with Parkland. Potential to impact on long views which is a sensitivity of LCA C1 in relation to new development/infrastructure. Open rural landscape not close to existing infrastructure. No woodland adjacent to the site to expand upon to provide screening.	Located within LCA C1 Yare Tributary Farmland with Parkland. A development consideration of LCA C1 is to protect the quality, character and setting of the key landscape assets, notably the tributary corridors. Site lies on the edge of a tributary valley of the River Yare in a rural location not close to existing infrastructure and is likely to adversely affect the setting of this tributary valley. Adjacent to woodland which provides opportunity to expand upon to provide additional screening.	

Landscape designations or policy protection	Is the site or surrounding area subject to a landscape designation or other policy protection?	<p>South Norfolk Local Plan, Development Management Policies Document Adoption Version, October 2015</p> <p>Policy DM 4.5 Landscape Character and River Valleys Lies within a Rural River Valley landscape type and would conflict with this policy which states: "... Particular regard will be had to protecting the distinctive characteristics, special qualities and geographical extents of the identified Rural River Valleys and Valley Urban Fringe landscape character types."</p> <p>Policy DM 4.6 Landscape Setting of Norwich Lies within the Southern Bypass Protection Zone and would have potential to conflict with this Policy DM 4.6 which states: "All development proposals within the Norwich Southern Bypass Landscape Protection Zone (NSBLPZ), as shown on the Policies Map, should have regard to protecting the openness of the</p>	<p>South Norfolk Local Plan, Development Management Policies Document Adoption Version, October 2015</p> <p>Policy DM 4.5 Landscape Character and River Valleys Potential adverse effects on views from Rural River Valley to the east.</p> <p>Policy DM 4.6 Landscape Setting of Norwich Lies within the Southern Bypass Protection Zone and on the A140 Undeveloped Approach to Norwich. Potential to harm views from both roads.</p>	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None	None
Principal Visual Receptors	How close are surrounding principal visual receptors and what influence would the proposed development have on these?	No highly sensitive visual receptors identified close to the site. Adjacent to A140 with open views into the site (the only close visual receptor). Largely screened from the A47 southern bypass. Open views from Venta Icenorum Roman Town (also a visitor attraction) within the Tas valley - Heritage consultant will need to advise on heritage constraints. Visible from Tas Valley Way long distance walking route on eastern side of valley.	No highly sensitive visual receptors identified close to the site. Adjacent to A140 and A47 Norwich southern bypass - likely to be visible from both roads. Potentially visible on skyline from Venta Icenorum Roman Town (also a visitor attraction) within the valley - Heritage consultant will need to advise on heritage constraints.	Adjacent to Mangreen Lane and a public right of way (footpath). Views would be in the context of existing double line of pylons next to the proposed substation.	Adjacent to public rights of way (footpath and bridleway). Views would be in the context of existing double line of pylons next to the proposed substation, and Norwich Main substation and Mangreen quarry.	Adjacent to public rights of way (bridleways). Views would be in the context of existing pylons and Norwich Main substation.	Adjacent to public rights of way (bridleways). Views from some locations would be in the context of existing pylons and Norwich Main substation.	Near public rights of way. Adjacent to railway line and near A140 - people in trains and on 'A' roads not highly sensitive. Views from some locations would be in the context of existing pylons and Norwich Main substation.	Near public rights of way. Views from some locations would be in the context of existing pylons and Norwich Main substation.	Near public rights of way.	Adjacent to railway line - people in trains not highly sensitive. Views would be in the context of existing pylons.	Adjacent to minor road. Views would be in the context of existing pylons. No public rights of way close to site.	Close to minor road. Views would be in the context of existing pylons. No public rights of way close to site.	Near public rights of way.	Near public rights of way.	Near public rights of way.	No public rights of way or other visual receptors very close to site.	Public right of way (footpath) which is also the route of the Tas Valley Way long distance walking route lies close to the western edge of the site. Adjacent to a minor road.	
