Scotland England Green Link 1 - English Onshore Scheme

Environmental Appraisal Report: Volume 2

Chapter 02: Project Alternatives

May 2022

For: National Grid Electricity Transmission

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2. Project Alternatives

2.1 Introduction

This chapter sets out the need case for Scotland England Green Link 1 (SEGL1) (the Project) and describes how it, and the English Onshore Scheme (EOS) have evolved and the alternatives that have been considered taking account of National Grid Electricity Transmission's (NGET) statutory duties under the Electricity Act 1989 (the 1989 Act).

2.2 Need for the Project

In response to the UK and Scottish Government's legally binding targets to reach net zero in their greenhouse gas emissions by 2050 and 2045 respectively, the way in which energy is generated is undergoing transformational change. The past year has seen increased ambition for offshore wind, with the Government's Ten Point Plan re-affirming the commitment to reach 40 GW of installed capacity by 2030. Huge volumes of renewable energy generation including onshore and offshore wind will connect to the electricity transmission system over the coming years.

Electricity demand is predominantly located in the south, leading to high north-south power flows. These flows are highly variable due to the intermittent nature of wind generation and interconnection. The transmission system will need to be prepared to manage large swings in power flows. The north-south flows contribute significantly to system constraints across the entire Great Britain transmission system. To operate the network safely, we must make sure that the power flow across the Scotland England boundary does not exceed the capability of the network between the two regions.

In order to economically and efficiently transmit this energy from where it is generated to where it is needed there is a requirement to increase the capability/ capacity of the electricity transmission system.

In the short to medium-term, increased power flows through Scotland and between Scotland and England are caused by generation already connected to the transmission network, and by generation contracted to connect to the network in the Scotland and North of England region.

In the medium to the long-term there are significant increases in north to south power flows across a diverse and credible range of scenarios including a tripling of wind generation connected across the Scottish networks by 2030, driving higher north-to-south power transfers, and at least a doubling of transfer requirements from northern Scotland to the Midlands over the next 10 years. New reinforcements will be required to facilitate these power flows through the North of England. The Project is one of those reinforcements.

2.3 Power Flows Across the Great Britain Electricity Transmission System

The electricity transmission system across Great Britain is divided by a number of boundaries, which are notional lines used to represent areas of high-power flows between different parts of the system (**Figure 2-1**). Boundaries split the system into parts, crossing critical transmission circuit paths that carry power between areas where power flow limitations may be encountered. When flows across a boundary are forecast to be above the capability of the network, then energy generation needs to be managed to ensure that the capability of network is not exceeded. Managing shortfalls in network capability across boundaries results in additional costs, referred to as 'constraint costs', to operate the network. Some level of constraint is expected as part of the economic operation of the network, however, where excessive constraints occur then investment in new infrastructure may be needed to provide additional network capability.

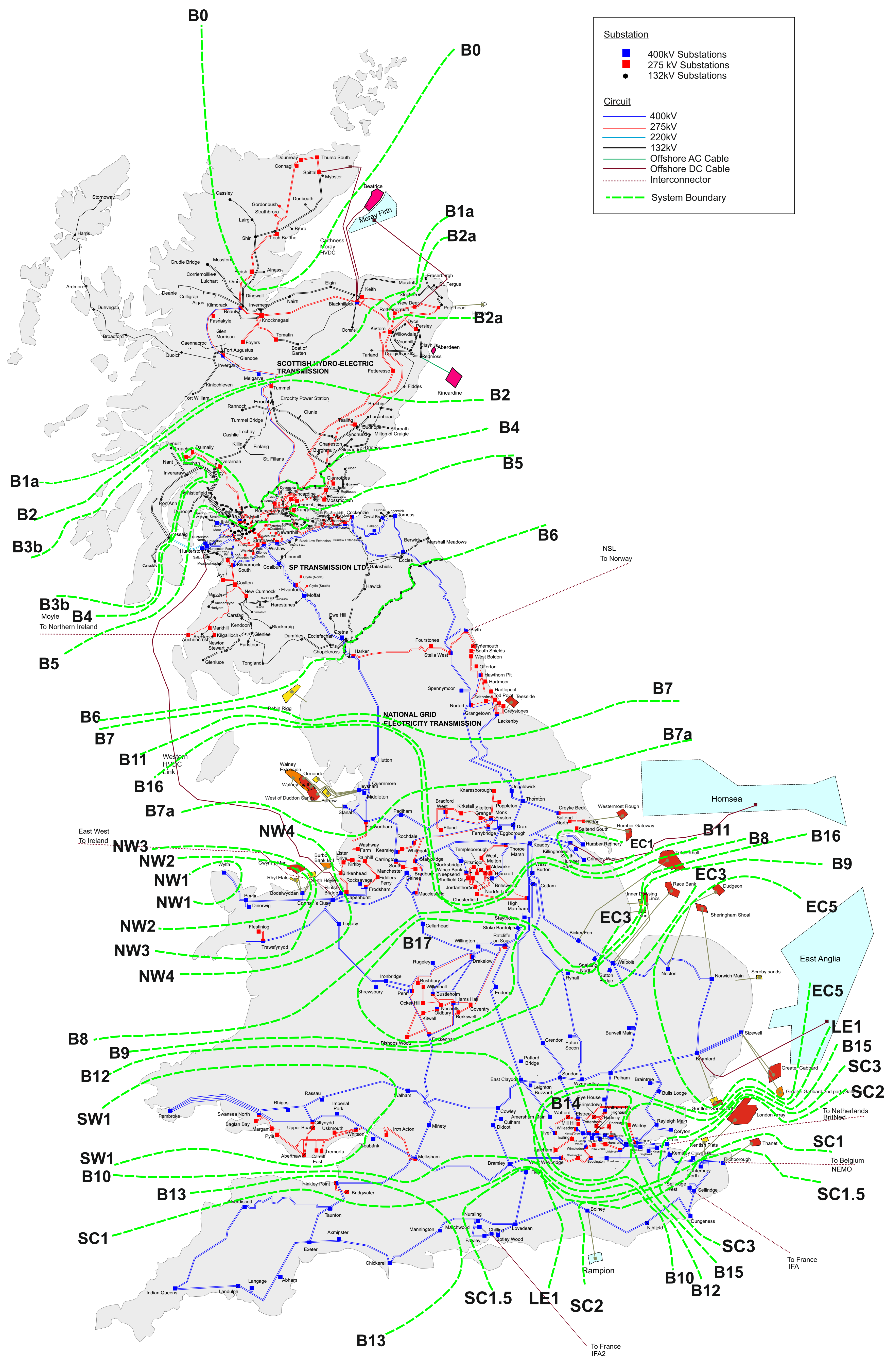
The Project is required to increase transmission capacity across the B6 boundary between southern Scotland and northern England.

Figure 2-1 shows the extent of the B6 area. The boundary transfer requirements for B6 already exceed the existing boundary capability. The required boundary transfer capability starts to pick up in all four Future Energy Scenarios (produced by National Grid ESO) (Ref 2-1) in the mid-2020s with a significant gap between capability and requirements starting to emerge. The shortfall in capability is on average, 5.3 GW in 2027 increasing to almost 6.4 GW in 2029 across all four FES.

The existing Anglo-Scottish transmission network across the B6 boundary primarily consists of two double-circuit 400 kV routes and a High Voltage Direct Current (HVDC) subsea link on the west coast. There are also some limited capacity 132 kV circuits across the boundary. The key transmission routes are 400 kV circuits from Strathaven to Harker and from Eccles to Blyth/ Stella West, and the Western HVDC link from Hunterston in Ayrshire to Flintshire Bridge (Connah's Quay) in North Wales.

