CALEDONIA
Offshore Wind Farm

Code: UKCAL-CWF-CON-EIA-RPT-00001-1006

Volume 1 Overview Chapters

Chapter 6 Site Selection and Alternatives

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Volume 1 Chapter 6 Site Selection and Alternatives

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Acronyms and Abbreviations

AIS	Automatic Identification System
AoS	Areas of Search
AWI	Ancient Woodland Inventory
CCC	Committee on Climate Change
CES	Crown Estate Scotland
DE	Design Envelope
DWPA	Drinking Water Protected Areas
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
GBS	Gravity-Based Structures
GHG	Green House Gas
GIS	Geographical Information System
GW	Gigawatts
HDD	Horizontal Directional Drilling
HND	Holistic Network Design
HRA	Habitats Regulations Appraisal
km	kilometre
km^2	kilometre squared
kV	kiloVolt
m	metre
MD-LOT	Marine Directorate Licensing Operations Team
MW	Megawatt

NETS	National Electricity Transmission System
NGESO	National Grid Electricity System Operator
NSA	National Scenic Areas
OECC	Offshore Export Cable Corridor
OnTI	Onshore Transmission Infrastructure
OSP	Offshore Substation Platform
OTNR	Offshore Transmission Network Review
OWF	Offshore Wind Farm
RAG	Red Amber Green
RLB	Red Line Boundary
SAC	Special Areas of Conservation
SEA	Strategic Environmental Assessment
SEIA	Socio-Economic Impact Assessment
SLA	Special Landscape Areas
SPA	Special Protection Areas
SSEN-T	Scottish and Southern Electricity Networks - Transmission
SSSI	Sites of Special Scientific Interest
SuDs	Sustainable Drainage Systems
TJB	Transition Joint Bay
UXO	Unexploded Ordnance
VMS	Vessel Monitoring System
WLA	Wild Land Areas
WTG	Wind Turbine Generator

6 Site Selection and Alternatives

6.1 Introduction

6.1.1 Overview

6.1.1.1 This chapter of the Environmental Impact Assessment Report (EIAR) provides an overview of the site selection process, and the reasonable alternatives studied for the Caledonia Offshore Wind Farm (OWF).

6.1.1.2 The Caledonia OWF comprises; Caledonia North and Caledonia South, collectively referred to as the ('Proposed Development (Offshore)') and the Onshore Transmission Infrastructure (OnTI) required to transfer the power from the Proposed Development (Offshore) to a connection to the National Electricity Transmission System (NETS), referred to as the ('Proposed Development (Onshore)').

6.1.1.3 Collectively, the Proposed Development (Offshore) and Proposed Development (Onshore) are referred to as the ("Proposed Development").

6.1.1.4 This chapter also provides information on the need for the Proposed Development and consideration of a 'do nothing' option where the Proposed Development is not progressed.

6.1.2 Legislation and Policy Background

6.1.2.1 To facilitate the development of the Proposed Development, Caledonia Offshore Wind Farm Limited (the Applicant) is required to submit several consenting applications including:

- 2 x Section 36 applications (Caledonia North and Caledonia South) for the construction of the power generation site (offshore windfarm) and any inter-array cabling. To be submitted to Marine Directorate Licensing Operations Team (MD-LOT).
- 4 x Marine Licence applications for any offshore platforms and cabling to the platforms and to shore (2 x Generation and 2 x Transmission). To be submitted to MD-LOT.
- A PPP application submitted to Aberdeenshire Council for all onshore works (all works landward of Mean Low Water Springs (MLWS)).

6.1.2.2 These applications are supported by a single EIAR (covering both onshore and offshore).

6.1.2.3 The Proposed Development consent applications are subject to the requirement for an Environmental Impact Assessment (EIA) under the following regulations. The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) (HM Government, 2007[1]) (for Scottish offshore waters) and the Marine Works (Environmental Impact

Assessment) (Scotland) Regulations 2017 (as amended) (Scottish Government, 2017[2]) (for Scottish inshore waters) as the construction and operation of an Offshore Wind Farm (OWF) comprises "regulated activities" within the meaning of the Regulations. Electricity generation projects of >1 Megawatt (MW) which fall inside United Kingdom (UK) territorial waters, and require consent under Section 36 of the Electricity Act 1989, are also required to provide an EIA under the terms of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) (Scottish Government, 2017a[3]). In respect of the OnTI, the relevant EIA regulations are the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) (Scottish Government, 2017b[4]).

6.1.2.4 These regulations (collectively referred to hereafter as the EIA Regulations) establish the statutory process and minimum requirements of the EIAR.

6.1.2.5 The EIA Regulations require that EIARs 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."

6.1.2.6 This chapter of the EIAR therefore provides a description of the reasonable spatial and geographical alternatives that have been considered by the Applicant in the formulation of the consenting applications required.

6.1.3 'Do-Nothing' Option

6.1.3.1 Although not stipulated by the EIA regulations, good practice encourages the consideration of a 'do nothing' scenario. This scenario is a projection of the existing baseline as if the Proposed Development is not progressed and developed.

6.1.3.2 An assessment of the future baseline under the 'do nothing' scenario is provided for all technical topics within the EIAR.

6.1.3.3 As outlined in Volume 1, Chapter 2: Legislation and Policy there are four key drivers for the shift in energy production to low carbon sources in the UK and Scotland, including renewable energy, which are:

- The urgent need to tackle climate change;
- The need to secure energy, through the deployment of renewable electricity capacity;
- The need for new energy infrastructure; and
- The need to maximise economic opportunities of the transition to a low carbon economy.

6.1.3.4 Scotland's long-term climate change targets require net-zero Green House Gas (GHG) emissions by 2045, in line with advice from the Committee on Climate Change (CCC) and the statutory requirements defined by the Climate Change (Scotland) Act 2009 (Scottish Government, 2019a[5]).

6.1.3.5 The Scottish Offshore Wind Energy Policy (Scottish Government, 2020a[6]), building upon the ambitions outlined within the Scottish Energy Strategy (Scottish Government, 2017a[7]), sets out the Scottish Government's ambition to capitalise on the potential that offshore wind development can bring to Scotland and the role this technology could play in meeting Scotland's commitment to reach net zero by 2045.

6.1.3.6 The Sectoral Marine Plan for Offshore Wind Energy (Scottish Government, 2020b[8]), published in October 2020 provided the strategically planned spatial footprint for offshore wind development in Scotland.

6.1.3.7 It identified 15 sustainable Plan Options for the future development of commercial-scale offshore wind energy in Scotland and contributes to achieving Scottish and the UK's energy and climate change objectives. Plan Options were subject to Strategic Environmental Assessment (SEA), Habitats Regulations Appraisal (HRA), Socio-Economic Impact Assessment (SEIA) and an Island Communities Impact Assessment.

6.1.3.8 The Proposed Development (Offshore) location is identified as a Plan Option within the Sectoral Marine Plan as an area identified as suitable for the development of renewable energy. The Sectoral Marine Plan also considered a 'do-nothing' option and identified that to do nothing would not meet strategic net zero policies.

6.1.3.9 The Proposed Development, in generating and exporting circa 2 Gigawatt (GW) of electricity, will make an important contribution in helping to achieve the climate change policy aims and legislative requirements. The Proposed Development will contribute to Scotland's and UK net zero targets as well as offshore wind overall delivery targets.

6.1.3.10 As a result, the 'do nothing' option was not carried forward.

6.2 Stakeholder Engagement

6.2.1.1 The approach taken to the development of the Proposed Development has been shaped by early engagement with a wide range of stakeholders, along with consideration of a wide range of technical disciplines, including but not limited to, engineering, biodiversity, marine and coastal processes, geology, shipping and navigation, historic environment and landscape and townscape.

6.2.1.2 Stakeholder engagement has been a key aspect of the Proposed Development design, with consultation events undertaken to provide opportunities for stakeholders to provide information to the Applicant in regards relevant spatial and Proposed Development design decisions that

have been taken to date. Further detail on the stakeholder engagement undertaken to support the EIAR is set out in Volume 1, Chapter 8: Stakeholder Engagement and Consultation.

6.3 The Site Selection Process

6.3.1.1 The site selection process for the Proposed Development has been influenced by several key milestones/activities in the Proposed Development timeline:

- The publishing of the Sectoral Marine Plan and the identification of the Plan Option area;
- The recommendation of a Grid Connection Point to the NETS as part of the Offshore Transmission Network Review (OTNR) process and the Holistic Network Design (HND) study;
- The publication of the Holistic Network Design Follow up Exercise (HNDFUE);
- Environmental and technical studies; and
- Targeted consultation with key stakeholders and affected landowners.

6.3.1.2 An overview of the process of site selection, is illustrated in Figure 6-1.

6.3.1.3 It should be noted that whilst the site selection process is illustrated as a linear process in this chapter to aid presentation, site selection is a complex, iterative process considering multiple factors. As a result of this iterative process, the identification and selection of each of the Proposed Developments components is interrelated to the selection of other Proposed Development components, i.e. the process for the selection of the Proposed Developments Landfall Site impacts not only the Offshore Export Cable Corridor selection process but also the Onshore Export Cable Corridor (ONEC) selection process and in turn the Onshore Substation Site selection process. The decision for the site selection for each component was therefore not taken in isolation but considered all Proposed Development components as a whole.

6.3.1.4 The site selection process has necessarily followed a robust process of the utlisation of desk-based assessments to identify the initial potential Proposed Development component options. The Applicant has then sought to verify desk-based information obtained to inform these assessments though the undertaking of surveys and additional assessments to 'ground truth' desktop information.

6.3.1.5 Site selection and the Proposed Development design has also taken into account Schedule 9 of the Electricity Act 1989 (UK Parliament, 1989[9]). Within Schedule 9 a duty is placed on those holding an electricity generation licence to have regard to the preservation of amenity. Schedule 9 requires the relevant licence holder when formulating proposals in

connection with the generation and transmission of electricity to take account of the effects the proposals would have on the natural beauty of the countryside, on any flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest. It also took into account potential impacts on fish and fisheries, as further required by Schedule 9. The following sections detail how these elements have been considered when designing the Proposed Development.

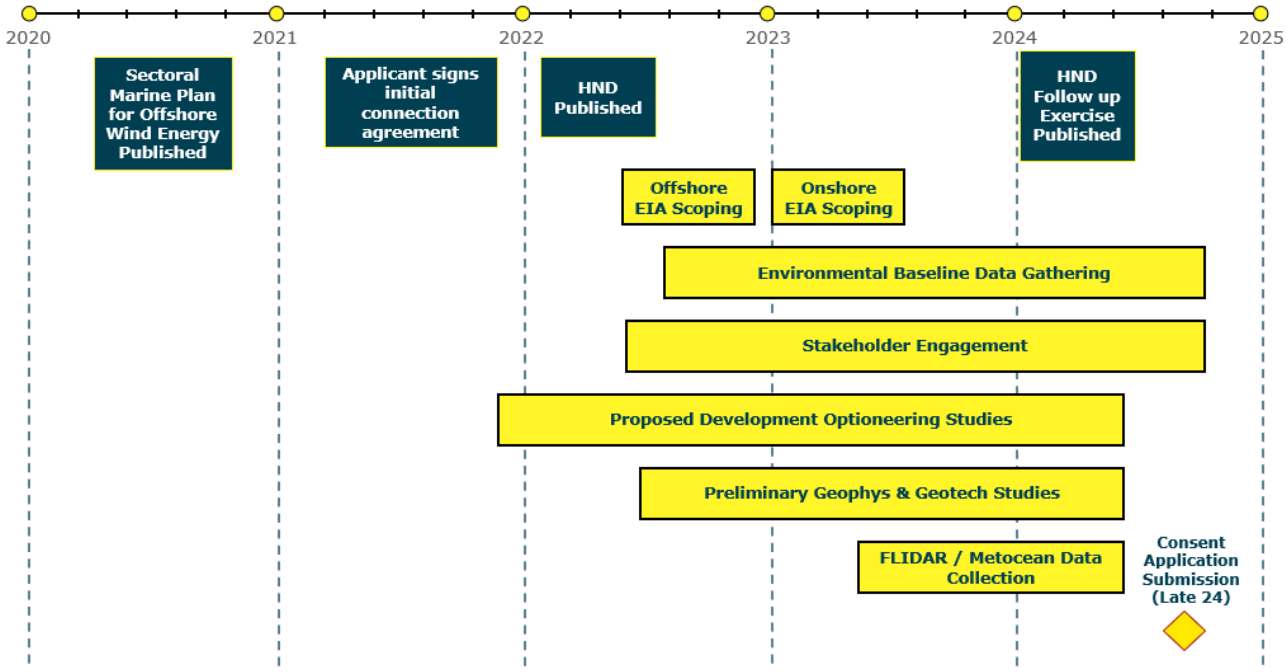


Figure 6-1: Key Milestones in Proposed Development Refinement

6.4 ScotWind and the Sectoral Marine Plan

6.4.1.1 The first Sectoral Marine Plan for Offshore Wind Energy (Blue Seas Green Energy) was adopted in 2011 (Marine Scotland, 2011[10]). Following from this, the Draft Sectoral Marine Plan for Offshore Wind, Wave and Tidal energy in Scotland was published in July 2013, which identified potential options for commercial scale offshore wind energy developments. These draft options were never formally adopted by Scottish Ministers, but the draft options were included in Scotland's National Marine Plan (Scottish Government, 2015[11]) and are retained on Marine Scotland National Marine Plan Interactive Maps for reference (Marine Scotland, 2024)[12].

6.4.1.2 In November 2017, Crown Estate Scotland (CES) announced its intention to run a further leasing round for commercial-scale offshore wind energy projects in Scottish Waters. To inform the spatial development of this

leasing round, the Marine Scotland Sectoral Planning Team[i], as planning authority for Scotland's Seas, was required to undertake a planning exercise in accordance with relevant UK and Scottish legislation.

6.4.1.3 The Sectoral Marine Plan[8] for Offshore Wind Energy, published in October 2020, identified the most sustainable Plan Options for the future development of commercial-scale offshore wind energy in Scotland, including deep water wind technologies and covered both Scottish inshore and offshore waters. It also contributed to achieving Scottish and the UK's energy and climate change objectives and was developed to ensure consistency with Scotland's National Marine Plan[11].