Known designated heritage assets	Presence of known designated heritage assets within the substation footprint (RED = impact on designated asset with limited mitigation options, AMBER = impact on designated asset with mitigation options available, GREEN = no designated assets present, no impact)	299	568	303	226	402	429	591	608	510	409	219	480	614	285	369	274	208	
Known non-designated heritage assets	Presence of known non-designated heritage assets within the footprint (RED = impact on non-designated asset with limited mitigation options, AMBER = impact on non-designated asset with mitigation options available, GREEN = no known non-designated assets present, no known impact)	No known designated heritage assets within substation footprint.	No known designated heritage assets within substation footprint.	No known designated heritage assets within substation footprint.	No known designated heritage assets within substation footprint.	No known designated heritage assets within substation footprint.	No known designated heritage assets within substation footprint.	No known designated heritage assets within substation footprint.	No known designated heritage assets within substation footprint.	No known designated heritage assets within substation footprint.	No known designated heritage assets within substation footprint.	No known designated heritage assets within substation footprint.	No known designated heritage assets within substation footprint.	No known designated heritage assets within substation footprint.	No known designated heritage assets within substation footprint.	No known designated heritage assets within substation footprint.	No known designated heritage assets within substation footprint.	No known designated heritage assets within substation footprint.	
Unknown heritage assets (potential for buried archaeology)	Potential for as yet undiscovered heritage assets to be present within the footprint (RED = high potential for buried archaeology, AMBER = moderate potential for buried archaeology, GREEN = envisaged lower potential or limited current indication for buried archaeology)	Record of a Neolithic axe factory, and cropmarks and find spots suggesting multi-period activity across area. Potential for remains to survive below ground. Limited options for micro-siting. Options for undertaking archaeological evaluation and mitigation works.	Cropmarks and find spots suggesting multi-period activity across area. Potential for remains to survive below ground. Limited options for micro-siting. Options for undertaking archaeological evaluation and mitigation works.	No known non-designated heritage assets within substation footprint.	Probable post-medieval boundary recorded within substation footprint. Options for micro-siting and undertaking archaeological evaluation and mitigation works.	Find spots of Bronze Age and post-medieval date, potentially indicative of buried archaeological remains. Options for micro-siting and undertaking archaeological evaluation and mitigation works.	Site of medieval village, cropmarks of undated field systems, Roman pits and find spot. Limited options for micro-siting. Options for undertaking archaeological evaluation and mitigation works.	Cropmarks of undated ditches and post-medieval boundaries. Options for micro-siting and undertaking archaeological evaluation and mitigation works.	No known non-designated heritage assets within substation footprint.	Multi-period find spots, Roman pits and possible field system. Options for micro-siting and undertaking archaeological evaluation and mitigation works.	Cropmarks of undated ditches and post-medieval boundaries, and multi-period find spots. Options for micro-siting and undertaking archaeological evaluation and mitigation works.	Find spots ranging from prehistoric through to post-medieval period, potentially indicative of buried archaeological remains. Options for micro-siting and undertaking archaeological evaluation and mitigation works.	Cropmarks of undated ditches and multi-period find spots ranging from late prehistoric to post-medieval. Options for micro-siting and undertaking archaeological evaluation and mitigation works.	No known non-designated heritage assets within substation footprint.	No known non-designated heritage assets within substation footprint.	No known non-designated heritage assets within substation footprint.	No known non-designated heritage assets within substation footprint.	Multi-period find spots, potentially indicative of buried archaeological remains. Options for micro-siting and undertaking archaeological evaluation and mitigation works.	
Setting of heritage assets (this was initially based on whether an asset(s), predominantly designated, features within a 5km radius of the proposed sub-station, and then assessed according to the RAG criteria - detailed in the next column)	Proximity and potential visibility of the proposed onshore substation from, predominantly designated, heritage asset(s) and the potential to alter (adversely impact) the asset's heritage significance as a result of a change in setting (RED = close proximity and perceived direct visibility and/or impact on heritage significance, AMBER = potential partial visibility and/or potential impact on heritage significance, GREEN = no visibility and/or no envisaged impact upon heritage significance)	High potential for remains associated with the cropmark features. Limited options for micro-siting. Options for undertaking archaeological evaluation and mitigation works.	High potential for remains associated with the cropmark features. Limited options for micro-siting. Options for undertaking archaeological evaluation and mitigation works.	Lower potential envisaged based on no known heritage assets and current indication.	Lower potential envisaged based on a single record of a heritage asset and current indication.	Low to moderate potential for buried archaeological remains. Options for micro-siting and undertaking archaeological evaluation and mitigation works.	High potential for remains associated with the cropmark features. Limited options for micro-siting. Options for undertaking archaeological evaluation and mitigation works.	Moderate potential for remains associated with the cropmark features. Options for micro-siting and undertaking archaeological evaluation and mitigation works.	Lower potential envisaged based on no known heritage assets and current indication.	High potential for remains associated with the Roman pits and field system. Limited options for micro-siting. Options for undertaking archaeological evaluation and mitigation works.	Moderate potential for remains associated with the cropmark features. Options for micro-siting and undertaking archaeological evaluation and mitigation works.	Low to moderate potential for buried archaeological remains. Options for micro-siting and undertaking archaeological evaluation and mitigation works.	Moderate potential for remains associated with the cropmark features. Options for micro-siting and undertaking archaeological evaluation and mitigation works.	Lower potential envisaged based on no known heritage assets and current indication.	Lower potential envisaged based on no known heritage assets and current indication.	Lower potential envisaged based on no known heritage assets and current indication.	Lower potential envisaged based on no known heritage assets and current indication.	Low to moderate potential for buried archaeological remains. Options for micro-siting and undertaking archaeological evaluation and mitigation works.	