Since the early 1990s, works have been completed to maximise the existing alternative current (AC) network and increase the capacity over B6 to enable larger power transfers, predominantly in the north to south direction. These works include the uprating of existing circuits from 275 kV to 400 kV, modifications to existing generator control systems for improved system damping and the installation of both series and shunt compensation. On top of the AC system improvements, additional boundary transfer capability has been delivered by the commissioning of the Western HVDC Link.

Figure 2-1: Great Britain Electricity Transmission System Boundaries



2.5 Annual Network Planning

The balance between the cost of investing in the network against the cost of constraints to ensure investment occurs at the right time and in the right place is undertaken through a series of annual activities overseen by the relevant regulated body: National Grid Electricity System Operator (National Grid ESO which is an entirely separate entity to NGET). This includes:

- Future Energy Scenarios (FES) – these are developed annually by National Grid ESO with input from industry and other stakeholders. The FES represent a range of different, credible ways in which the energy system could evolve taking account of policy and legislation, including net zero targets.
- Electricity Ten Year Statement (ETYS) – using data from the FES, National Grid ESO undertakes and annual assessment to identify points on the transmission system where more network capability is needed to ensure that energy is delivered efficiently and reliably to where it is needed.
- Network Options Assessment (NOA) (Ref 2-2) – the Transmission Owners and other stakeholders respond to ETYS with solutions to address network capability requirements. These are assessed by National Grid ESO so that the most economic and efficient solutions are recommended to proceed, and others told to hold or stop.

The need for SEGL1 has been identified and assessed as part of this continuous annual cycle. A subsea HVDC link between Torness and Hawthorn Pit, known as the Eastern Link, was given a 'proceed' signal in the first NOA published in 2015/16. The need for reinforcement on the east coast has continued to strengthen since then in response to both connected and contracted generation connections as well as alignment of the FES with net zero targets established by the UK and Scottish Governments. As a result, the most recent NOA 2021/22 (Ref 2-2) published in January in 2022 gave a 'proceed' signal to three east coast reinforcements including:

- Torness to Hawthorn Pit (which will be delivered by SEGL1);
- Peterhead to Drax; and
- Peterhead to South Humber.

2.6 Primary Objective of the Project

The primary objective of the Project is to reinforce the electricity network and increase transmission capacity across the B6 boundary between southern Scotland and northern England before 2030.

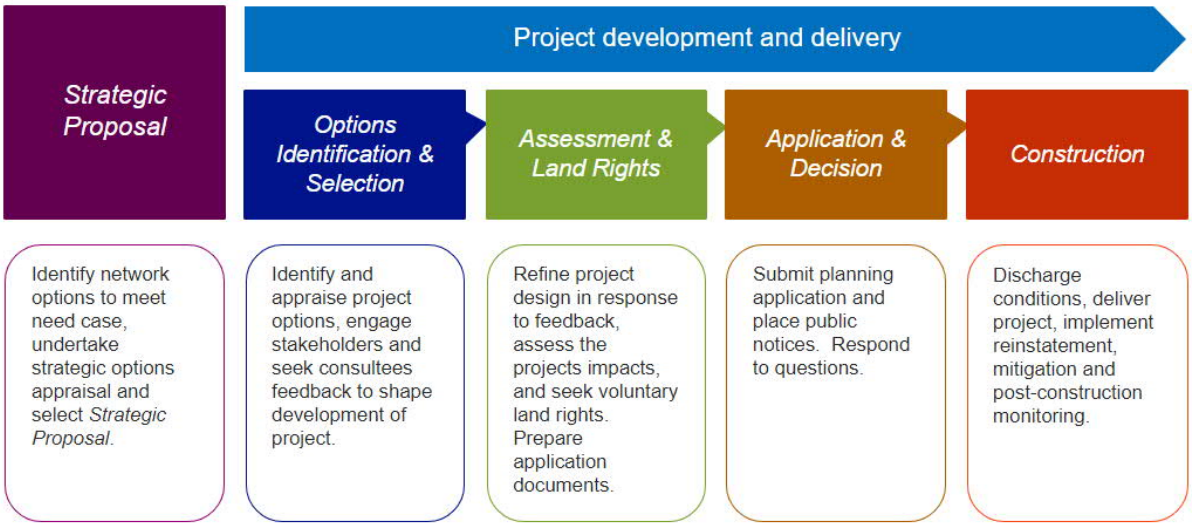
2.7 Approach to Developing the Project

As a transmission licence holder under the 1989 Act NGET has a number of statutory duties which it must take account of in developing and maintaining its network. These duties are set out in NGET's Stakeholder, Community and Amenity Policy. As a transmission licence holder NGET is required to develop and maintain an efficient, coordinated and economical electricity transmission system and to facilitate competition in the supply and generation of electricity.

Under Schedule 9 of the 1989 Act NGET is required to consider ways to preserve amenity in England and Wales, which it interprets to mean the natural environment, cultural heritage, landscape and visual quality, and also includes the impact of its works on communities, such as the effects of noise and disturbance from construction.

NGET has a systematic approach to developing new infrastructure projects which follows five main stages, as set out in **Figure 2-2.** NGET considers a range of engineering, economic, environmental and social factors consistent with its statutory duties, as well as consulting with stakeholders and members of the public at key stages by being open with information and transparent about the judgements it makes.

Figure 2-2: NGET's Approach to Project Development



2.8 Strategic Options Appraisal and Strategic Proposal

In developing the Project, consideration was given to developing subsea links from the existing Torness substation in East Lothian to substations within NGET's licence area as far south as substations around Middlesbrough. Overhead line options were considered and discounted as part of this exercise.

The strategic options assessed comprised a fixed 'start' point on the network in Scotland at Torness in East Lothian, which was identified by Scottish Power Transmission (SPT). It is planned that ahead of the completion of SEGL1, a new 400 kV substation will be constructed in the Torness area, known as Branxton 400 kV substation. This substation will become a key node on the main interconnected transmission system. Its connectivity to the existing 400 kV system, and location close to the east coast, means that it will become a collector substation for offshore wind in the Firth of Forth and further offshore as well as providing the connection point for the SEGL1 Project.

The strategic options appraisal identified a number of alternative 'end' points at substations on the network in England, in an area from Blyth in Northumberland as far south as Middlesbrough, both on the coast and inland. The objective of the strategic options appraisal was to identify a preferred Strategic Proposal which would best meet the need case by providing additional network capability when it is needed while also taking account of our statutory and licence obligations.

For each strategic option, different factors were assessed including:

- **Network capability and technical considerations**: this included different transmission technologies, the additional network capability it would provide as well as factors influencing construction and operation.
- **Environmental and socio-economic impacts**: this included high-level consideration of the potential impacts of different options on the environment and people and included a range of onshore and offshore considerations such as biodiversity, archaeology and other land/ sea users.
- **Programme and cost implications**: this included consideration of how much different options might cost and how long it would take to develop, consent and construct them taking into account when network capability will be needed in order to prevent constraints.
- **Boundary transfer capability**: this included consideration of the level of boundary transfer capacity that could be provided and how quickly it could be provided.