6.4.1.4 The key stages of the planning process in relation to the identification of the Draft Plan Options are summarised in Table 6-1.

Table 6-1: The key planning stages of the identification of Draft Plan Options within the Sectoral Marine Plan

Stage	Summary
1. Opportunity and Constraint Analysis (Iteration 1)	An iterative identification process of initial Areas of Search (AoS) carried out through the use of an opportunity and constraint analysis. The analysis sought to identify areas of opportunity for the future development of offshore wind, whilst also identifying areas that minimised potential negative impacts to the environment, other sectors and users of the sea.
2. Opportunity and Constraint Analysis (Iteration 2) – Single Issue Constraint Analysis	The AoS were refined with consideration to specific spatial issues and feedback from Sectoral engagement workshops in Spring 2018, identifying a range of distinct AoS, noting that no commercial or technology specific information was used in this refinement process.
3. Scoping Consultation – Screening and Scoping Reports	Scottish Ministers consulted on the screening and scoping stages of the Plan process during June and July 2018. Screening and scoping reports were prepared and published online for the SEA, HRA and SEIA alongside the AoS scoping study.
4. Opportunity and Constraint Analysis (Iteration 3)	A further (third) iteration of the opportunity and constraint analysis considered the responses received during the Scoping Consultation. The AoS were refined with consideration to the outputs of this analysis. As a result, certain AoS were either removed or refined to avoid/incorporate certain areas of Scottish Waters. This stage also considered the areas of seabed proposed by stakeholders via the scoping consultation. A number of the areas proposed overlapped with existing AoS, while others overlapped with areas with higher levels of constraint or entirely new areas. Upon review of this information, a number of areas were identified to move forward in the plan process.

[i] In 2023, Marine Scotland was renamed Marine Directorate.

Stage	Summary
	Accordingly, some additional areas were included at this stage, where there was significant stakeholder interest, but also increased constraint. The Sustainability Appraisal stage assessed these new areas in greater detail.
5. Identification of Draft Plan Options	In total, 22 revised AoS were made available to the Sectoral Marine Plan Project Board and two Project Steering Groups for consideration and comment. Responses from both the Board and Steering Groups, together with the outputs of the initial assessments, was presented to Scottish Ministers to inform their decision on which AoS should progress to the Sustainability Appraisal for more detailed assessment. At this stage, 17 revised AoS were selected as Draft Plan Options.
6. Assessment of Draft Plan Options	The Draft Plan Options identified were subject to SEA, HRA, SEIA, and Sustainability Appraisal with reports produced to summarise these outputs.
7. Consultation on Draft Plan Options	Statutory consultation was held on the draft Plan and Sustainability Appraisal for a period of 14 weeks between 18 December 2019 and 25 March 2020. To support the consultation process, a total of 17 events were held during February and March 2020 in coastal communities across Scotland. A total of 443 consultation responses were received and the responses received were analysed to produce the Consultation Analysis Report (June 2020). Where permission was been granted, copies of submitted responses were published online.
8. Finalisation and Adoption of the Plan	An analysis of the responses received was used to inform the Scottish Ministers' decision on which Draft Plan Options to progress. The Post Adoption Statement (Scottish Government, 2020c[13]) published in conjunction with the Plan detailed the changes made to the draft Plan as a result of consultation feedback. In addition to the production of the Final Plan, the following documents were updated and finalised: ▪ Final Regional Location Guidance (Scottish Government, 2020b[14]); ▪ Post Adoption Statement (Scottish Government, 2020c[13]); ▪ Appropriate Assessment (Scottish Government, 2020d[15]); ▪ Final Islands Communities Impact Assessment (Scottish Government, 2020e[16]); and ▪ Equalities Impact Assessment (Scottish Government, no date[17]).

6.4.1.5 In the ScotWind Leasing process, a total of 20 proposed OWF projects were awarded option agreements within 15 Plan Options, for a total of 27.6GW. This included 17 proposed OWF projects awarded in January 2022, with a further three sites awarded in August 2022 as part of the ScotWind 'Clearing' process.

6.4.1.6 As part of the ScotWind Leasing process, the Applicant was successfully awarded an Option Agreement (granting exclusive rights) to develop an

OWF within the NE4 Plan Option (the Caledonia Site), which is located within the Moray Firth, off the north-east coast of Scotland.

6.4.1.7 The Sectoral Marine Plan for Offshore Wind Energy[8] suggested that the NE4 Plan Option is likely to be important as a foraging area for seabirds, including kittiwake from multiple designated sites, and has been classified as subject to 'high levels of ornithological constraint'. It also identifies that there is potential for development in the NE4 Plan Option to have significant consequences for navigational safety, due to a large overlap with the key shipping route around the Scottish coastline. Relatively low socio-economic costs (compared to other Plan Options) were identified as potentially arisings from development within the NE4 Plan Option, associated with commercial shipping and fishing. The key issues relating to offshore ornithology, shipping and navigation, commercial fisheries and socio-economics have been considered as part of the site selection and design processes, and are addressed as part of this EIAR (refer to Volumes 2, 3 and 6), and parallel HRA process for nature conservation designated sites.

6.4.1.8 The NE4 site was initially leased as a 1GW Plan Option (as described in the Sectoral Marine Plan), however this capacity was indicative and not representative of a cap on development which could limit efficient use of leased seabed. Subsequent technical analysis and design work by the Applicant has confirmed that the site can accommodate at least double this generation capacity, which would ensure efficient use of the seabed to support Scotland achieve its offshore wind targets. Caledonia OWF Option to Lease Agreement with Crown Estate Scotland has been amended to reflect this.

6.5 Proposed Development Components

6.5.1 Array Area

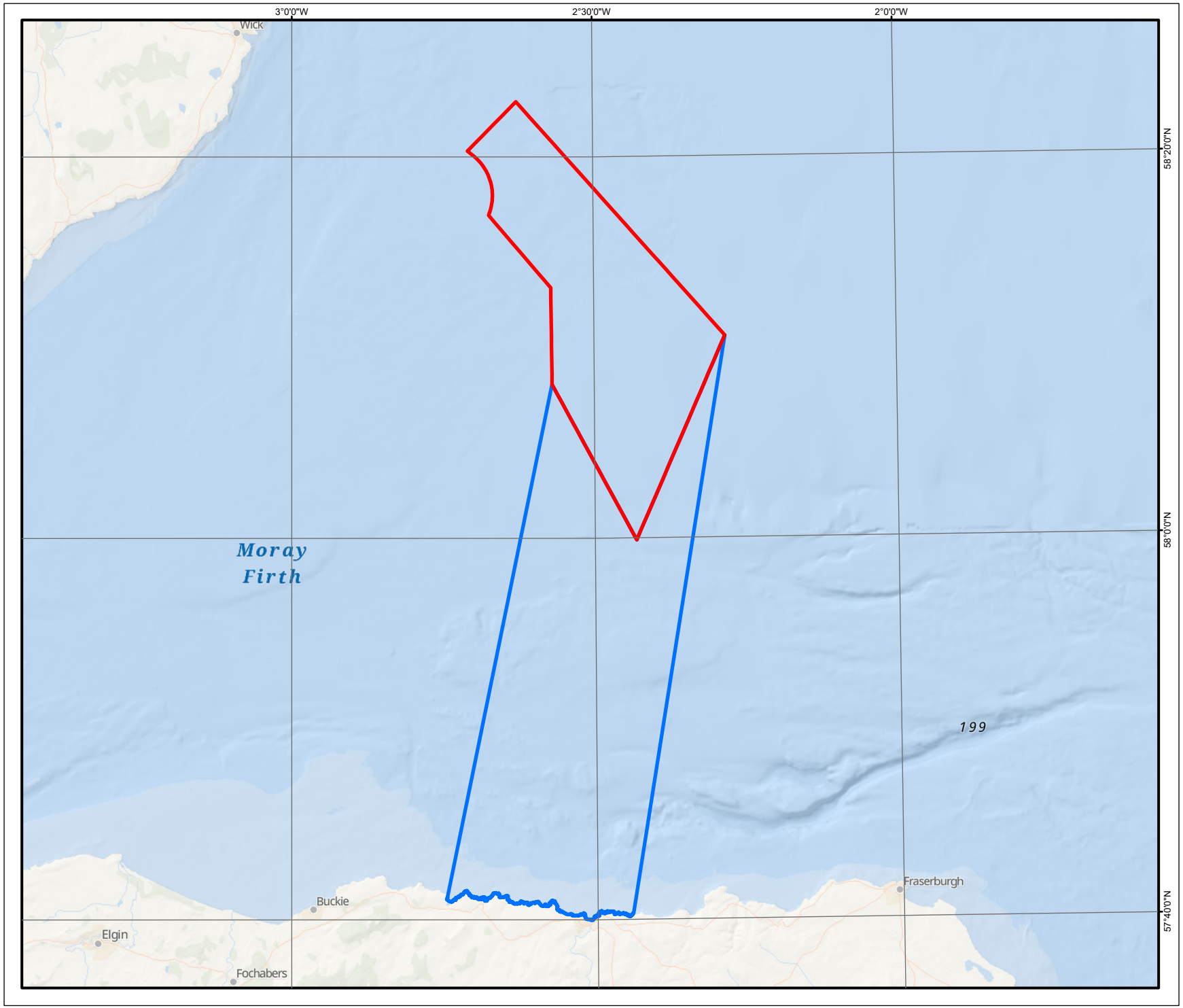
6.5.1.1 The Array Area is where the Wind Turbine Generators (WTGs), Inter-Array Cables, Interconnector Cables and Offshore Substation Platform(s) (OSPs) will be located.

6.5.1.2 The site selection process of the Array Area was primarily driven by the ScotWind Leasing process where the NE4 Plan Option was formally identified (Scottish Government, 2020b[8]).

6.5.1.3 The Applicant, on choosing to bid for the NE4 Plan Option, undertook extensive desktop reviews of known existing constraints (such as existing infrastructure (subsea cables, wells), known (charted) wrecks, shipping lanes, exclusion zones), and geology, among other factors and engaged with National Grid Electricity System Operator (NGESO) to discuss timescales and design for connection to the NETS.

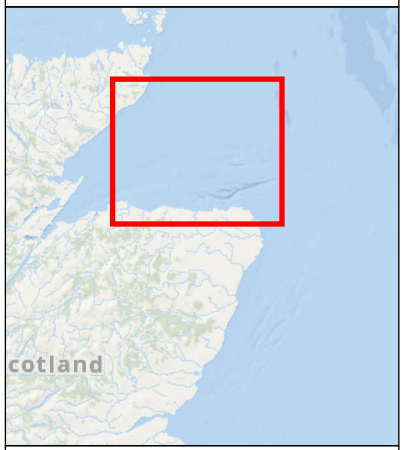
6.5.1.4 An Offshore Scoping Report for the Proposed Development (Offshore) was submitted to MS-LOT in September 2022 (Caledonia Offshore Wind Farm Limited, 2022[18]).

6.5.1.5 The Offshore Scoping Report identified the Array Area as shown in Figure 6-2.



Offshore Scoping Area - Offshore Export Cable Corridor

Offshore Scoping Area - Array Area



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03	20/08/2024	For Review	AC	GS	EC
02	23/07/2024	For Review	AC	GS	EC
01	04/06/2024	For Review	DM	JN	EC

CALEDONIA Offshore Wind Farm

ARUP

CONTRACTOR DRAWING NO: UKCAL1_ARP_WNF_ENV_MAP_00298

CONTRACTOR REV: 04

GEODETIC PARAMETERS: WGS 84 / UTM Zone 30N (EPSG:32630)