Historic Landscape Character	Potential impact on the character and significance of the historic landscape (RED = significant/detrimental change, AMBER = some (manageable) change, GREEN = no change)	Scheduled Monuments located approx. 0.3km to the east and approx. 0.4km to the north-east. Perceived direct visibility and potential impact on setting (and associated heritage significance).	Scheduled Monuments located approx. 0.6km to the east and approx. 0.7km to the north-east. Perceived direct visibility and potential impact on setting (and associated heritage significance).	Listed Buildings located approx. 0.3km to the north-east and south-west. Perceived direct visibility and potential impact on setting (and associated heritage significance).	Listed Buildings located approx. 0.2km to the south-west, and approx. 0.5km to the north. Perceived direct visibility and potential impact on setting (and associated heritage significance).	Scheduled Monument located approx. 0.85km to the north-east, and Listed Buildings located approx. 0.5km to the north and west. Potential for partial visibility and impact on heritage setting (and associated heritage significance).	Listed Buildings located approx. 0.45km to the west. Potential for partial visibility and impact on heritage setting (and associated heritage significance).	Scheduled Monument located approx. 0.95km to the north-east, and Listed Buildings located within approx. 1km to the north-east, east, south and west. Potential for partial visibility and impact on heritage setting (and associated heritage significance).	Listed Buildings located approx. 0.6km to the south, and approx. 0.7km to the north-west. Potential for partial visibility and impact on heritage setting (and associated heritage significance).	Listed Buildings located approx. 0.5km to the north-west, and approx. 0.55km to the south-east. Perceived direct visibility and potential impact on setting (and associated heritage significance) with Listed Buildings located to the north-west.	Listed Buildings located approx. 0.4km to the south-east, and approx. 0.5km to the north-east and east. Sholesham Conservation Area located approx. 1km to the south-east. Perceived direct visibility and potential impact on setting (and associated heritage significance) with Listed Buildings located to the east and south-east.	Listed Buildings located approx. 0.2km to the south-west, and approx. 0.8km to the east and north-west. Shotesham Conservation Area located approx. 1km to the south-east. Perceived direct visibility and potential impact on setting (and associated heritage significance) with Listed Buildings located to the south-west.	Listed Buildings located approx. 0.5km to the south-west, north-west. Mulbarton Conservation Area located approx. 0.9km to the west. Perceived direct visibility and potential impact on setting (and associated heritage significance) with Listed Buildings located to the south-west and Mulbarton Conservation Area.	Located within approx. 1km of Listed Buildings to the north, east, south and west. Mulbarton Conservation Area located approx. 0.85km to the south-west. Potential for partial visibility and impact on heritage setting (and associated heritage significance).	Nearest Listed Buildings are located approx. 0.3km to the south-west and Mulbarton Conservation Area is approx. 0.7km to the west. Perceived direct visibility and potential impact on setting (and associated heritage significance) with Listed Buildings located to the south-west and Mulbarton Conservation Area.	Nearest Listed Buildings are located approx. 0.4km to the south and Mulbarton Conservation Area is approx. 0.4km to the west. Perceived direct visibility and potential impact on setting (and associated heritage significance) with Listed Buildings located to the south and Mulbarton Conservation Area.	Listed Buildings and Mulbarton Conservation Area located approx. 0.5km to the west, and further Listed Buildings located approx. 0.6km to the north. Perceived direct visibility and potential impact on setting (and associated heritage significance).	Listed Buildings and Mulbarton Conservation Area located approx. 0.25km to the south-east. Perceived direct visibility and potential impact on setting (and associated heritage significance).	