At a strategic level, a key factor influencing all the options considered was the distance between the 'start' and 'end' points. A shorter reinforcement would cross fewer network boundaries and provide less network capability but could be delivered more quickly alleviating potential constraints in the short term. Conversely, a longer reinforcement would cross more network boundaries and provide greater network capability but would take longer to deliver increasing the risk of constraints in the short term.

Hawthorn Pit substation was identified as the 'end' point because it provides a strong point on the network to connect into and has the benefit of being relatively close to the coast when compared to the other options, which reduces the length of onshore cable routes. Hawthorn Pit substation also benefits

from land around the existing substation on which to locate a new substation and converter station. Potential connection options north of Hawthorn Pit were discounted because they would trigger substantial additional works to reinforce the network and therefore do not deliver a benefit. Potential connection options south of Hawthorn Pit included Spennymoor, Norton and Lackenby substations but they have longer routes overall to deliver a similar amount of additional network capability and so have a greater potential for environmental impact and at a greater cost.

2.9 Options Identification and Selection

Once Hawthorn Pit was confirmed as the preferred 'end' point, parallel marine and terrestrial routeing/ siting studies were undertaken. These focused on identifying a preferred subsea cable route to be subject to seabed survey and a preferred underground cable route, converter station and substation in the vicinity of Hawthorn Pit substation. A preferred marine cable route, cable landfall, onshore cable route, converter station and substation site were identified and were the subject of consultation with Durham County Council (DCC), Sunderland City Council, Natural England, Historic England, and the Environment Agency. Following feedback from the statutory consultees, the preferred option was further developed and was the subject of public consultation on the proposed option in Spring 2021. This process is discussed in more detail below.

2.9.1 Subsea Cable Routeing Study

The proposed subsea cable along the east coast of the UK between the landfall points at Torness, East Lothian, and near Seaham in County Durham is approximately 176 km long. The proposed cable route was the subject of an iterative routeing process which identified the route and cable landfalls which, on balance, represent the best solution from an environmental, technical, financial and social perspective. The marine cable routeing studies identified six route options which were the subject of consultation with stakeholders. The proposed marine cable route has been designed to minimise its impact on areas such as rock outcrops within the Farnes East Marine Conservation Zone (MCZ) and to minimise interactions with the Northumberland Marine Special Protection Area (SPA) and Berwickshire and North Northumberland Coast Special Area of Conservation (SAC).

Geophysical and geotechnical seabed surveys have been undertaken to identify subsurface bathymetry, geology, seabed quality, and to support the identification of archaeological features and other marine cables. Wider environmental surveys have also been carried out including grab samplings and camera transects, to look at the quantity and quality of fauna and flora species.

2.9.2 Terrestrial Siting and Routeing Study

The development of the English Onshore Scheme (EOS) (the onshore components of the Project in England) has comprised two main steps:

- The identification and assessment of alternative landfall, substation and converter station sites (siting); and
- The identification and assessment of alternative cable routes (routeing).

The approach to identifying and assessing alternative sites and routes has ensured the integrated and iterative consideration of potential impacts on the environment and local communities, alongside technical and engineering considerations. The overall aim of this approach was to identify sites or routes which best balanced these factors.

Table 2-1 provides a summary of the key environmental considerations which have informed the identification and assessment of alternative sites and routes.

Table 2-1: Summary of Key Environmental Siting and Routeing Considerations

Consideration	Description
Biodiversity	Consideration of the potential impact of alternative sites and/ or routes on designated and non-designated sites, priority and other important habitats.
Physical Environment	Consideration of the proximity of alternative sites and/ or routes to, or extent within flood risk zones, as well as the locations or crossings of water courses, drains or other surface water features. Consideration of the potential to encounter existing contaminated land.

Consideration	Description
Historic Environment	Consideration of the potential direct and indirect impact of alternative sites and/ or routes on designated and non-designated archaeological or heritage assets as well as the potential to encounter unrecorded archaeology.
Landscape and Visual	Consideration of the potential impact of alternative sites and/ or routes on landscape designations and landscape character.
Marine	Consideration of the potential impact of habitats or features that have the potential to be affected by cable installation primarily through direct disturbance and removal during cable trenching and burial activities, and /or placement of cable protection.
Socio-economic and Community	Consideration of the potential impact of alternative sites and/ or routes on Public Rights of Way (PRoW), cycle routes and other socio-economic receptors.
Planning Consents and Allocations	Consideration of the potential impact of alternative sites and/ or routes on proposed planning applications, consents or allocations at the time of the appraisal.
Access	Consideration of the proximity of alternative sites and/ or routes to existing main roads (in particular A-class roads) as well as potential access routes to alternative sites and/ or routes.

Table 2-2 sets out the key technical and engineering considerations which have informed the identification and assessment of alternative landfall, substation, converter stations sites, and cable corridors. This included consideration of the constructability of alternative sites and/ or routes, as well as land required to build, operate and maintain them.

Table 2-2: Summary of Key Technical and Engineering Siting and Routing Considerations

Consideration	Description
Cliff Heights/ Drill Length (Landfall only)	The height of cliffs encountered at the proposed Landfall Area, and therefore drill length and depth required.
Ground Conditions	The feasibility of construction taking in to account the ground conditions expected at alternative sites and/or routes, including physical constraints, surface and bedrock geology and contaminated land.
Accessibility	Accessibility for construction taking into account the local road network, obstacles to construction access and the potential need for new temporary or permanent access roads to be established.

2.9.2.1 Landfall Sites

The landfall is where the offshore (submarine) cables come ashore; it is the interface between the EOS and the Marine Scheme and where the submarine cables connect to onshore cables at a buried transition joint pit (TJP). Following the identification of the connection point at the Hawthorn Pit substation, a study area was initially based on a landfall zone approximately 5 km inland from the landward side of Mean Low Water Springs (MLWS) to provide sufficient opportunity to locate landfall infrastructure (TJP), converter station and cable routes to the connection point, as shown in **Figure 2-3**.