DRAWING TITLE

Figure 6-2: Proposed Development (Offshore) Scoping Boundaries

STATUS: Approved

SCALE: 1:500,000

DRAWING NUMBER: N/A

SHEET NO: 01 of 01

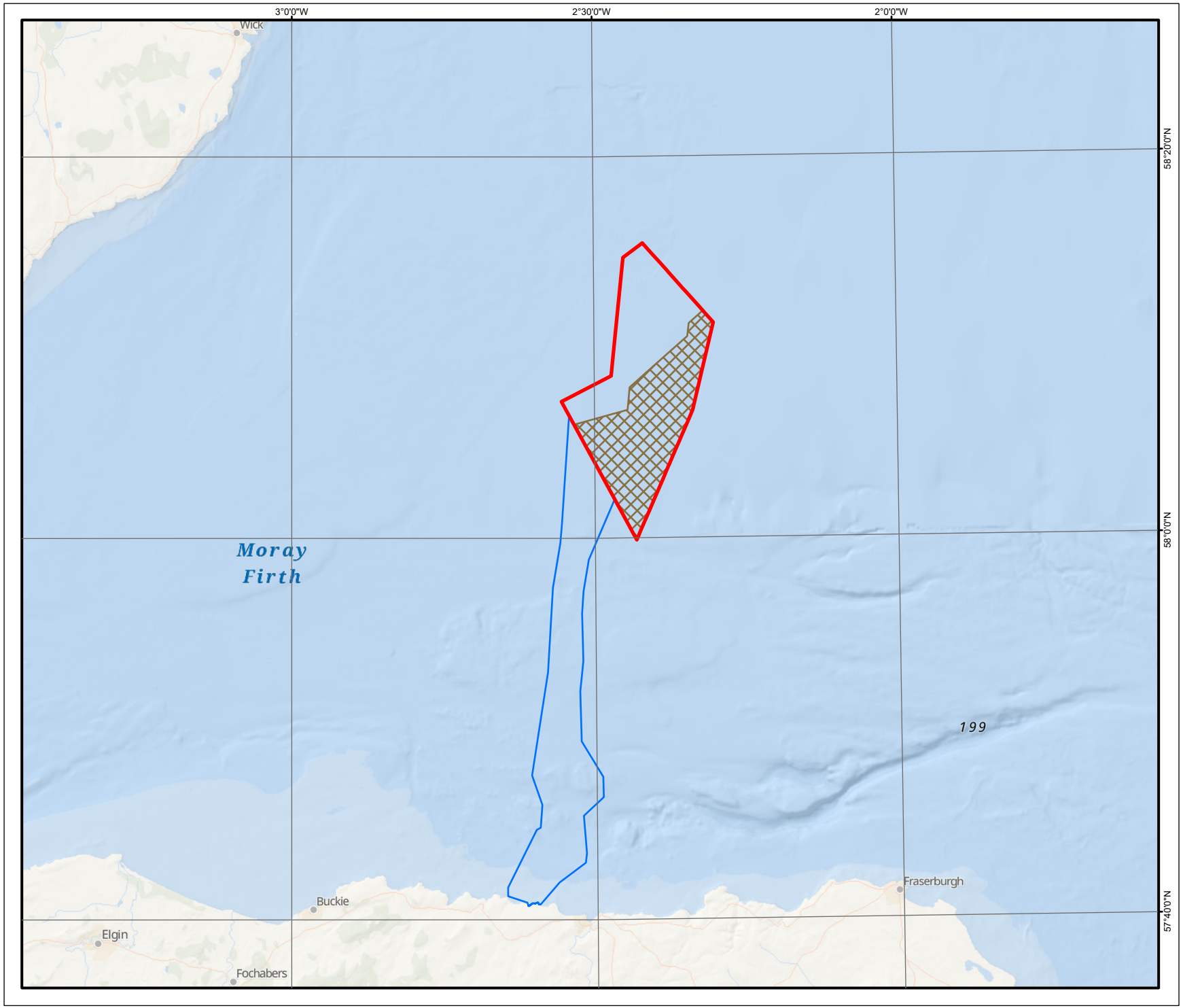
REV: N/A

6.5.1.6 Due to the significant volume of NETS reinforcement works required to connect offshore wind projects and commercial drivers, the Applicant has adjusted the consent application approach since scoping with the expectation to deliver the Proposed Development in phases. To support with the deliverability of these phases, the Applicant is submitting two offshore consent applications (Section 36 and associated Marine Licences) for the Proposed Development (Offshore). Within the Proposed Development Array Area, there are therefore two sites, referred to as Caledonia North Site and Caledonia South Site (see Figure 6-3a and 6-3b). The Applicant will also be submitting two Marine Licence applications for the OfTI infrastructure, to support the delivery of each phase. The boundaries of Caledonia North and Caledonia South have been developed to ensure that both can accommodate the required number of WTGs to have an even split in generation capacity between the two sites. This process also considered a range of site selection criteria including water depth, preliminary ground conditions and early energy yield analysis. The sequencing of how the phases can be brought forward is discussed in more detail in Volume 1, Chapter 5: Proposed Development Phasing.

6.5.1.7 At the time of submitting the Offshore Scoping Report (Caledonia Offshore Wind Farm Limited, 2022)[18], it was identified that foundations for WTGs could include bottom-fixed and floating technology. The maximum number of WTGs was reported to be 150 with the Array Area of approximately 429 kilometres squared (km^2), describing an indicative split of up to 111 bottom-fixed foundations and 39 floating foundations. This has since been refined to a maximum of 140 WTGs across both Caledonia North and Caledonia South based on indicative grid connection capacity, bathymetry, optimisation and alignment of early WTG layouts with dominant wind directions and energy yield analysis results.

6.5.1.8 Water depths across the entire Caledonia site range from 39m-102m, generally increasing from North to South. While bottom-fixed foundations may be considered anywhere in the site, (up to 140 WTG), installation of floating WTG is only considered in part of the Caledonia South Site (up to 39 WTG) (see Figure 6-3a).

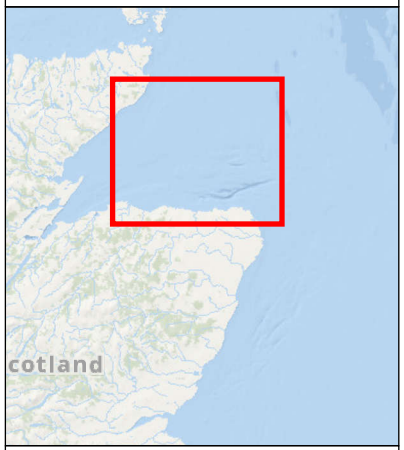
6.5.1.9 Since submission of the Offshore Scoping Report, a number of design refinements have been made in response to technical and environmental studies. Further details regarding the refinement of the Design Envelope (DE) are provided in the following sections in relation to Caledonia North and Caledonia South.



Caledonia South Site

Caledonia South Offshore Export Cable Corridor

Area Suitable for Floating WTG



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CALEDONIA Offshore Wind Farm

ARUP

CONTRACTOR DRAWING NO: UKCAL1_ARP_WNF_ENV_MAP_00299

CONTRACTOR REV: 04

GEODETIC PARAMETERS: WGS 84 / UTM Zone 30N (EPSG:32630)

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Figure 6-3a: Caledonia South

STATUS: Approved

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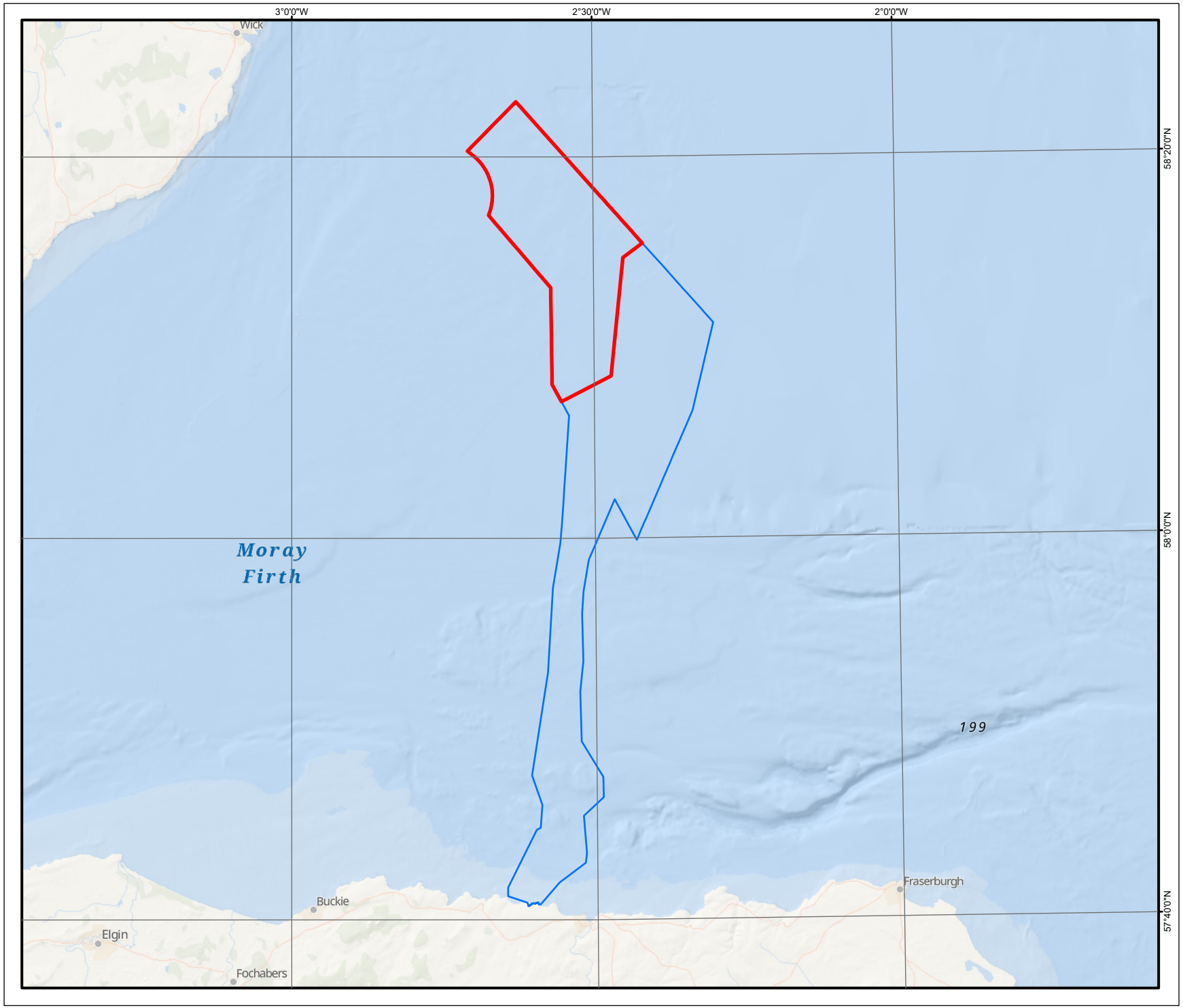
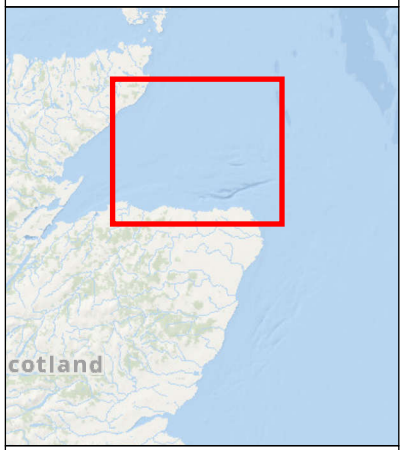


Caledonia North Site

Caledonia North Offshore Export Cable Corridor



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CALEDONIA Offshore Wind Farm

ARUP

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CONTRACTOR REV: 04

GEODETIC PARAMETERS: WGS 84 / UTM Zone 30N (EPSG:32630)

DRAWING TITLE

Figure 6-3b: Caledonia North

STATUS: Approved

SCALE: 1:500,000

DRAWING NUMBER: N/A

SHEET NO: 01 of 01

REV: N/A

Caledonia North Site

6.5.1.10 The Caledonia North Site has a footprint of approximately 218.5km^2. It comprises the relatively shallower waters of the Caledonia OWF and it is therefore proposed to contain bottom-fixed WTG foundation technology only.

6.5.1.11 The Caledonia North Site will have a maximum of 77 bottom-fixed WTG throughout the Array Area.

6.5.1.12 The potential use of Gravity-Based Structures (GBS) as a WTG foundation type was included within the Offshore Scoping Report; however, following further technical screening, this technology has been discounted mainly due to site conditions and water depths. Furthermore, it is recognised that GBS would represent the worst-case scenario for a number of environmental receptors (e.g., benthic subtidal habitats, physical processes) and, therefore, removing this WTG foundation type from the DE is considered to have improved the impact assessment and reduced complexity for stakeholders. Therefore, the potential options for WTG foundations within the Caledonia North Site include the following bottom-fixed technology:

- Jacket with pin piles;
- Jacket with suction caissons; and
- Monopile.

6.5.1.13 The Offshore Scoping Report (Caledonia Offshore Wind Farm Limited, 2022[18]) indicated that the total number of OSPs required to export the power generated by the WTGs from the Array Area would be up to six. This has since been refined down to up to four OSPs, with two associated with the Caledonia North Site. As above, the use of GBS foundation types has also been discounted with regards to OSPs for technical and environmental reasons.

6.5.1.14 Up to five interconnector cables linking the OSPs were included in the Offshore Scoping Report (Caledonia Offshore Wind Farm Limited, 2022)[18], with a total length of up to 135 kilometres (km). This has since been refined down to two interconnector cables, one of which will be associated with the Caledonia North Site connecting the two OSPs, with a total length of up to 30km. This has greatly reduced the number and length of interconnector cables to be installed since scoping, effectively due to the reduced number of OSPs included within the DE. It is also noted that it is not planned to connect OSPs between the Caledonia North Site and the Caledonia South Site.

6.5.1.15 At scoping, inter-array cables were identified at a maximum total length of 720km, noting this related to the full NE4 Plan Option. With regards to the Caledonia North Site, it is assumed that up to 360km of inter-array cables will be installed.

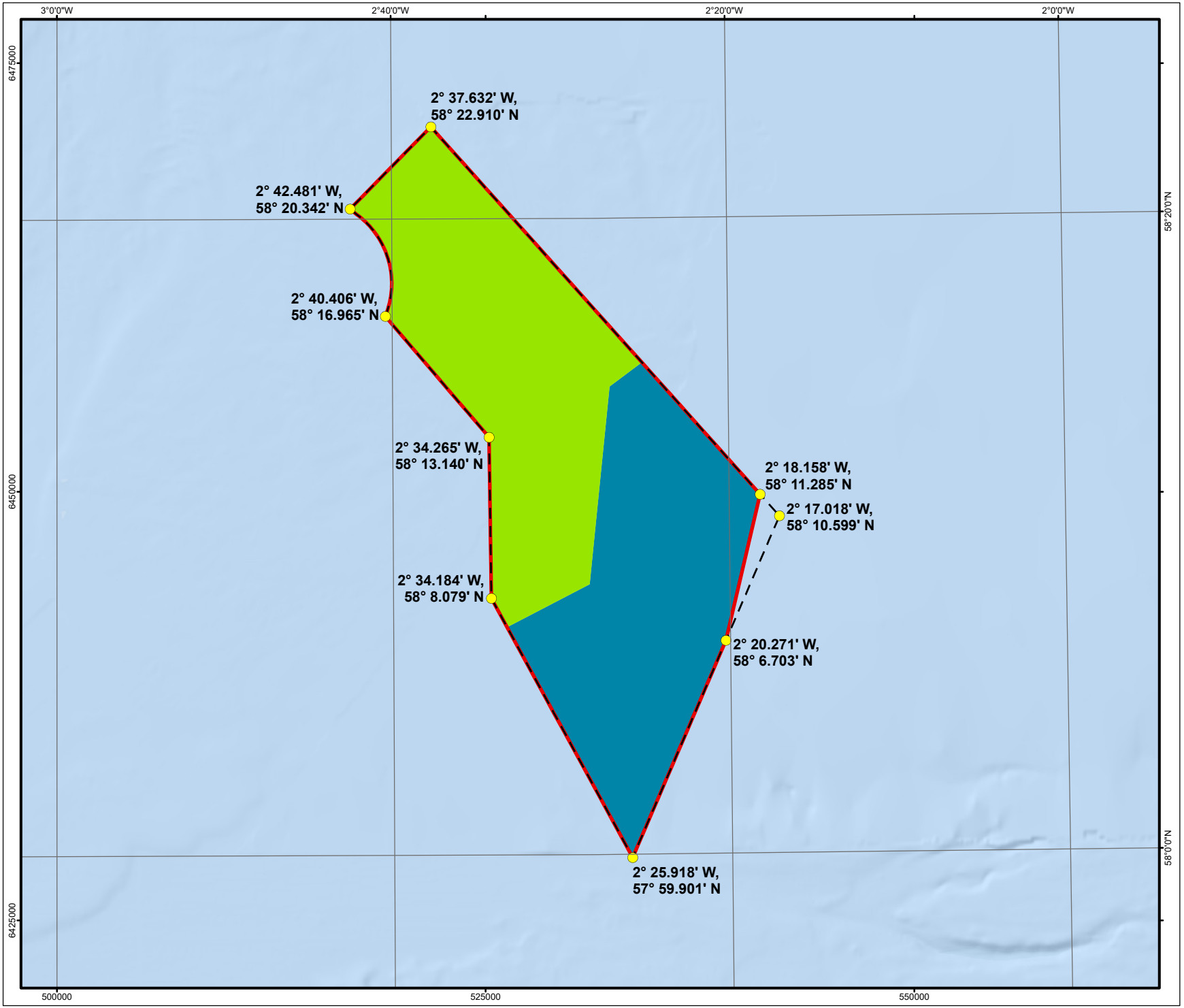
Caledonia South Site

6.5.1.16 The Caledonia South Site has a footprint of approximately 204.5km^2. The DE for the Caledonia South Site includes either bottom-fixed WTG foundation technology only or a combination of bottom-fixed and floating technologies.

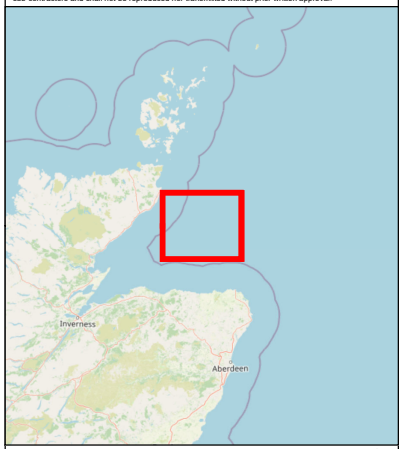
6.5.1.17 The Caledonia South Site will have a maximum of 78 WTG which will be either bottom-fixed foundation only or a combination of bottom-fixed and floating.

6.5.1.18 The Caledonia South Site has been reduced by approximately 6km^2 in the context of the Array Area presented at the Offshore Scoping stage (noting this captured the full NE4 Plan Option; see Figure 6-4). The south-eastern area of Caledonia South, was reduced following consultation with commercial fisheries stakeholders (including the review of available Automatic Identification System (AIS), Vessel Monitoring System (VMS) and landings data) in combination with the consideration of technical constraints. It was also recognised that additional significant engineering and operational challenges may be encountered in this south-eastern area. In particular, steep slopes can create challenges for anchoring and mooring of floating WTG foundation technology, and this area could present challenges with regards to a consistent mooring arrangement/design across the overall Caledonia South Site. Furthermore, steep slopes may complicate the installation of anchoring systems or increase the risk of foundation instability. Similar challenges also may be encountered during cable installation, making it more difficult to achieve and maintain proper burial and protection from erosion.

6.5.1.19 Volume 4, Chapter 8: Commercial Fisheries provides further details on the removal of an important nephrops (langoustine or prawn) trawling fishing ground as a part of the design mitigation for the Caledonia South Site.



Original Caledonia OWF
Revised Caledonia OWF
Caledonia North Site
Caledonia South Site



0 2 4 6 8 10 km

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
01	16/09/2024	Approved	EV	BB	DH

CALEDONIA Offshore Wind Farm

GoBe APEMGroup

CONTRACTOR DRAWING NO: UKCAL1_GO_WNF_GEN_MAP_00001
CONTRACTOR REV: 01

GEODETIC PARAMETERS: WGS 84 / UTM zone 30N (EPSG: 32630)

DRAWING TITLE

Figure 6-4: Array Area Evolution

STATUS: Approved
SCALE: 1:300,000
DRAWING NUMBER: N/A
SHEET NO: 01 of 01
REV: N/A

6.5.1.20 The potential use of GBS identified within the Offshore Scoping Report was discounted following further technical screening, mainly due to the site conditions and water depths. Furthermore, it is recognised that GBS would represent the worst-case scenario for a number of environmental receptors (e.g., benthic subtidal habitats, physical processes) and, therefore, removing this WTG foundation type from the DE is considered to have improved the impact assessment and reduced complexity for stakeholders. In addition, a floating barge option was removed from the DE pre-scoping given the highly mobile conditions in the Moray Firth which would not be conducive to the use of this foundation type. The floating barge is also relatively immature technology and would not be suitable for the installation of large WTGs included within the DE for the Caledonia South Site. Therefore, the potential options for WTG foundations within the Caledonia South Site include the following:

- Jacket with pin piles (bottom-fixed);
- Jacket with suction caissons (bottom-fixed);
- Monopile (bottom-fixed);
- Fully-restrained platform (bottom-fixed);
- Semi-submersible (floating); and
- Tension leg platform (floating).

6.5.1.21 The Offshore Scoping Report (Caledonia Offshore Wind Farm Limited, 2022[18]) indicated that the total number of OSPs to export the power generated by the WTGs from the Array Area would be up to six. This has since been refined down to up to four OSPs, with two associated with the Caledonia South Site. As above, the use of GBS foundation types has also been discounted with regards to OSPs for technical and environmental reasons (note, OSP foundations will use bottom-fixed technology only).

6.5.1.22 Up to five interconnector cables linking the OSPs were included in the Offshore Scoping Report (Caledonia Offshore Wind Farm Limited, 2022[18]), with a total length of up to 135km. This has since been refined down to two interconnector cables, one of which will be associated with the Caledonia South Site connecting the two OSPs with a total length of up to 30 km. This has greatly reduced the number and length of interconnector cables to be installed since scoping, effectively due to the reduced number of OSPs included within the DE. It is also noted that it is not planned to connect OSPs between the Caledonia South Site and the Caledonia North Site.

6.5.1.23 At scoping, inter-array cables were identified at a maximum total length of 720km, noting this related to the full NE4 Plan Option. With regards to the Caledonia South Site, it is assumed that up to 365km of inter-array cables will be installed.

6.5.2 Offshore Export Cable Corridor and Landfall Site

Scoping Boundary

6.5.2.1 The Offshore Export Cable Corridor (OECC) is the area within which the Offshore Export Cables will be installed from the OSPs to the Transition Joint Bays (TJBs) at the Landfall Site. The Offshore Scoping Report (Caledonia Offshore Wind Farm Limited, 2022[18]) identified the OECC, as shown in Figure 6-2.

6.5.2.2 Site selection of the OECC was informed by the recommendation in the HND that the Proposed Development would connect into the New Deer substation.

6.5.2.3 20 potential landfall locations were identified along a stretch of Aberdeenshire coastline (see Figure 6-5).

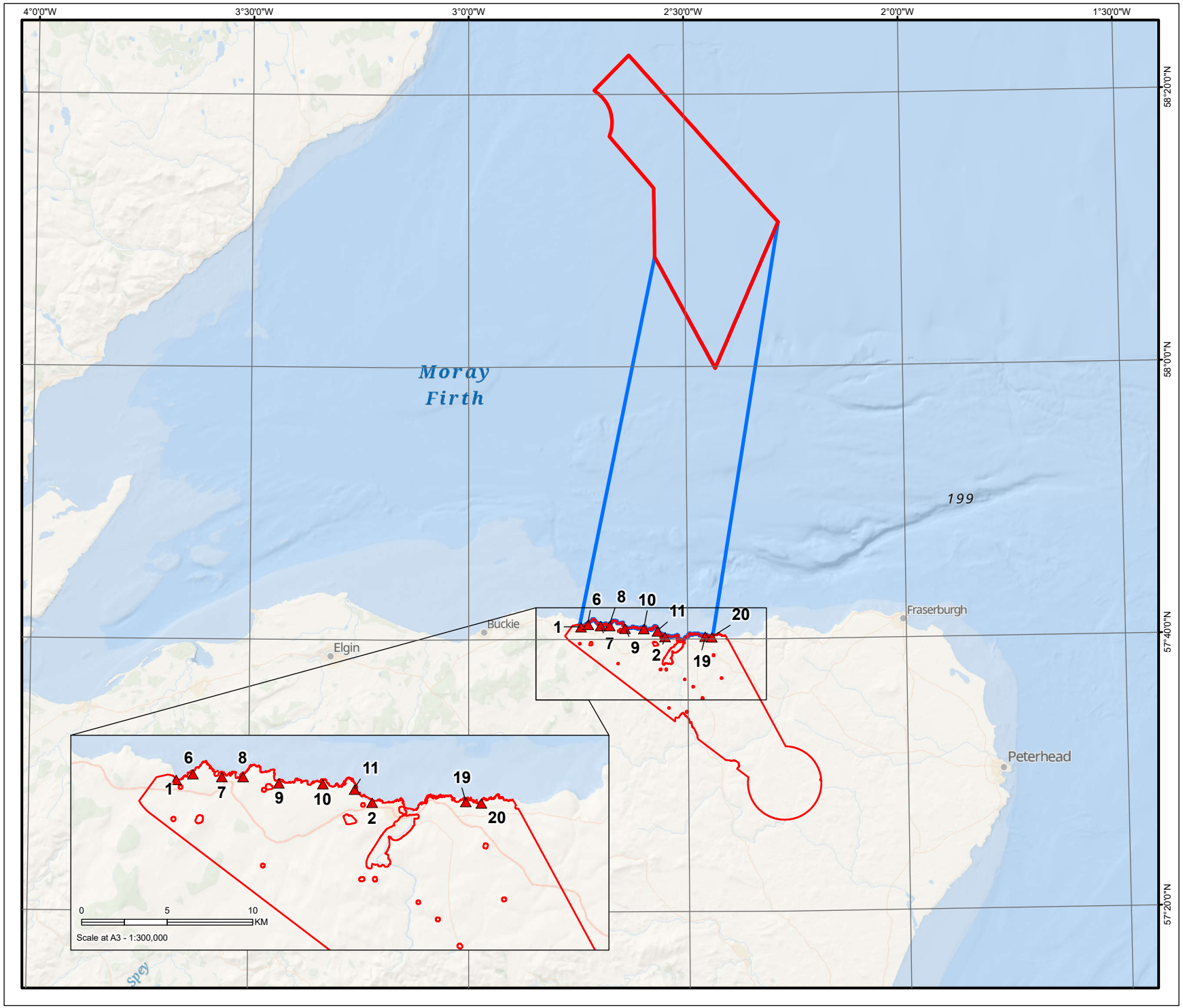
6.5.2.4 A feasibility and screening assessment was undertaken for these possible landfall locations, to confirm their suitability for inclusion as potential landfall locations within the EIA Scoping corridor.

6.5.2.5 Each landfall location was the subject of a desk-based constraints mapping exercise using third party publicly available data. The findings of the review was used to inform a Red Amber Green (RAG) assessment. The criteria considered as part of the RAG assessment is provided within Volume 7A, Appendix 6-1: Landfall Appraisal RAG Criteria, and summarised below:

- Ground conditions and topography:
    - The suitability of ground conditions for open cut/trench; and
    - The suitability of ground conditions for Horizontal Directional Drilling (HDD).
- Access:
    - Access for cable vessels / barges;
    - Area and availability of space for Transition Joint Bay and 100m wide working corridor; and
    - Access to shoreline / intertidal area.
- Environmental and planning considerations:
    - Natural heritage and water environment, consideration of the distance of proposed locations from internationally, nationally and locally protected sites such as Special Protection Areas (SPA), Special Areas of Conservation (SAC), Sites of Special Scientific Interest (SSSI), Ramsar and ancient woodland;
    - Cultural heritage, consideration of the distance of proposed locations from Scheduled Monuments, Listed Buildings and Conservation Areas;

- People/land use, consideration of potential conflicts with existing infrastructure, distance from residential properties and sensitive land uses and core paths/recreational routes; and
- Planning, consideration of potential conflicts with planning policy or committed developments.

6.5.2.6 Following this appraisal, a landfall area of search between Sandend and Old Haven was identified for inclusion within the Offshore Scoping Report (Caledonia Offshore Wind Farm Limited, 2022[18])and the Onshore Scoping Report (Caledonia Offshore Wind Farm Limited, 2023[19]) which encompassed 10 short listed landfall locations.

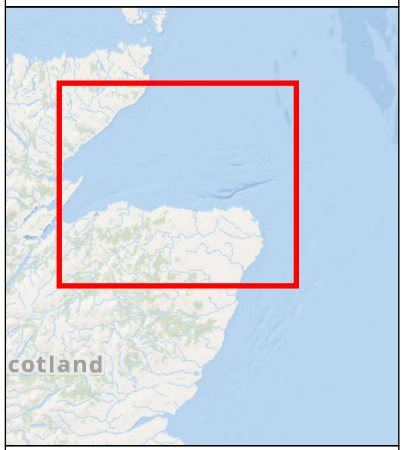


Offshore Scoping Area - Array Area

Offshore Scoping Area – Offshore Export Cable Corridor

Onshore Scoping Area

Potential Landfall Sites



0 5 10 15 20 km

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
04	30/08/2024	Approved	AC	GS	EC
03	20/08/2024	For Review	AC	GS	EC
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01	04/06/2024	For Review	DM	JN	EC

CALEDONIA Offshore Wind Farm

ARUP

CONTRACTOR DRAWING NO: UKCAL1_ARP_WNF_ENV_MAP_00300

CONTRACTOR REV: 04

GEODETIC PARAMETERS: WGS 84 / UTM Zone 30N (EPSG:32630)

DRAWING TITLE

Figure 6-5: Landfall Location Longlist

STATUS: Approved

SCALE: 1:700,000

DRAWING NUMBER: N/A

SHEET NO: 01 of 01

REV: N/A

Consent Application Boundary

6.5.2.7 This relatively wide OECC presented within the Scoping Report was refined ahead of planned geophysical and environmental survey works in 2023. The refinement process involved further constraints analysis and extensive engagement with the commercial fishing industry.