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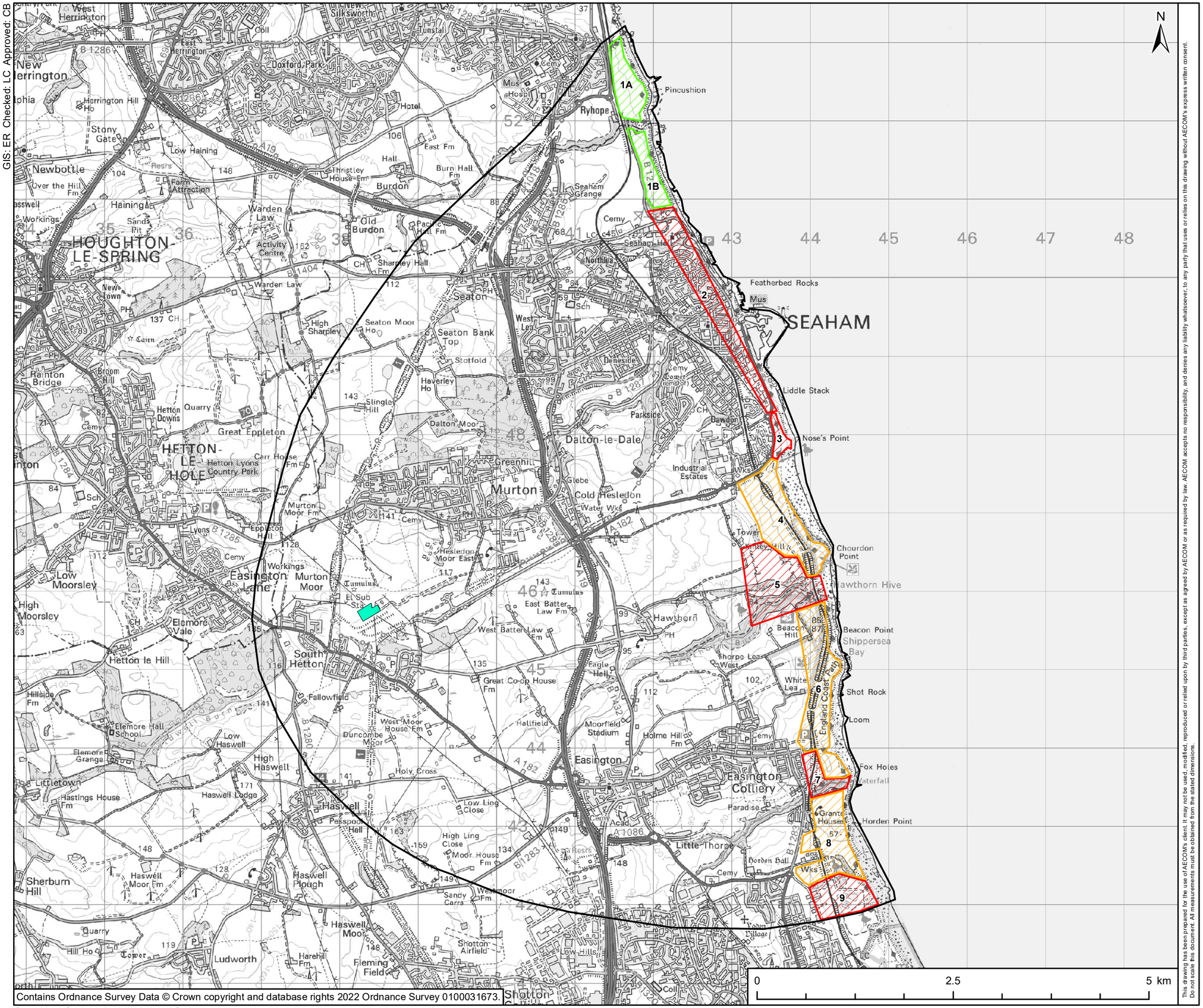

Coordinate System: British National Grid

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PROJECT

Scotland England Green Link 1

KEY

- Study Area (WOOD)
- Hawthorn Pit Substation

Engineering Landfall Site

- Red
- Amber
- Green

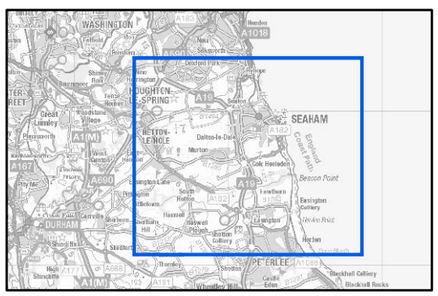

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Figure 2-3
Potential Landfall Areas within the Study Area

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DATE: 23/03/2022

Nine landfall sites between Ryehope and Easington were considered in developing the EOS, which included the review of technical and environmental factors influencing engineering and design. The preferred landfall site provided the best balance between impacts on the environment and the local community with technical and engineering feasibility.

Assessment of the suitability of the coastline within the study area to accommodate a landfall site considered the suitability of ground conditions, site accessibility, and potential drill and/ or trench profiles to install the cable. The coastline was divided into nine potential landfall areas, which were assigned a RAG (red/ amber/ green) rating correlating with the number of constraints in each landfall, with red being the most constrained and green the least (see **Figure 2-3**).

This identified that for the areas rated as red (Landfall Area 2, 3, 5, 7 and 9) it would be unfeasible to install a landfall for the following reasons:

- **Landfall Area 2**: This largely comprised the seafront within Seaham as well as Seaham Harbour. Due to the presence of built development, there is insufficient space to locate a construction compound and drill site. In addition, the presence of the town and built development would make routeing a cable route difficult, causing unnecessary disturbance to the local population when there are other more suitable options.
- **Landfall Area 3**: This area comprised the land at Nose's Point to the south of Seaham; whilst this site has good access from the A182 locating a construction compound would be difficult due to space constraints and there is a mining shaft and water supply which limits where the drill site could be located. In addition, ground conditions are poor showing evidence of previous mining activities which could be a potential risk for drilling activities should former mining shafts be encountered.
- **Landfall Area 5**: Above ground mining operations are present within this Landfall Area and a section of woodland (Hawthorn Dene Site of Special Scientific Interest (SSSI)) forms a constraint to routeing for the onshore route, effectively ruling out this area due to the obstructions identified.
- **Landfall Area 7**: The presence of woodland (ancient woodland, Durham Coast SAC and SSSI) as well as the railway and built development to the west substantially limits where a construction compound/drill site could be located or how the area could be accessed.
- **Landfall Area 9**: Siting the construction compound and installing a cable route would not be possible at this site due to the presence of woodland and Horden Grasslands Local Nature Reserve (LNR) as well as a water treatment plant or settlement ponds. This is understood to be Horden mine water treatment scheme which is used to manage and treat the rising mine waters in the area and prevent the pollution of East Durham aquifer, River Wear and the coastal areas of East Durham. The area also has poor access due to the presence of the railway and industrial estate.

Due to the above constraints and limitations these areas were parked from the optioneering process and the remaining Landfall Areas (1 (green), 4, 6 and 8 (all amber) were taken forward for further appraisal.

Landfall Area 1 comprised two options: Landfall Area A1 and Landfall Area 1B. Landfall Areas 1A and 1B have the lowest cliff heights and therefore drill length (800 m to 900 m) and are much less constrained by the railway. For the other landfall areas, the presence of the railway in closer proximity to the cliff tops means either access east of the railway is constrained by crossing the railway or locating the drill west of the railway is constrained by an increase in topography and therefore length and depth of the drill with potential effects on the rating of the cables. Based on the limited borehole information Landfall Areas 1A and 1B have the most favourable ground conditions with the greater risk of presence of former mine workings present for the other landfall areas.

Landfall Areas 1A and 1B have good access from the existing highway network with a potential compound site in Landfall Area 1B (car boot market site) which would not require much preparation in order to be used as a compound. Although Landfall Area 4 has relatively good access, the topography of the area would mean the compound would require cut and fill in order to provide a level site. Landfall Areas 6 and 8 have poor road access and would likely require access via residential streets and haul roads with the railway providing a further constraint to access. Furthermore, the railway line also limits the locations where a compound could be sited

All four landfall areas have some form of ecological nature conservation designation within them, with Landfall Areas 1A and 1B being the least constrained and having the most land outside of any designations. For the other landfall areas effects on these designations could be largely avoided by locating construction works outside designated areas, but for some landfalls there is a limited amount

of land not within a designation. Landfall areas 1A and 1B are in closest proximity to the Northumbria Coast Ramsar and SPA, designated in relation to overwintering birds. However, construction works at any of the landfall areas could have effects on overwintering birds if the habitat within the landfall area was used by overwintering bird species associated with nature conservation designations in the wider area.

From a marine point of view Landfall Area 1 was the least preferred of all landfall areas due to the greater presence of Annex 1 reef, with 1A being less favourable than 1B. However, effects can be mitigated through appropriate management measures.