6.5.2.8 The Applicant commissioned a technical and environmental study to review the ten shortlisted landfall locations between Sandend Bay and Old Haven, completed by HDD experts Riggall and Associates, at the following locations:

- Sandend;
- Redhythe;
- Portsoy West;
- Portsoy East;
- Boyne Bay;
- Stake Ness;
- Whitehills;
- Boyndie Bay (short and long HDD options considered);
- Cornhill (Bay of Cullen); and
- Old Haven.

6.5.2.9 This study involved further desk-based assessment and on-site ground-truthing. As a consequence of this assessment, the most easterly landfall locations of Cornhill (Bay of Cullen) and Old Haven were removed due to technical difficulties with the HDD installation around cliff elevation and the potential risk of drill fluid loss, the proximity of a tanker anchoring location, a dredge area and steep slopes within the Southern Trench.

6.5.2.10 In parallel, the Applicant commissioned an Export Cable Routeing study by the Vysus Group, a survey and geo-engineering consultancy. This study identified potential technically feasible export cable routes and survey corridors to eight pre-selected HDD offshore exit points from within the Offshore Scoping Area Export Cable Corridor, based on environmental considerations (e.g., benthic habitat types) and engineering constraints (e.g., bathymetry/topography and ground conditions).

6.5.2.11 Following the completion of these studies, the most westerly landfall location at Sandend was removed due to previous experience of stakeholder feedback from the Moray West OWF, and technical challenges due to HDD length and elevation.

6.5.2.12 In addition to these assessments, the Applicant also carried out wintering bird surveys at the potential landfall locations to understand the potential ecological constraints in each location.

6.5.2.13 Upon the completion of these assessments and surveys, three preferred landfall locations were shortlisted to be taken forward for further analysis: Boyne Bay, Stake Ness and Boyndie Bay. The three remaining landfall locations were subject to additional assessment, through the completion of a technical and commercial appraisal by Marine Construction Management Ltd. This assessment included consideration of the following criteria on a technical and commercial basis:

- Site Establishment;
- Phase 1: HDD Construction;
- Phase 2: Direct Pull In;
- Phase 3: Duct Lowering and Cable Protection; and
- OFTO Considerations.

6.5.2.14 A summary of these assessments undertaken on the three shortlisted landfall locations is provided within Table 6-2. As the appraisal and selection of a landfall site requires consideration and assessment of the onshore impacts caused by the landfall infrastructure and the ONEC, this table also provides the consideration of onshore impacts. This information was obtained from the assessment work undertaken to identify the ONEC as described in Section 6.5.3.

Table 6-2: Summary of landfall locations Appraisal

Landfall location	Summary of appraisal
Boyndie Bay	**Offshore** An Offshore Export Cable in this location would potentially not require to cross any existing infrastructure as it maintains a position to the east of the SHEFA-2 and Moray East OWF cables. The site is however constrained by the space available between the SHEFA-2 subsea cable in the approach towards Banff/Macduff and the presence of an anchorage and marine disposal ground with the risk of snagging within, or close to, an anchorage. Consultants analysed both a 'short' and 'long' HDD options at Boyndie, both options were considered technically unfavourable. The 'short' option was technically unconventional solution insofar as the cable could not be pulled in directly from the cable laying vessel, with a float in section required with post lay burial. The 'long' option required a HDD drive of 1200 metre (m), the longest of all the potential landfall location options. **Onshore** Due to spatial constraints, the HDD compound would be within <250m of several residential receptors and presented challenges around maintaining suitable noise limits during construction.

Landfall location	Summary of appraisal
	As a result of the location of a historic landfill site in proximity to the landfall location, there was also only one feasible route for the ONEC to exit the landfall location. To further avoid adjacent residential properties, this ONEC option would then intersect an area allocated by Aberdeenshire Council within the Aberdeenshire Local Development Plan (LDP) 2023 (Aberdeenshire Council, 2023[20]) as Reserved Land (Site R1) for the expansion of Banff cemetery. To avoid this site would result in reducing the width of the ONEC to 70m in width.
Boyne Bay	**Offshore** The HDD at this location would be 744m in length. Geological conditions also result in a risk of encountering variable bedrock and therefore would be challenging HDD conditions. **Onshore** This location also had a high potential for Unexploded Ordnance (UXO) discovery, due to the proximity to the former Royal Air Force base in Banff. This location was in close proximity (within 500m) to residential properties. There was the potential at this location to encounter features, such as geological , solution features (e.g., karsts and voids) that could result in loss of drilling fluid features, due to proximity (100m) to Boyne Bay Quarry, which would only have been understood through geotechnical investigations. This location had the potential for adverse impact to heritage assets given the proximity to Boyne Castle (approximately 600m).
Stake Ness	**Offshore** Stakeness was the shortest HDD option at 480m, which would equate to shorter construction programme. It also had the lowest expected drilling fluid losses during HDD within bedrock. The geology at this location was identified as being very consistent along the length of the HDD, with a maximum depth of cover at 17m, considerably shallower than the other landfall locations. **Onshore** This landfall location was the furthest site from residential receptors at 600m. This location also had a high potential for UXO discovery, due to the proximity to the former Royal Air Force base in Banff.

6.5.2.15 The preferred Landfall Site for the Proposed Development was identified as Stake Ness.

6.5.2.16 On confirmation of the preferred Landfall Site, the OECC was refined to focus the final approaches to shore at Stake Ness (refer to Figure 6-3a and b). Up to four Offshore Export Cables will be included within the OECC, based on two from the Caledonia North Site and two from the Caledonia South Site (aligning with the maximum number of OSPs; see Section 6.5.1 for more details).

6.5.2.17 The maximum total length of Offshore Export Cables is identified as up to 330km, based on an anticipated total length of up to 180km of offshore export cables associated with the Caledonia North Site and up to 150km of offshore export cables associated with the Caledonia South Site.

6.5.2.18 The Offshore Scoping Area Export Cable Corridor was refined to the current OECC following a review of environmental constraints, seabed conditions and a cable installation feasibility study, which identified the most suitable area based on soil conditions and seabed gradient as well as taking into account potential cable crossings and avoidance of the anchorage area and disposal grounds.

6.5.2.19 The Landfall Site is the interface between the Proposed Development (Offshore) and the Proposed Development (Onshore). Section 6.5.3 outlines how the ONEC has been developed in an iterative fashion to respond to the outcomes of the assessments and decisions related to the development of the OECC, and vice versa.

6.5.3 Onshore Export Cable Corridor

6.5.3.1 The ONEC is the area within which the high voltage buried cable circuits are located between the TJBs at the Landfall Site to the Onshore Substations.

6.5.3.2 The ONEC was identified using a four-stage process which has progressively refined and narrowed the corridor:

- Stage 1 – Identification of an Onshore Scoping Area between potential landfall locations and the Onshore Substation Scoping Area in the vicinity of the New Deer Substation.
- Stage 2 - Identification of a preferred 2km wide ONEC within the Onshore Scoping Area.
- Stage 3 - Identification of a preferred 500m wide ONEC within the 2km wide corridor.
- Stage 4 - Identification of the OnTI Red Line Boundary (RLB).

6.5.3.3 The routing studies and selection process undertaken for each of these stages is detailed below.

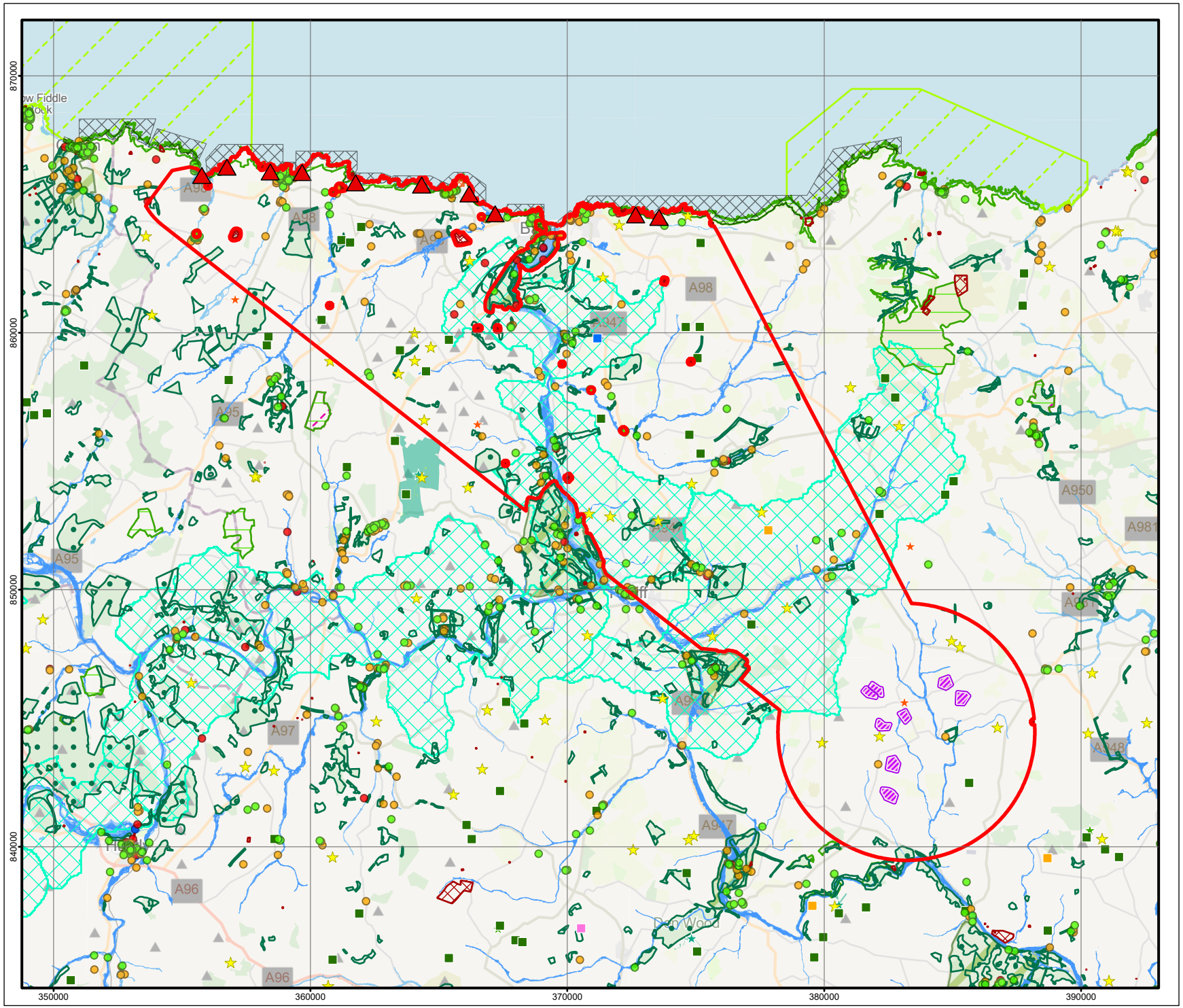
Stage 1 Identification of an Onshore Scoping Area

6.5.3.4 The first stage in defining the ONEC was the identification of the Onshore Scoping Area. The Onshore Scoping Area took the form of a corridor covering 10 of the initial 20 potential landfall locations along the Aberdeenshire coast and the Onshore Substation Scoping Area in the proximity of New Deer, as described in Paragraph 6.5.2.6.

6.5.3.5 The northern part of the Onshore Scoping Area extended across approximately 22km of Aberdeenshire coastline between. From the northern extent the area ran approximately 33km inland towards New Deer substation. At its narrowest point the Onshore Scoping Area measured approximately 7km, refer to Figure 6-6.

6.5.3.6 The Onshore Scoping Area avoided overlaps with statutory designated sites such as SPA, SAC, Ramsar sites and National and Local Nature Reserves. The corridor was also refined to avoid direct impacts on Scheduled Monuments and Gardens and Designed Landscapes.

6.5.3.7 The maximum design parameters considered to identify potential routing options were up to six onshore export cable circuits with a nominal voltage of up to 275 kiloVolt (kV), routed within the Onshore Scoping Area inland to the Onshore Substations.



- Onshore Scoping Area
- Phase 2 Substation Site Selection Areas
- Potential Landfall Site

Cultural Heritage

- Category A Listed Building
- Category B Listed Building
- Category C Listed Building
- Property In Care
- Conservation Area
- Scheduled Monument (Polygon)
- Garden / Designed Landscape
- Geological Conservation Review Site

Environmental Designations

- Ancient Woodland Inventory
- Sites of Special Scientific Interest
- Special Protection Areas
- Special Area of Conservation
- Protected Drinking Water Catchment

Energy Site

- Battery
- Biomass (dedicated)
- Solar Photovoltaics
- Wind Onshore
- Wind Turbine Application - Live Consent
- Wind Turbine Application - Operational
- Wind Turbine Application - Under Construction
- Wind Turbine Application - Undetermined

Flood Risk Area

- River Flood Extent - High Likelihood
- River Flood Extent - Medium Likelihood
- River Flood Extent - Low Likelihood
- Coastal Flood Risk Extent

0 2 4 6 8 km

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
04	30/08/2024	Approved	AC	GS	EC
03	20/08/2024	For Review	AC	GS	EC
02	23/07/2024	For Review	AC	GS	GS
01	02/04/2024	For Review	CE	GS	GS

CALEDONIA Offshore Wind Farm

ARUP

CONTRACTOR DRAWING NO: UKCAL1_ARP_WNF_ENV_MAP_00303

CONTRACTOR REV: 04

GEODETIC PARAMETERS: OSGB36 / British National Grid (EPSG:27700)

DRAWING TITLE

Figure 6-6: Onshore Scoping Area and Constraints Mapping

STATUS: Approved

SCALE: 1:200,000

DRAWING NUMBER: N/A

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Stage 2 Identification of a preferred 2km wide Onshore Export Cable Corridor

6.5.3.8 Stage 2 involved the refinement of the Onshore Scoping Area. This process occurred following the shortlisting of the three preferred landfall locations, as described in Paragraph 6.5.2 and in parallel with the Onshore Substation Site selection process, as described in Section 6.5.4. A desk-based study was undertaken using a range of publicly available information, imported into a geographical information system (GIS) model and a number of buffers implemented for each parameter.

6.5.3.9 Following completion of the GIS modelling the data was reviewed and a total of five potential 2km wide corridors were identified from within the Onshore Scoping Area, which routed from the three preferred landfall locations to the potential onshore Substation Sites.

6.5.3.10 The high-level RAG assessment criteria is set out within Volume 7A, Appendix 6-1: Landfall Appraisal RAG Criteria and considered the following criteria:

- Encompass the three shortlisted landfall locations and the potential onshore Substation Sites in the vicinity of New Deer;
- Take the most direct corridor from the landfall location where possible;
- Avoid settlements;
- Avoid environmentally designated or sensitive areas or Salmon River crossings;
- Avoid areas of Ancient Woodland Inventory woodland;
- Avoid areas of forestry / plantation where possible, if not possible then areas of tree felling to be minimised;
- Avoid areas identified as safeguarded for minerals;
- Avoid areas of steep terrain;
- Avoid onshore wind farms; and
- Minimise crossings of other infrastructure such as overhead lines and underground power cables.

6.5.3.11 It also considered the following:

- Cultural heritage – proximity to known designated heritage assets such as World heritage Sites, Listed Buildings (Category A, B and C), Scheduled Monuments and Inventory gardens and Designated Landscapes and inventory Battlefields;
- Hydrology – proximity to areas of flood risk and the need for watercourse crossings;

- Geology and soils – proximity to geological conservation review sites, geological SSSIs and the potential for deep peat and priority peatland; and
- Planning policy/development planning – potential conflicts or synergies with permitted planning applications and local authority adopted/proposed planning allocations.

6.5.3.12 During the RAG assessment several parameters enclosed the wider scoping area and impacted all potential corridor options. These included Drinking Water Protected Areas, 15km wide European designations including Ramsar, SPA and SAC and watercourses including the River Deveron and subsequent tributaries. These constraints were therefore not differentiators between the identified options.

6.5.3.13 The preferred 2km wide corridor route identified was relatively flat with a maximum slope steepness between 10 and 12 degrees and avoided gas pipelines or gas sites. The preferred option also created a shorter, more direct route from the landfall to substation.

Stage 3 Identification of a preferred 500m wide Onshore Export Cable Corridor

6.5.3.14 Following the identification of a preferred 2km wide Onshore Export Corridor further refinement was undertaken at Stage 3 to identify a 500m wide corridor option.

6.5.3.15 At this stage no preferred Landfall Site or Onshore Substation Site had been identified and therefore options were required to provide flexibility on which shortlisted landfall locations/Onshore Substation Sites they encompassed. The following criteria were considered when developing the 500m wide corridor options:

- Engineering Criteria
    - Minimise number of Class A (major) road-crossings;
    - Minimise number of crossings of major watercourses;
    - Where possible, avoid landfill sites;
    - Where possible, avoid areas at risk of flooding; and
    - Where possible, avoid terrain/slopes greater than 15° from horizontal.
- Land-Use and Planning Constraints
    - Minimise number of crossings of core-paths and cycle routes;
    - Minimise number of crossings of the Moray East cable and avoid where possible;
    - Where possible, avoid woodland;
    - Where possible, avoid cemeteries; and

- Where possible, avoid "prime agricultural land" (classes 1 to 3.1).

- Environmental Constraints / Designations
  - Where possible, avoid SSSI (including 100m buffer for potential habitats);
  - Where possible, avoid Ancient Woodland (including 50m buffer);
  - Where possible, avoid geological conservation review sites;
  - Where possible, avoid Scheduled Monuments;
  - Where possible, avoid Inventory Gardens and Designed Landscapes;
  - Where possible, avoid Listed Buildings;
  - Where possible, avoid Conservation Areas; and
  - Where possible, avoid settlements.

6.5.3.16 Using the above criteria, eight corridor options were developed and were the subject to site visits to ground truth the desk based assessment, and a RAG scoring appraisal.

6.5.3.17 Site visits focussed on the key sections of the corridors where more complex engineering requirements were identified to potentially be required, such as areas of steep terrain, the landfall sites, substation sites, and at road crossings and watercourse crossings. Potential pinch-points and bottlenecks were also targeted during the site visit, where the presence of constraints realistically gave less than 500m width within the corridor.

6.5.3.18 The RAG scoring appraisal tested and challenged the eight corridor options against a broader range of technical and environmental criteria. The RAG appraisal was undertaken to identify the constraints and challenges affecting each corridor option, and to assess the extent to which these challenges could adversely impact the buildability and consentability of the options. The 500m wide corridor RAG scoring appraisal included the following criteria in addition to the criteria listed in 6.1:

- Additional engineering criteria:
  - Proximity to existing structures and infrastructure within the corridors, such as wind turbines, pylons, and communications masts;
  - Areas of recorded land sliding and instability;
  - Areas of shallow rock;
  - Areas of potentially contaminated land; and

- Areas of poor ground conditions such as compressible alluvium and peat.

- Additional land-use and planning criteria:
  - Areas of Mineral Safeguarding and Areas of Search for Minerals;
  - Residential Properties, including 50m and 100m buffer zones around properties;
  - Other (non-residential) buildings; and
  - Relevant proposals in the planning system, including recently consented projects and developments.
- Additional environmental criteria:
  - Private Water Supply abstractions;
  - Wells and Pumps (possible unregistered abstractions) from Ordnance Survey data; and
  - Drinking Water Protected Areas.

6.5.3.19 Following the RAG Appraisal and site visits to ground truth desk based information, three corridors were taken forward for further evaluation:

- Option 1: Boyne Bay Landfall to Site 5 or Burnside Substation;
- Option 3: Stake Ness Landfall to Site 5 or Burnside Substation; and
- Option 7: Boyndie Bay Landfall to Site 5 or Burnside Substation.

6.5.3.20 Although the corridors taken forward for further evaluation all terminated at Burnside or Site 5, given the geographical proximity to Site 1a/1b, the corridors were considered suitable for all of the Preferred Onshore Substation Sites.

6.5.3.21 Modifications were made to the shortlisted corridor options in vicinity of constrained areas and at key crossings, to give greater optionality for future development of corridors during the next stage.

Stage 4 Identification of the OnTI RLB

6.5.3.22 Stage 4 involved the refinement of the preferred 500m wide corridor to the OnTI RLB (refer to Figure 6-7). This stage was completed on confirmation of the preferred Landfall Site and Onshore Substation Site.

6.5.3.23 The preferred 500m wide corridor was refined based on environmental and engineering criteria as well as taking into consideration site specific inputs. This involved consideration of the following:

- Avoidance of buildings, including residential properties;
- Minimising the areas of woodland within the corridor;
- Aligning where possible to field boundaries;

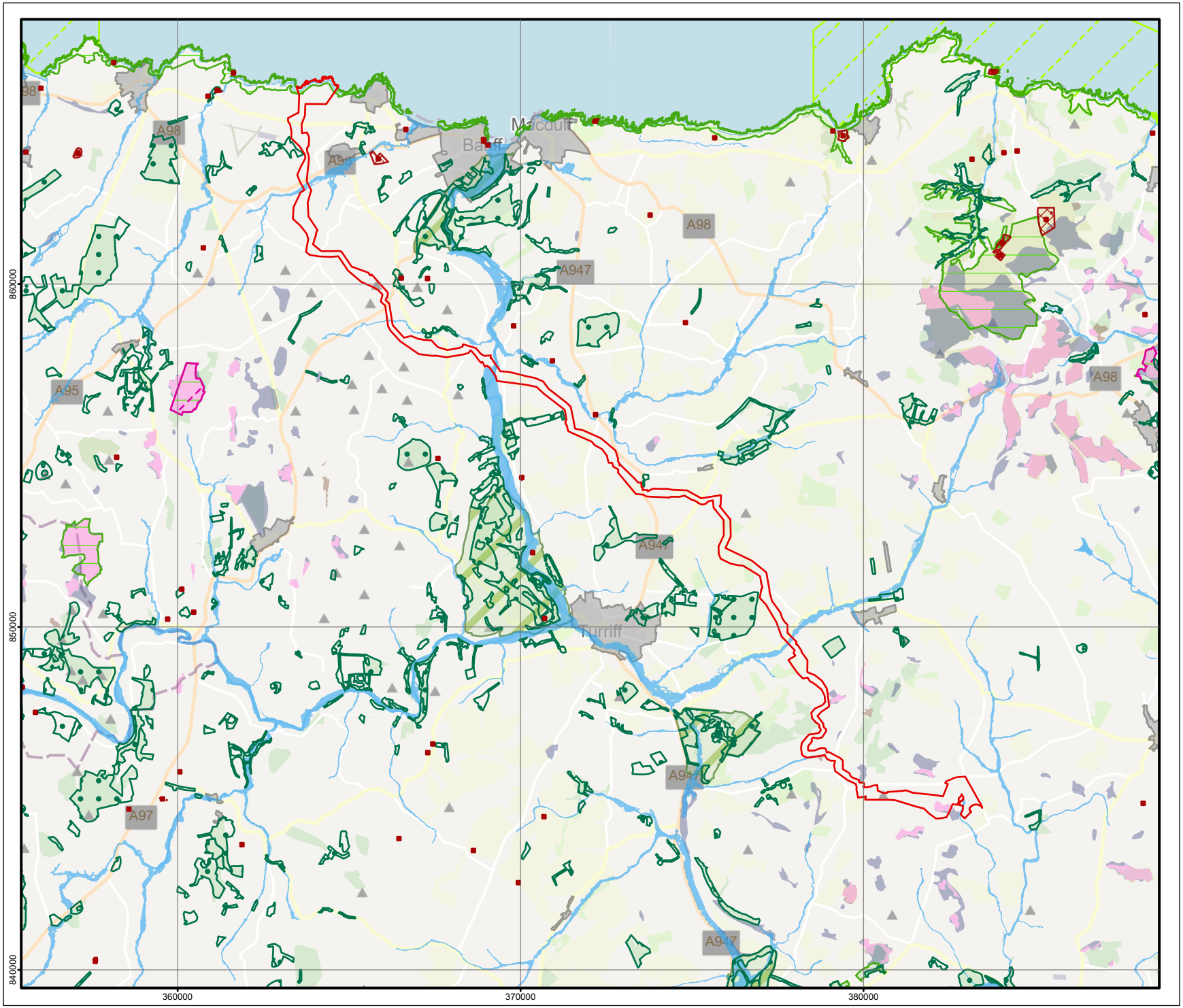
- Minimising the areas of potential peatland within corridor;
- Cable drum size and how these will be transported to site and stored at construction compounds or satellite compounds;
- The spacing of jointing bays and the consideration of appropriate access locations;
- The spacing of temporary construction compounds and the consideration of appropriate access locations;
- Road width to understand whether a Heavy Goods Vehicle carrying a cable drum would be able to access certain areas;
- Construction methodology requirements such as open cut trenching and HDD;
- Watercourse crossings requirements;
- Results of the Phase 1 Habitat Survey;
- Information provided by landowners through the public consultation process; and
- Haul road spacing requirements.

OnTI RLB Refinements Following Pre-Application Consultation

6.5.3.24 As outlined in Volume 1, Chapter 8: Stakeholder Engagement and Consultation and Application Document 1: Pre-Application Consultation Report, pre-application public consultation events were held in April 2024 to provide feedback to the public on the development of the EIA and the Proposed Development design. Two combined offshore and onshore feedback events were held in Banff and New Deer and provided members of the public the opportunity to comment on the refined Proposed Development design.

6.5.3.25 Through the public engagement, feedback was received from a landowner in proximity to the existing New Deer substation about the potential for the ONEC to sterilise their business due to the specific nature of their farming operations. As a result, to avoid this potential risk the OnTI RLB was extended to the south to allow greater opportunity for the Onshore Export Cable Route to be designed to minimise or avoid these impacts during the detailed design process.

6.5.3.26 Additionally, feedback from landowners gathered through these events helped inform further minor changes to the RLB to ensure optimal ONEC alignment taking into account local information.