Following the review of all the key constraints the proposed cable Transition Joint Pit (TJP) located on the car boot sale site in Landfall Area 1B was taken forward as the emerging preferred landfall area for the following reasons:

- This part of the landfall has the lowest cliff heights;
- There is a level site and good direct access from the B1287;
- Locating the TJP at the southern end of Landfall Area 1B would maximise the distance to the Ramsar and SPA designations (500m to the north and south); and
- Mature woodland north of the beach car park would screen views of construction works.

2.9.2.2 Underground Cable Route Corridor

Following the selection of Landfall Area 1B as the emerging preferred option, a broad route corridor to the connection point at Hawthorn Pit substation was mapped by excluding major areas of built development and environmental designations including nature conservation designations, ancient woodland and areas of priority habitat, landscape designations such as the Area of High Landscape Value (AHLV) and key historic environment designations.

The purpose of identifying the broad route corridor was to identify the area within which the converter station could be located as well as potential cable routes to connect the landfall with Hawthorn Pit substation. From reviewing constraint mapping it was apparent that there was only one potential corridor between Landfall Area 1B and Hawthorn Pit substation due to the constraints present, particularly large areas of built development associated with Seaham and Murton and the relatively short distance and therefore, because of a lack of alternative options (without unnecessarily extending the length of the route), no options appraisal to compare different cable corridors was undertaken. Instead, the corridor boundaries were kept under review as work was undertaken and where required amended to avoid effects on infrastructure and/or environmental constraints. The broad route corridor is shown in **Figure 2-4** and provides the most direct, and therefore most economic and efficient, route taking into account the settlement pattern and other constraints.

Moving from a broad route corridor to a detailed cable alignment was an iterative approach that sought to take the most direct route whilst avoiding constraints including environmental, ecological, socio-economic, heritage and landscape receptors. These features, and how they have been avoided, can be seen on the various figures in the topic-specific chapters of this EAR document.

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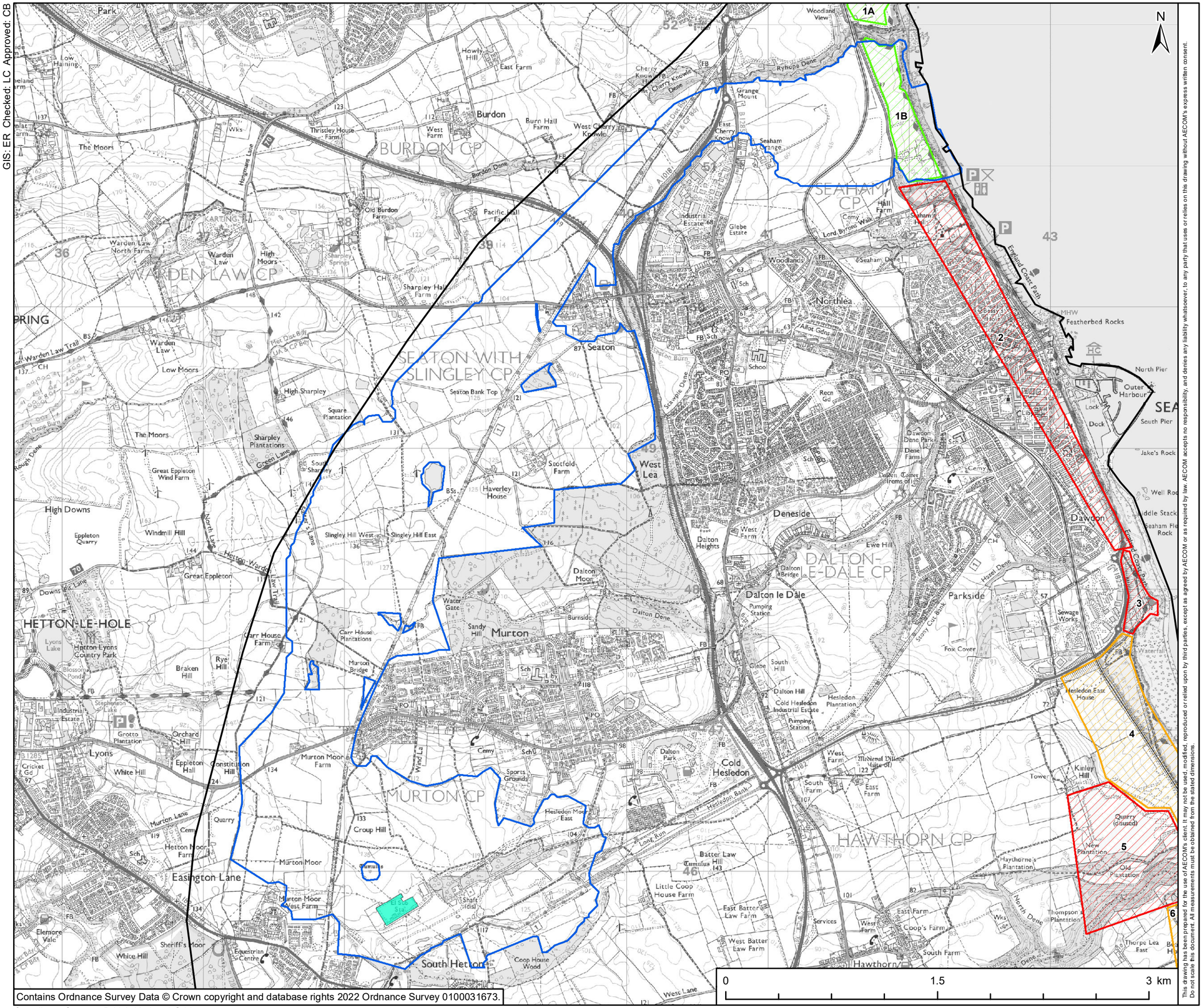

Coordinate System: British National Grid

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PROJECT

Scotland England Green Link 1

KEY

- Study Area
- Broad Route Corridor - 1B
- Hawthorn Pit Substation

Engineering Landfall Site

- Red
- Amber
- Green

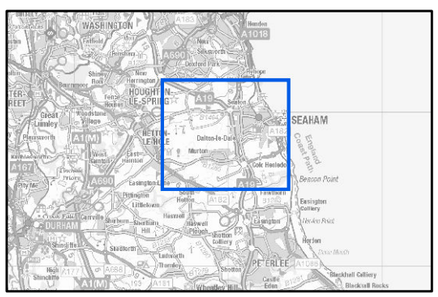

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Figure 2-4
Broad Route Corridor 1B

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2.9.2.3 Converter Station Sites

The optioneering for converter station sites was based on assumptions about footprint, height, and temporary construction areas based on similar NGET infrastructure. Converter station sites were sought as close as reasonably possible to the substation site to reduce the length of the AC cable circuits which require a wider swathe than DC cables and therefore have greater potential for environmental effects and can limit routeing options.

Four converter station locations were identified with the aim of minimising the landscape and visual effects of the permanent built elements taking into account landform and any existing features which could help screen it as well as adjoining land uses and the amenity of local inhabitants. Known ecological and historic environment mapped constraints as well as the engineering design parameters and requirements were also considered.

Figure 2-5 shows the location of four converter station Sites A, B, C and D initially identified within broad route corridor 1B. The four sites were collectively reviewed and analysed to help justify the selection of an emerging preferred option.

The review of the key constraints associated with all converter station sites and their access identified converter station Site A as the emerging preferred option, noting that further investigation was needed to confirm potential links via surface and groundwater with the SSSI to the south, as well as with regard to geotechnical risks such as depth of made ground and potential contamination. The intention was that the converter station and new substation would be sited together at Site A adjacent to the existing substation.