Onshore Transmission Infrastructure Red Line Boundary

Cultural Heritage

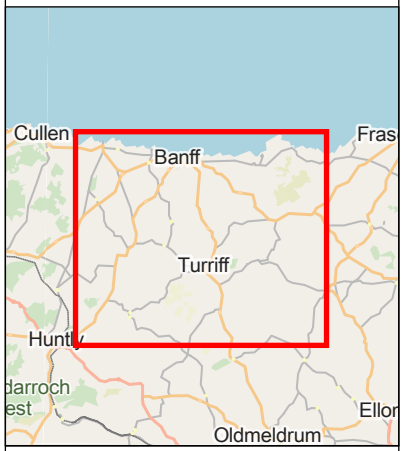
- Scheduled Monument (Point)
- Scheduled Monuments (Polygon)

Environmental Designations & Land Use

- Ancient Woodland Inventory
- Garden / Designed Landscape
- Site of Special Scientific Interest
- Special Protection Areas
- Special Area of Conservation
- River & Coastal Flood Risk
- Urban Settlement

Carbon & Peatland 2016 Map

1 2 3 5



0 1 2 3 4 5 km

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
04	30/08/2024	Approved	AC	GS	GS
03	20/08/2024	For Review	AC	GS	GS
02	23/07/2024	For Review	AC	GS	GS
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CALEDONIA Offshore Wind Farm

ARUP

CONTRACTOR DRAWING NO: UKCAL1_ARP_WNF_ENV_MAP_00304	CONTRACTOR REV: 04
GEODETIC PARAMETERS: OSGB36 / British National Grid (EPSG:27700)	

DRAWING TITLE

Figure 6-7: Refined OnTI RLB and Constraints Mapping

STATUS: Approved	SCALE: 1:150,000	
DRAWING NUMBER: N/A	SHEET NO: 01 of 01	REV: N/A

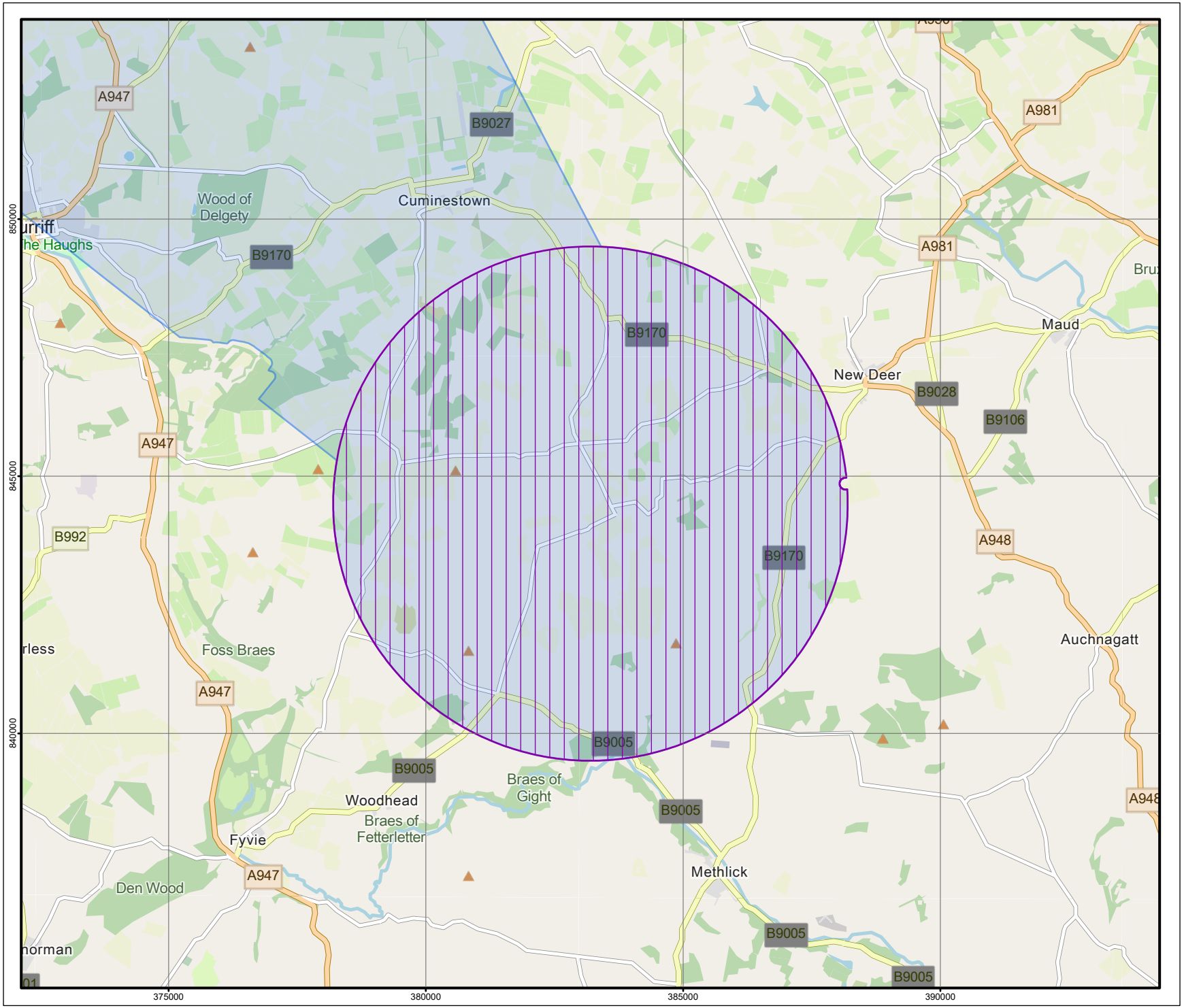
6.5.3.27 The OnTI RLB comprises a corridor that runs approximately 37km between the Landfall Site and the Onshore Substation Site, and from the Onshore Substation. This corridor varies in width from approximately 500m to 100m. It should be noted that installation of the cable circuits are expected to only require a corridor around 100m wide known as the working width. The exact location and arrangement of the Onshore Export Cables within the ONEC will be determined at detailed design following further technical studies.

6.5.3.28 The OnTI RLB also comprises the Onshore Grid Connection Cable Corridor, from between the Onshore Substation and the Grid Connection Point, which is a distance of approximately 300m. The Onshore Grid Connection Cable Corridor between the Onshore Substation and Greens Substation, which may also be required to facilitate the connection to the NETS of the Proposed Developments second phase, that would be subject to a second planning application when the location of Greens Substation has been confirmed.

6.5.4 Onshore Substation Site

6.5.4.1 The preferred location for any offshore wind farm substation is adjacent, or as near as possible, to the Grid Connection Point where it will connect to the NETS. Section 4.1.3 of Volume 1, Chapter 4: Proposed Development Description (Onshore) provides detail on the Proposed Developments (Onshore) Grid Connection Point. The Applicant commenced the substation site selection process in the summer of 2022, at this point the location of the Grid Connection Point was understood to be the existing New Deer substation, as recommended in the Holistic Network Design. The Applicant was aware that a new substation was also to be constructed by Scottish and Southern Electricity Networks - Transmission (SSEN-T), called New Deer 2 which later became known as Greens substation, to facilitate the connection of new renewable generation onto the NETS.

6.5.4.2 Through discussions with SSEN-T the project understood that these two assets would be electrically connected and that therefore it was likely that Greens would be situated in a proximal location to New Deer. In order to ensure that the substation site selected would be suitable for either a connection to New Deer or Greens, or a split between both, a 6km diameter search area around the existing New Deer substation (the Onshore Substation Scoping Area) was defined to inform the Onshore Substation Site search, refer to Figure 6-8. Paragraph 6.5.4.25 to 6.5.4.30 of this chapter provide further detail on the suitability of the site selected to accommodate both a connection to New Deer and Greens.



Onshore Substation Scoping Area

Onshore Scoping Area

0 1 2 3 4 km

REV	DATE	DOC STATUS	ORIGIN	REVIEW	APP
04	30/08/2024	Approved	AC	GS	GS
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CALEDONIA Offshore Wind Farm

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GEODETIC PARAMETERS: OSGB36 / British National Grid (EPSG:27700)

DRAWING TITLE

Figure 6-8: Onshore Substation Scoping Area

STATUS: Approved

SCALE: 1:100,000

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SHEET NO: 01 of 01

REV: N/A

6.5.4.3 A substation site selection appraisal was undertaken, commencing in the summer of 2022.

6.5.4.4 The substation site selection appraisal followed the following key stages:

- Site identification and site survey. This stage involved the identification of potential sites within the Onshore Substation Scoping Area and the undertaking of site visits to confirm desk-based data review and assumptions. Following these site visits a shortlist of suitable sites for appraisal was identified;
- Site appraisal. This stage involved the environmental and technical appraisal of identified shortlisted sites; and
- Preferred Onshore Substation Site selection. This stage involved the refinement of identified shortlisted sites to the preferred Onshore Substation Site.

Site Identification and Site Survey

6.5.4.5 A robust appraisal in line with the National Grid Horlock Rules (National Grid, 2009[21]) was applied to identify potential substation sites within the Onshore Substation Scoping Area.

6.5.4.6 Due to the rolling nature of the landform within the Onshore Substation Scoping Area it was considered important to be able to identify at an early stage the suitability of areas based on the need to achieve relatively large, flat sites for the substation. This is to avoid extensive areas of cut and fill which would be likely to result in increased land take requirements and engineering solutions and lead to greater landscape and visual effects.

6.5.4.7 Through a previous substation site selection process undertaken for the Moray East project, the Applicant was aware of a potential substation site (referred to as Burnside). A search for other sites within the Onshore Substation Scoping Area that could provide a minimum area of 75,000m^2 commenced with an emphasis on the potential landscape and visual effects of the onshore substation. Consideration was given to the initial following objectives:

- Minimisation of the need for cut/fill. Identification of areas where there is a high proportion of the land with a rise of <2.5%;
- Identification of areas where a site would sit less prominent in the wider landscape and have limited visibility in the area. Consideration of the wider landscape and landform (hill, valley etc.) and how a site may sit within it;
- Identification of areas with no residential properties within 50m. Where properties are within 250m buffer further analysis was undertaken on aspect, orientation and potential impacts on properties to identify potential significant constraints to progression of the location; and

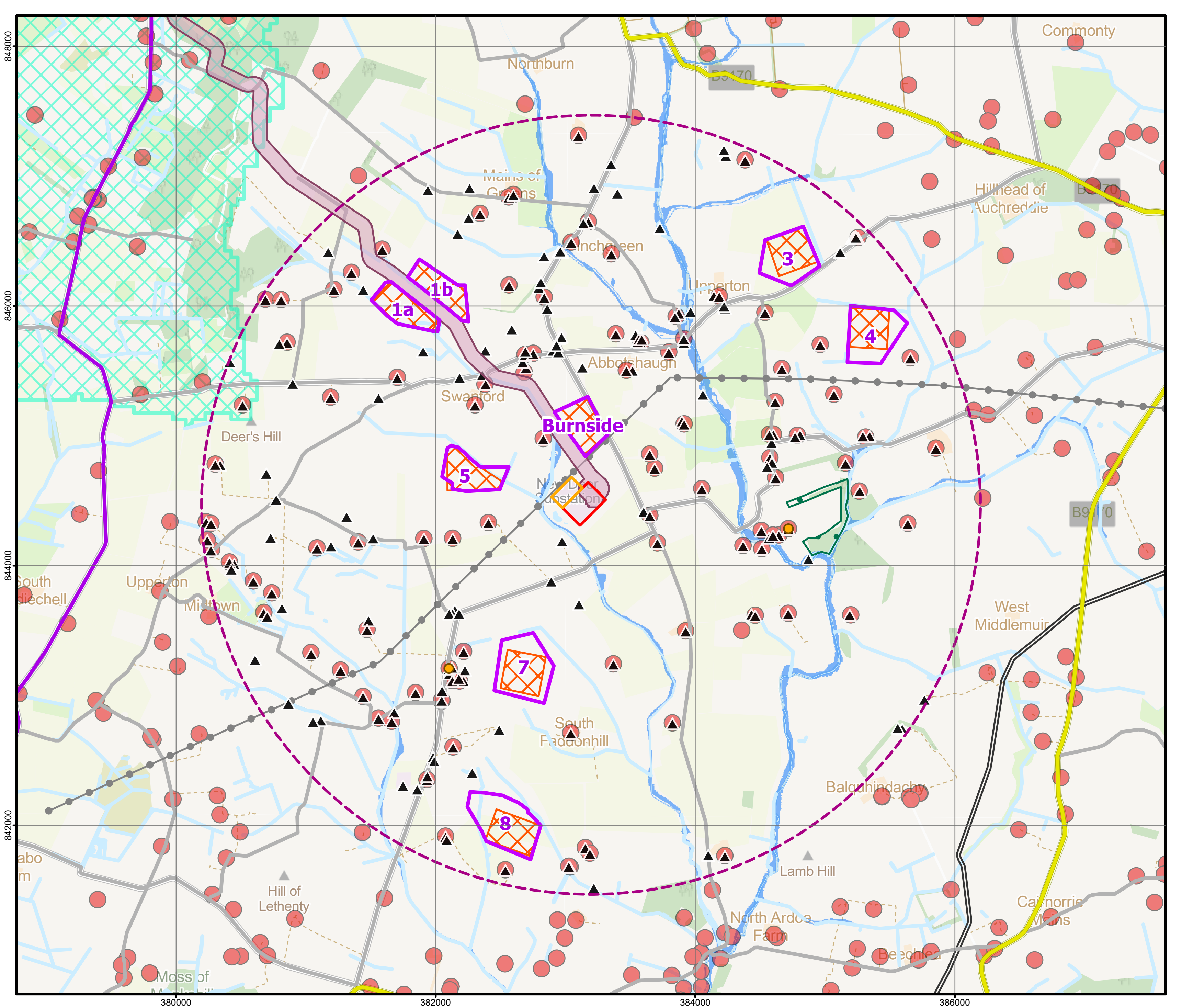
- Technical constraints including the location of the Moray East substation and cable corridor, New Deer substation, existing overhead transmission lines and other utility routes.

6.5.4.8 Based on these objectives nine potential sites were identified. Sites were then visited to confirm desk-based data review and assumptions. As a result, three sites were discounted from further consideration for the following reasons:

- One site was identified as having a level change of approximately 20m which would require large amounts of cut and fill to achieve the relatively flat area required;
- One site was identified as being visible on higher ground. In addition, falling landform at the site would not leave sufficient flexibility of space for elements such as Sustainable Drainage Systems (SuDs) and landform changes without encroaching closer to nearby residential properties; and
- One site was discounted on the basis of potential landscape and visual impacts

6.5.4.9 An identified site was also split into two areas in response to the site location in proximity to the Moray East cable corridor.

6.5.4.10 The shortlist of seven sites and Burnside, shown in Figure 6-9, was then subject to a high-level environmental appraisal.



Onshore Substation Scoping Area
Identified Suitable Substation Location
Shortlisted Substation Site
Moray East Substation
New Deer Substation
Moray East Cable Route (50m buffer)

Natural & Built Environment

Property
Category B Listed Building
Ancient Woodland

Infrastructure & Transport

B Road
Minor Road
Aberdeenshire Cycle Route
Overhead Line
Gas Pipeline

Hydrology

Private Water Supplies
Surface Water (Line)
Surface Water (Area)
High Likelihood Flooding (1 in 10 year event)
Protected Drinking Water Area Catchments

0 200 400 600 800 1,000 m

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CALEDONIA Offshore Wind Farm

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GEODETIC PARAMETERS: OSGB36 / British National Grid (EPSG:27700)

DRAWING TITLE

Figure 6-9: Substation Site Short List and Constraints Mapping

STATUS: Approved
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DRAWING NUMBER: N/A
SHEET NO: 01 of 01
REV: N/A

Site Appraisal

6.5.4.11 Each shortlisted site was considered using a RAG assessment methodology, provided within Volume 7A, Appendix 6-3: Substation Site Appraisal RAG Criteria. This RAG appraisal built on the Applicants experience and data gathered as part of the Moray East OWF project. The criteria considered as part of the RAG assessment included:

- Biodiversity
    - Distance of proposed sites from internationally, nationally and locally protected sites such as SPA, SAC, SSSI, Ramsar and ancient woodland; and
    - Suitability of a site to support protected and/or notable species.
- Landscape and Visual;
    - Affect on national and local important landscape planning designations such as National Scenic Areas (NSA), Wild Land Areas (WLA) and Special Landscape Areas (SLA);
    - Landscape character sensitivity to development, i.e. does the location have notable human influences in the form of development;
    - Visual sensitivity to development, i.e. is the location in an area of proximity to residential properties, or visible from recreational routes/public roads; and
    - Physical suitability of site for substation and mitigation, i.e. does the site allow for opportunities for landscape and visual mitigation.
- Hydrology and Watercourses;
    - Proximity to areas of flood risk;
    - Proximity to watercourses; and
    - Proximity to private water supplies.
- Geology, Soils and Land Use;
    - Potential for impacts on geological conservation review sites;
    - Potential impact on deep peat and priority peatland;
    - Land capability for agriculture classification of proposed site;
    - Earthworks, materials and waste, whether ground conditions are favourable for development and if engineering properties of soils anticipated could be suitable for reuse on site; and
    - Potential for constraints or adverse impacts to arise from ground contamination.
- Cultural Heritage;

- Consideration of the distance of proposed locations from Scheduled Monuments, Listed Buildings and Conservation Areas.

- Access;
  - Proximity of a site to the existing road network; and
  - Requirement for watercourse crossings to access site.
- Infrastructure Impact;
  - Impact to existing infrastructure (requirement to reroute infrastructure / reroute roads/tracks).
- People/Land Use; and
  - consideration of distance from residential properties and sensitive land uses and core paths/recreational routes.
- Planning Policy/Development Planning.
  - consideration of potential conflicts with planning policy or committed developments.

6.5.4.12 The appraisal concluded that none of the sites are located within or immediately adjacent to any statutory environmental designations. All sites had the potential to support protected or notable species and none of the sites were in areas of flood risk. Each of the sites were largely comparable in terms of distance from residential receptors. A summary of the appraisal is provided within Table 6-3.

Table 6-3:Summary of Substation Site Appraisal

Site	Summary of appraisal
Burnside	Site on minor high point close to Moray East and New Deer substations. Site noted as providing opportunity to cluster electrical infrastructure development given proximity to the existing Moray East and New Deer substations rather than development having a more widespread cumulative influence within this rural landscape. The site however was noted to be constrained by infrastructures such as wayleaves and roads and therefore there may be difficulty in identifying mitigation planting/earthworks areas. Two properties are within 250m of site boundary. Site directly adjacent to minor road to the east. Site not located within an area of peatland. Site requires the re-directing of a single access track.

Site	Summary of appraisal
Site 1a	The landscape and visual influence of this site is relatively well contained by landform and vegetation although there is some overlooking from the minor roads and nearby properties. Two properties are within 250m of site boundary. Site is >100m from existing minor road network. Site area includes Class 1 priority peatland (as identified within Carbon and Soils peatland map (James Hutton Institute, 2017[22])) and the site intersects / is in close proximity to watercourse / drainage features.
Site 1b	The landscape and visual influence of this site is relatively well contained by landform and vegetation. One property within 250m of site boundary. Site is directly adjacent to private road with no requirement to cross watercourses to access. Site includes large area of Class 5 carbon-rich soils and potential for deep-peat. Site is part of a larger body peatland which includes Class 1 peatland (as identified within Carbon and Soils peatland map (James Hutton Institute, 2017[22])).
Site 3	The landscape and visual influence of a substation on this site would be relatively widespread due to its elevated location with potential also for visibility from higher areas to the east. One property located within 250m of site boundary. Site is approximately 50m north of minor road. Not within an area of peatland.
Site 4	Six properties to the north of the site would overlook the site from their main aspects and such views would be difficult to mitigate except by planting close to the properties so that their open outlooks would be lost. Two properties within 250m of site boundary. Site is >100m from existing minor road network with potential requirement to cross a watercourse to access.

Site	Summary of appraisal
	Site includes localised Class 5 carbon-rich soils and potential for deep-peat (as identified within Carbon and Soils peatland map (James Hutton Institute, 2017[22])).
Site 5	This site benefits from a low lying location and visual containment as well as its location relatively close to the existing Moray East and New Deer substations, which clusters electrical infrastructure development, as opposed to a widespread cumulative influence within this rural landscape. There is potential for some mitigation of views from the close-range properties through planting closer to the properties themselves and also in the vicinity of the site. One property within 250m of site boundary. Site area includes Class 1 priority peatland (as identified within Carbon and Soils peatland map (James Hutton Institute, 2017[22])). Site is >500m from existing minor road network.
Site 7	The landscape and visual influence of this site is relatively well contained by landform however there is some overlooking from the minor roads and nearby properties to the north and west due to their higher elevations relative to the site and/or the openness of the location. There are nine properties within 500m of Site 7 some with open views from their main or rear facades over garden grounds and some also gaining views in other directions of the Moray East and New Deer substations so there is the potential for cumulative effects. No properties within 250m of site boundary. Site includes localised Class 5 carbon-rich soils and potential for deep-peat (as identified within Carbon and Soils peatland map (James Hutton Institute, 2017[22])). Site boundary is approximately 400m from the Grade B Listed Building of Millbrex Church.
Site 8	The landscape and visual influence of this site is relatively well contained by landform however there is some overlooking from the minor roads and nearby properties to the north and west due to their higher elevations relative to the site and/or the openness of the location. One property within 250m of site boundary.

Site	Summary of appraisal
	Site includes localised Class 5 carbon-rich soils and potential for deep-peat (as identified within Carbon and Soils peatland map (James Hutton Institute, 2017[22])). Site is >500m from existing minor road network. Site access would require watercourse crossing.

Substation Site Selection Shortlist

6.5.4.13 A short list of three preferred sites was identified for further detailed consideration, Sites 1a, 1b (combined to form one site), Site 5 and Burnside.

6.5.4.14 These three sites were then subject to further assessment based on a range of environmental and technical factors and building upon the Applicants knowledge from former projects such as Moray West and Moray East, to inform the decision-making process. Assessments included:

- Phase 1 Ecological Surveys;
- Phase 1 Peatland Survey;
- Engineering Feasibility Assessment; and
- Engineering Concept Design.

6.5.4.15 Site areas were also evaluated to identify if land for each site could be expanded to provide further space for construction processes and mitigation requirements.

6.5.4.16 During this review updated planning policy was also considered such as the National Planning Framework 4 (NPF4) (Scottish Government, 2023a[23]). NPF4 was adopted after the long list development process and out the national spatial principles for developments in Scotland. NPF4 includes policies such as the requirement to protect carbon-rich soils, restore peatlands and minimise disturbance to soils from development and also deliver positive biodiversity effects from development and strengthen nature networks.

6.5.4.17 The aim of the peatland assessment was to provide additional information to verify the information obtained on the potential short listed sites via the Carbon and Soils peatland map (James Hutton Institute, 2017[22]) and through data gathered during the Phase 1 ecological surveys.

6.5.4.18 The aim of the feasibility study undertaken was to assess the substation requirements for connection to the NETS and map this spatially to the preferred sites. Assessment and reporting included feasibility-level substation layout designs, potential site compound layouts, indicative equipment lists and constructability risks.

6.5.4.19 The aim of the Engineering Concept Design undertaken was to review the technical aspects and provide concept-level designs for the three preferred substation sites. Assessment and reporting focused on technical and constructability factors, as well as OFTO / operation and maintenance. The output was a concept-level design for the three sites, based on site-visit reports and a clear recommendation for the preferred substation location, from a technical perspective.

Table 6-4: Summary of Technical Assessments

Site	Results of additional assessment
Site 1a/b	The proposed ONEC from the Landfall Site would be approximately 31km. The site is approximately 2km from the existing New Deer substation. The site is approximately 1.4km from the Greens substation preferred location. The site contains slightly undulating wet land. The site requires a challenging and long access road to connect to the local road network. The site is constrained with the Moray East export cables between the two sites (1a and 1b), reducing the available space for construction compounds. Given the challenging ground conditions development of the site was identified as potentially considerably more expensive and time consuming. Surveys confirmed the presence of deep peat on the southern half of the land parcel with no way to avoid direct impact to this area.
Site 5	The proposed ONEC from the Landfall Site would be approximately 31km. The site is approximately 1km from the existing New Deer substation. The site is approximately 2.8km from the Greens substation preferred location. The site is relatively flat land and surveys confirmed the area has been impacted by agriculture and forestry and as a result does not meet the

	definition of a priority peatland habitat. A probing survey confirmed that deep peat (greater than 1m thickness in some places) is present, therefore this area may be classed as Class 3 or 5 soil i.e. not supporting peatland habitat, but deep peat is present. Given the challenging ground conditions development of the site was identified as potentially considerably more expensive and time consuming. The site requires a challenging and long access road to connect to the local road network. The site does not contain an obvious area for a construction compound. It is likely that required access roads and the proposed attenuation pond would directly impact the area of confirmed deep peat.
Burnside	The proposed ONEC from the Landfall Site would be approximately 32km. The site is in close proximity to the existing New Deer substation (with approximately 500m). The site is approximately 2.5km from the Greens substation preferred location. The site is relatively flat and dry and contains no peatland. The site has good access to the local road network. The site is constrained by powerlines to the south and the Moray East cable to the west. The site contains multiple options for construction compound locations.

Substation Site Selection

6.5.4.20 Following the completion of these assessments, the preferred Onshore Substation Site was identified as the Burnside site.

6.5.4.21 Sites 1a & 1b and Site 5 were identified as less favourable from a land use and constructability perspective as they were partially located on areas of deep peat. The potential access routes were also less favourable, with less overall space to accommodate temporary construction compounds.

6.5.4.22 Burnside, the preferred Substation Site, is close to the existing public road network and has the advantage of close proximity to the existing New Deer and Moray East substations, allowing for the clustering of electrical infrastructure. This aligned with some of the Consultation responses received during the Onshore Pre-Application events, with a preference identified from some respondents for locating the substation site near the existing Moray East and New Deer substations.

6.5.4.23 Clustering this form of development is generally considered to be beneficial as this approach avoids widespread landscape character and visual effects within a rural area. The site also has the potential to use land to the north of the Onshore Substation Site to provide mitigation planting and bunding, alleviating concerns in regards the site being constrained by existing infrastructure. The site is also considered to offer a high level of technical viability with regard to routing of the Onshore Export Cables to the Grid Connection Point.

6.5.4.24 Following the selection of the preferred Onshore Substation Site, for the purposes of the EIA, an indicative substation layout was developed. This is described further in the Volume 1, Chapter 4: Proposed Development Description (Onshore).

Grid Connection Point Suitability

6.5.4.25 As described in Section 4.1.3 of Volume 1, Chapter 4: Proposed Development Description (Onshore) it is anticipated that the Proposed Development will connect the first phase to the existing New Deer substation, with the second phase connecting to Greens substation. This remains subject to ongoing detailed network design being conducted by National Grid ESO and Scottish and Southern Energy Networks Transmission (SSEN-T), in consultation with the Applicant. Until the detailed design is finalised, there remains the possibility that both phases of the development may connect entirely into the Greens substation. Throughout this process, the Applicant has considered the suitability of the selection of Burnside against all potential outcomes of the detailed design process, namely:

- a connection to New Deer substation;
- split connection between New Deer and Greens substations; and
- a connection to Greens substation.

6.5.4.26 It is considered that Burnside is the preferred site in all potential outcomes, based on the following rationale.

6.5.4.27 The location of the Greens Substation was confirmed in January 2024 via the submission of the Proposal of Application Notice to Aberdeenshire Council. The substation has not yet achieved planning permission and therefore the full details of the final design and landscaping proposals are not available. The selection of Burnside has allowed for the integration of the substation landscaping design with the existing Moray East and New Deer substations, avoiding widespread changes to the landscape character of the area by consolidating the substation against existing and similar assets.

6.5.4.28 In the vicinity of Greens substation there is likely to be construction activities being undertaken during similar time periods for a number of projects, including the construction of the Greens substation itself, Section 25 and Section 26 of the Beauly to Peterhead 400kV Overhead line and the onshore transmission infrastructure for the Stromar Offshore Wind Farm development. By situating the Onshore Substation at Burnside and not at a site closer to Greens substation, the Applicant has sought to reduce the potential cumulative construction impacts.

6.5.4.29 The distance between Burnside and Greens substation is approximately 2.5km, although seeking to reduce the length of the 400kV Grid Connection Cables is beneficial, it is considered that this distance is technically viable and is not uncommon among other offshore wind farm developments. This distance is within the tolerance of the Onshore Substation Scoping Area, which had a radius of 3km.

6.5.4.30 The Burnside site would also allow for both substations to be co-located within the same location, which would minimise potential impacts to the wider landscape character.

6.6 Conclusion

6.6.1.1 The site selection process explained within this chapter has culminated in the identification of the consent boundaries to be used for the Proposed Development within the required consent applications. The Applicant has endeavoured to take on board points raised by stakeholders during the EIA process for the Proposed Development, in relation to the site selection and/or design.

6.6.1.2 As discussed in Volume 1, Chapter 7: EIA Methodology, a maximum design scenario approach has been implemented when assessing any impacts arising from the Proposed Development as part of this EIAR. The final design will fall within these maximum parameters to ensure that it is compliant with the Proposed Development as assessed in the EIAR.

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