Site A is partially screened to the north by the existing substation and is part of a landscape that already contains substations and overhead lines. Existing ground disturbance also limits the potential for effects on heritage assets. Although there are potential biodiversity and visual effects from building a converter station here there is also the potential to provide measures to mitigate these effects.

Site B was less favoured than Site A on visual grounds as it would locate development on agricultural land in the open countryside and affect the more-open views from Murton to the north and would be located in closer proximity to the round barrow heritage asset to the west. The intention was that the converter station and new substation would be sited together at Site B adjacent to the existing substation.

Sites C and D were less favoured due to poor road access and extending urban development into open countryside. The required widening and other upgrades to the existing roads, or creation of new roads, would result in further environmental effects and would also affect users of these roads for walking, cycling and horse riding. In addition, both sites would need a much greater length of HVAC cable compared to Sites A and B also potentially increasing land take and environmental effects. A converter station at Site C would also have adverse effects on the AHLV immediately to the south. Given the distance of Site C and Site D from the existing substation the intention was that a new substation would be sited adjacent to the existing substation to minimise the length of the wider AC cable swathe.

Following on from completion of the initial converter station location analysis, a back check and review of the preferred converter station site was undertaken. This process is undertaken at key project milestones to ensure that the assumptions in relation to the Strategic Proposal remain valid, and/ or where potentially material changes to the Project may arise. Additional constraints identified at the preferred Site A and secondary preferred converter station at Site B, set out below, triggered the need for identification and appraisal of a new converter station site.

Discussions with DCC identified that the developer of Jade Business Park was due to submit a planning application in 2021 for development of the remainder of the Jade Business Park site, known as Phase 2. The extent and location of ecological mitigation for this development was not known at that time, but it was understood that it may affect Site A and any future proposed use of that site. In addition, a previously safeguarded route for the East Durham Link Road was identified, which crosses Site A. The Link Road, which would form a bypass to the south of Murton, has not been built (other than a section from the A19 to provide access to the Jade Business Park development) and the East Durham Link Road is not safeguarded in the recently adopted County Durham Plan (October 2020 Ref 2-3). Supporting text to Plan Policy 23 Allocating and Safeguarding Transport Routes and Facilities in paragraph 5.242 states:

“A number of other schemes have been considered for inclusion in this policy however for various reasons including the limited benefits that would result, they have not been included at this time. These

schemes will be reconsidered as part of future reviews of the Plan. This is particularly relevant to the proposed East Durham Link Road which would improve east-west links in the county and into Sunderland City Council's administrative area. However, the part of the route in Sunderland's area has not been included in their current local plan and therefore if it was included in our Plan it would be impossible to complete. If Sunderland were to include it in a future version of their local plan, then this position would be revisited."

In discussions with NGET, DCC indicated that plans to implement the East Durham Link Road around Murton may still come forward in the next decade. DCC Planning Policy Team confirmed that there is no safeguarded route alignment that would need to be considered from a planning policy perspective. Notwithstanding, NGET gave the supporting statement to Plan Policy 23 due weight as a material consideration in the potential siting of a converter station on Site A, because it could sterilise the East Durham Link Road alignment south of Murton and prejudice its development. On this basis NGET discounted Site A for a converter station site and considered alternative sites.

Subsequently, Site B was preferred, which performed better than Site C and Site D. In considering Site B in more detail NGET was approached by Aura Power which was in the advanced stages of developing a solar farm scheme on the agricultural land to the north of the existing Hawthorn Pit substation. NGET learned that Aura Power had a three-year option agreement with the landowner which included Site B. On that basis NGET considered that Site B was not available as a converter station option to meet the project timescales.

2.9.2.4 Identification of a New Converter Station Location

As a consequence of the potential constraints on Site A, and lack of availability of Site B, NGET identified a new converter station site on agricultural land south of Jade Business Park and north of Coop House Wood, referred to as Site E (**Figure 2-5**). Converter Station Site E had not previously been considered because it is located approximately 1 km beyond Hawthorn Pit substation and would require cabling past the substation to the converter station with DC cables and then cabling back to the substation with AC cables, which constrains cable routeing options. The strategic options were re-considered in light of the requirement for a small amount of additional onshore cabling, and Hawthorn Pit remained the preferred option given the extent of additional onshore cabling.

Site E was big enough to accommodate the converter station but not the substation as well. Site A could accommodate a substation without prejudicing the alignment of the East Durham Link Road. A decision was therefore taken to locate the converter station on Site E and the substation on Site A.

Converter station Site E was then reassessed against converter station Sites A to D. From an environmental perspective, Site E was preferred to Site A for the physical environment, landscape and visual and socio-economic constraints. There was not expected to be any Made Ground or contaminated land present at Site E which reduced potential risk of contamination or need for off-site disposal. The majority of the converter station at Site E will be screened from South Hetton by the mature woodland of Coop House Wood. Access to Site E can be taken directly from the Jade Business Park access road (Spring Road); and there will be no loss of public amenity space.

Site E was preferred over Site A with respect to biodiversity, given its greater distance from Hesledon Moor West SSSI. Siting the converter station on the agricultural land at Site E would be preferred rather than the draft priority habitat at Site A, which is more likely to support a diverse terrestrial invertebrate community, reptiles and amphibians. The screening provided by Coop House Wood at Site E was preferred to the open views from Murton to the north of Site B. Best practice during construction will include a buffer of 10-15 m from the boundary of Coop House Wood in order to ensure no direct impact on the trees and/ or roots during construction. Development of a converter station on Site E and a substation on Site A maintains a future route alignment for the East Durham Link Road to be extended and allows a Murton bypass to be delivered.

In summary, Site E:

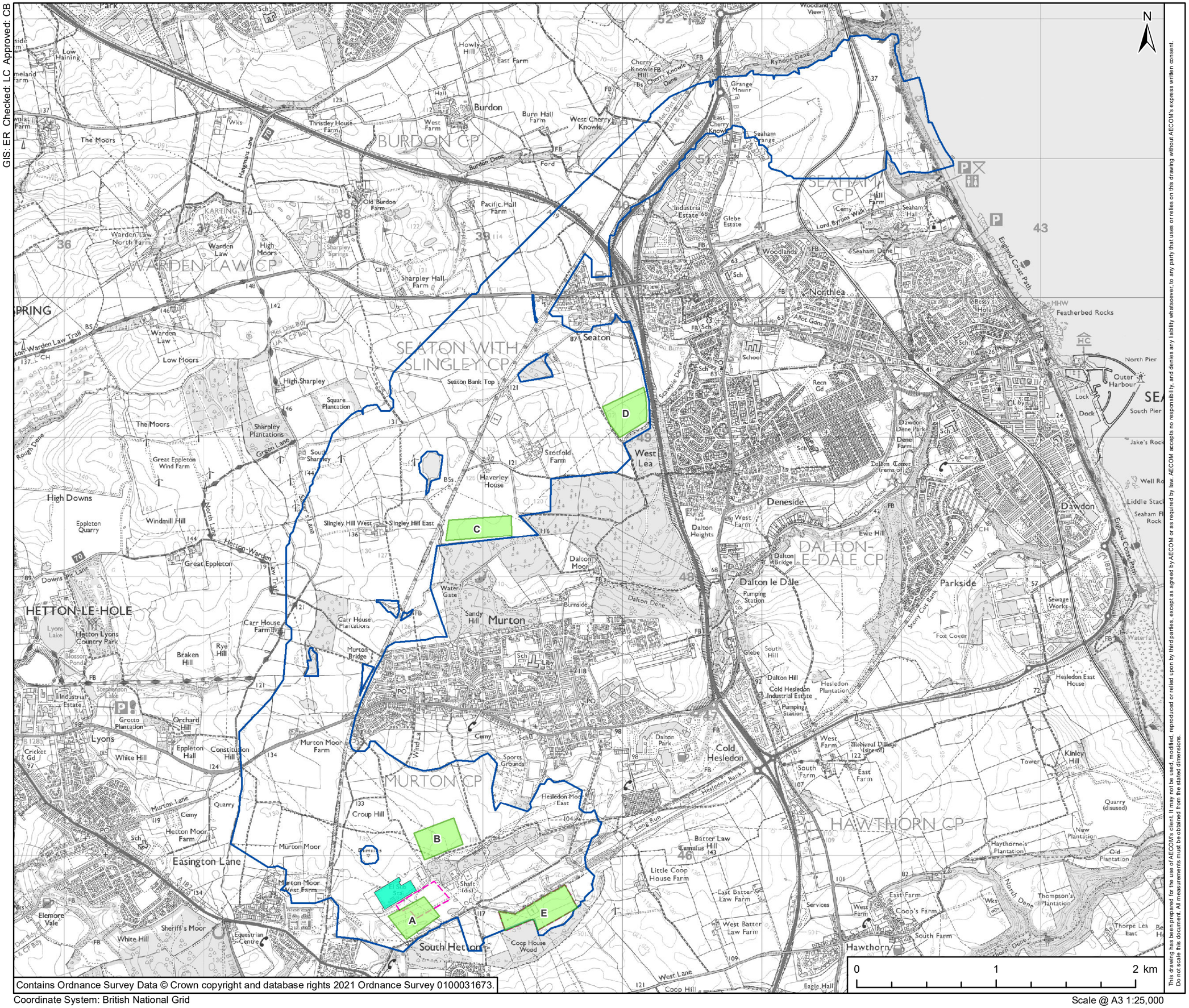
- Enables converter station access directly off the Jade roundabout which minimises the amount of land take for the permanent access road;
- Is set down in the landscape and away from the settlements of South Hetton and Murton, reducing its potential visual effects;
- Is afforded landscape screening to the south and east by the mature woodland of Coop House Wood;

- Is sited on the opposite side of the road from the allocated Jade Business Park site and will be seen in the context of the Jade Business Park development on the wider site; and
- Does not prejudice any future development of the East Durham Link Road.

Site E is preferred over the previously parked converter station Sites A, B, C, and D for the reasons set out above.

As set out above, a DC cable route had been identified from landfall to Site A but after the back check and review identified Site E for the converter station the cable route was revised to continue past Site A to the proposed converter station at Site E. The proposed DC route is approximately 10 km long and continues to follow the Sustrans NCR1 south towards the west of the existing Hawthorn Pit substation, where it crosses underneath the former railway line and NCR1 and continues south past the existing substation and through the field immediately west of the converter station Site E. The AC cable route between Site E and Site A runs in the opposite direction in close parallel to the DC cable route back across the field and then turns north for a short distance to connect into the new substation at Site A.

GIS: ER Checked: LC Approved: CB



Coordinate System: British National Grid

Scale @ A3 1:25,000

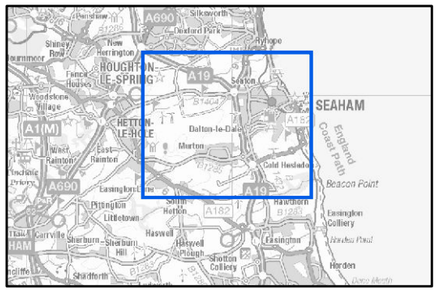
nationalgrid

PROJECT

Scotland England Green Link 1

KEY

- Onshore Area of Search
- Potential Converter Station Location (Wood, 2020)
- Hawthorn Pit Substation
- Indicative Substation and Converter Station Boundary



TITLE

Figure 2-5
Convertor Station Sites A to E

REFERENCE

SEGL1_T_ES_2-5_v2_20220323

SHEET NUMBER

1 of 1

DATE

23/03/2022

2.9.2.5 Feedback from Statutory Consultees

NGET consulted DCC, Sunderland City Council, Natural England, Historic England and the Environment Agency on the emerging preferred Landfall 1B, route corridor and converter and substation Site A. Consultation responses noted that Landfall 1B generally avoided Durham Coast SSSI, SAC, Northumbria Coast SPA but noted that species associated with these designations are mobile and likely to be found outside of the designations, and that detailed studies would be required to ascertain impacts and any mitigation.

The choice of route corridor was acceptable with measures to avoid or mitigate effects. Key issues were the maintenance of access along Sustrans NCR 1 and numerous public rights of way, pre-application consultation with Sustrans, and the potential for disturbance of archaeology along the route.

DCC supported the location of Site A with measures to avoid landscape harm and evidence and measures to avoid ecological harm and to demonstrate biodiversity net gain. DCC preferred Site A from a landscape point of view - referencing existing screening, reduced susceptibility to change due to existing infrastructure, and lower landscape value - but it considered that Site B would extend industrial character/ electricity infrastructure into an area that plays a role in separating South Hetton and Murton. DCC preferred Site B from an ecological perspective due to the habitat present at Site A and Site B's further distance from a SSSI and Local Wildlife Site (LWS). Other key issues were to undertake pre-application discussions with the Environment Agency regarding the underlying major aquifer and groundwater protection zone.

DCC, Natural England, Historic England and Sustrans were consulted as part of the back check and review process that identified Site E as the preferred converter station site and Site A as the preferred substation site and agreed with the reasons for the sites' selection.

2.10 Refinement During the Environmental Appraisal Process

Responding to consultation feedback, further refinement of the EOS was undertaken in parallel with the environmental appraisal to inform a greater level of deign definition and further consider potential environmental impacts and opportunities for mitigation. This has included confirmation on the working width, alignment of cable routes, construction compound locations, temporary and permanent access points, and HDD locations. The final EOS design is shown on **Figure 2-6** and is described in detail in **Chapter 03: Description of the English Onshore Scheme**. Refinements incorporated into the design are set out in **Table 2-3**.

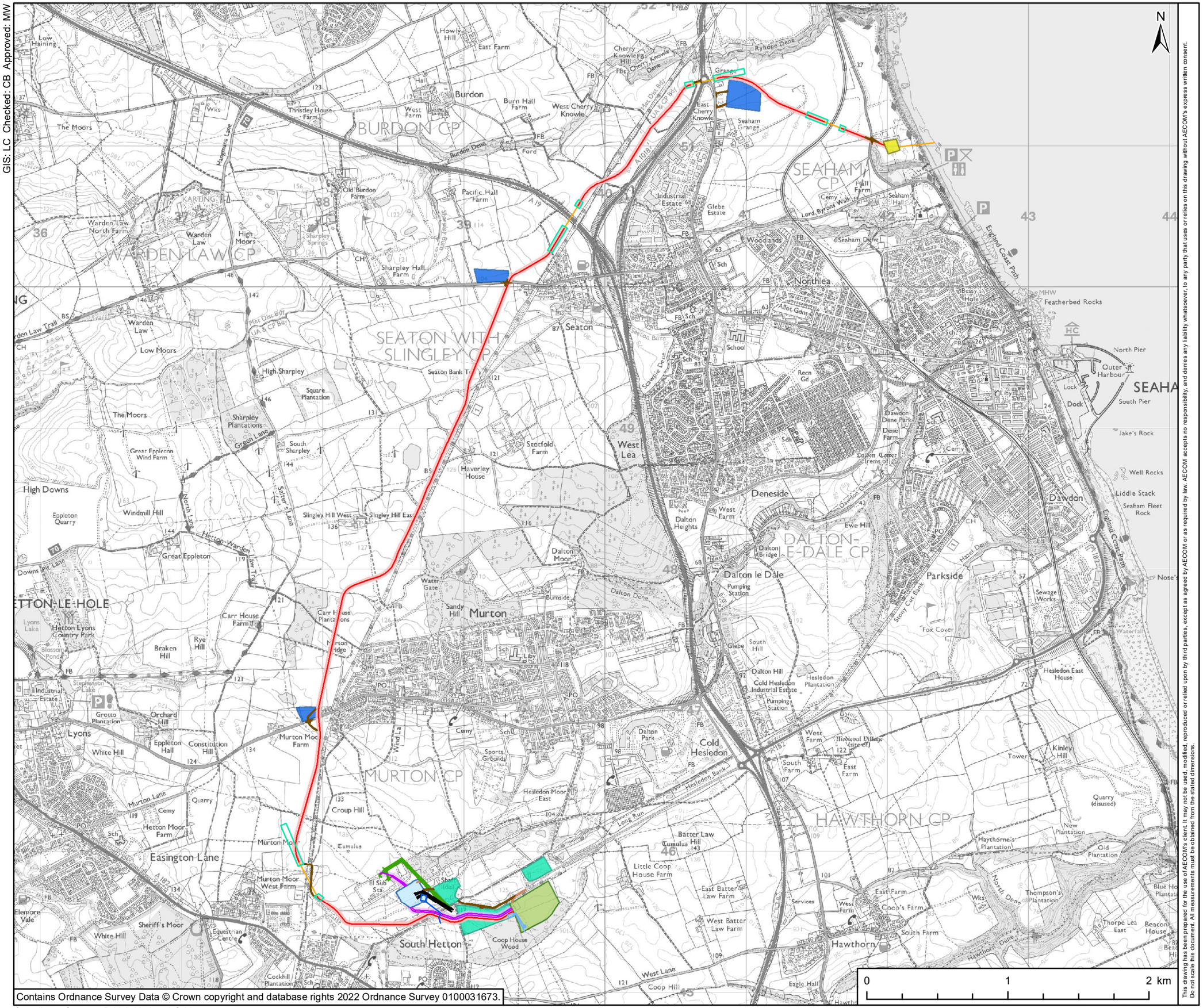
The Project team has revisited the work undertaken to date following the Project refinement and considers that each of the decisions remains valid in light of the final Project, which meets the primary objective.

Table 2-3: Refinement of the Design

Scheme component	Refinement
HVDC and HVAC Cable Route Working Width	A 40 m wide working width was established for the HVDC cable route. A 50 m wide working width was established for the HVAC cable route.
HDD Crossings	Four trenchless (HDD) crossings were confirmed along the HVDC cable route at the following locations to avoid disruption, closure, or diversion of infrastructure: • HDD1 – Durham Coast Rail Line; • HDD2 – the A1018; • HDD3 – A19; and • HDD 4 – NCR1.
Construction Compounds	Three construction compounds were confirmed along the HVDC cable route at the following locations: • Construction Compound 1 – to the east of the B1285, immediately south of HDD1; • Construction Compound 2 – immediately south of the B1404, to the west of the HVDC cable route; and

Scheme component	Refinement
	• Construction Compound 3 – immediately north of the B1285, to the west of the HVDC cable route. The converter station construction compound was confirmed immediately to the west of the converter station site, north of Coop House Wood. The substation construction compound was confirmed as being immediately west of the Jade Business Park Phase 2 development boundary.
Cable Route Alignment	The proposed cable route was realigned in the following locations to avoid constraints identified during the impact assessment: • The HVDC cable route was realigned at the crossing of the A1018, Stockton Road. The preferred route was moved approximately 180 m north, crossing the road underneath the A1018/ B1285 roundabout, to avoid a planning option agreement to the east of the B1285 Stockton Road; • The HVDC cable route was realigned prior to the crossing of the A19 (HDD3) to avoid an unallocated housing development site that was being consulted upon by the developer; the preferred route was moved approximately 100 m north west at the bridleway crossing of NCR1 to Burn Hall Farm to avoid routeing through the edge of the proposed “The Meadows, Seaton” housing site. • The HVDC cable route was realigned prior to the crossing of NCR1 (HDD4); the preferred route was moved approximately 75 m west at Murton Moor in order to provide adequate room for the establishment of the HDD compounds at this location; and • The HVAC cable routes were adjusted to minimise temporary impacts to fen habitat identified during the ecological surveys.
Access Points	Eighteen temporary access points were identified for the EOS to access the cable route alignment and construction compounds. Two permanent access points were identified to access the substation site and converter station site respectively.

GIS: LC Checked: CB Approved: MW



Coordinate System: British National Grid

Scale @ A3 1:25,000

nationalgrid

PROJECT

Scotland England Green Link 1

KEY

Permitted Development:

- Cable Landfall
- DC Cable Route - HDD (Horizontal Directional Drill)
- DC Cable Route - Opentrench
- DC Cable Working Width
- AC Cable Route
- AC Cable Working Width
- HDD Compound
- Cable Construction Compound
- Substation/Converter Station Construction Compound
- Temporary Access Road
- Converter Station Drainage Attenuation
- Substation Drainage Attenuation

Planning Application:

- Proposed Substation Location
- Proposed Converter Station Location
- Permanent Access Road

Overhead Line Works:

- Overhead Line and Pylon to be Erected
- Overhead Line and Pylons to be Removed

TITLE

Figure 2-6
Final English Onshore Scheme Design

REFERENCE

SEGL1_T_ES_2-6_v4_20220510

SHEET NUMBER: 1 of 1

DATE: 10/05/2022

2.11 Summary

In identifying the EOS, NGET has given consideration to a range of alternatives at both a strategic and project-specific level, and has included considerations of alternative landfall, substation, converter station sites and cable route corridors. In assessing these alternatives NGET has undertaken a series of specialist studies considering technical, environmental and economic factors as well as undertaken consultation with statutory and non-statutory consultees, stakeholder organisations, landowners and members of the public.

The results of these specialist studies and feedback received from consultation have informed decision making. Through consideration of alternatives NGET has established a preferred EOS which is considered to best balance technical, environmental and economic factors with feedback received from consultation.

The preferred EOS consequently comprises a landfall site to the north of Seaham following a 10 km HVDC cable route corridor to a converter station site south of Jade Business Park, connected by a 1 km long HVAC cable route corridor to a new substation at Hawthorn Pit. This proposed development is detailed in **Chapter 03: Description of the English Onshore Scheme**. This proposed development meets the primary objective.

2.12 References

Ref 2-1 National Grid ESO (2021) Future Energy Scenarios 2021

Ref 2-2 National Grid (2021) Network Options Assessment (NOA). Available at: https://www.nationalgrideso.com/research-publications/network-options-assessment-noa

Ref 2-3 Durham County Council (2020) County Durham Plan Adopted Version 2020. Available at: https://www.durham.gov.uk/media/34069/County-Durham-Plan-adopted-2020-/pdf/CountyDurhamPlanAdopted2020vDec2020.pdf?m=637424969331400000