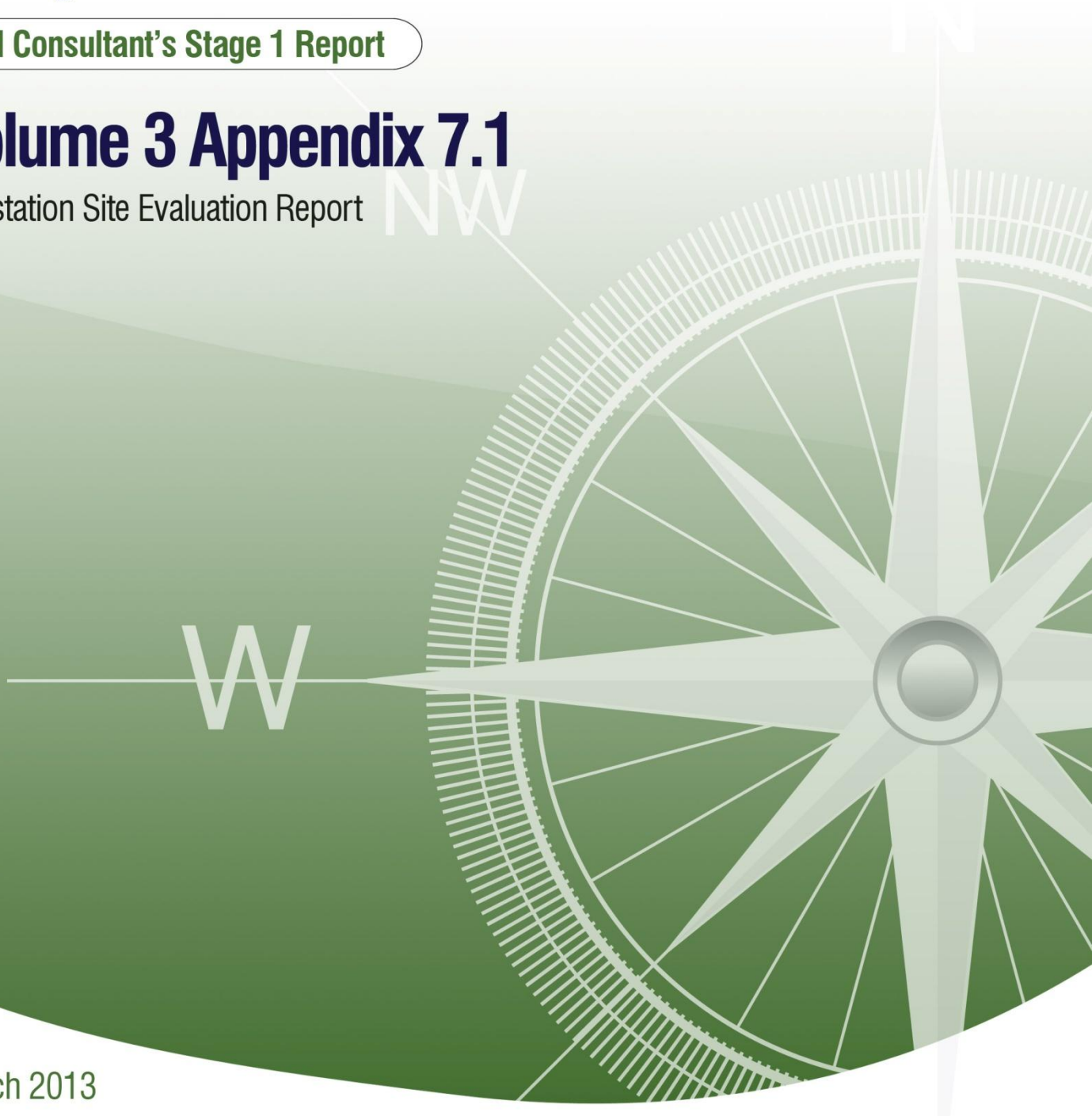
The Grid West Project

EIRGRID

Lead Consultant's Stage 1 Report

Volume 3 Appendix 7.1

Substation Site Evaluation Report



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TOBIN Consulting Engineers

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REPORT

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TABLE OF CONTENTS

TABLES

FIGURES

PLATES

1 INTRODUCTION

This report sets out how the identified potential substation site options were evaluated in order to identify a least constrained substation site for each of the three nodes, Bellacorick, Flagford and Cashla.

The process for identifying potential substation sites was described in the Volume 3 Appendix 6.1 *Route Corridor and Substation Site Identification and Description Report*. The process made use of spatial analysis and 'heat-mapping' as well as ordnance survey mapping and Bing[1] satellite images to initially identify potential site areas and locations suitable for a substation, with sufficient area to accommodate current and potential future connection requirements. The process used the knowledge and experience of the specialists guided by internationally proven site selection methods. The initial site selections were then refined through a series of site visits by the specialists, and adjusted as the position of route corridors changed during their refinement process.

Each of the substation locations evaluated in this report are the result of the site refinement process and represent options that are considered technically feasible and suitable for the development of the Grid West substations. Therefore it is recognised that any of these site areas and locations could be potentially developed if the site initially identified as least constrained is found to be unsuitable for any reason, including the situation where the site is not the best for the least constrained route corridor selected.

During the refinement process only substation sites that meet the following criteria were considered.

- Provided sufficient area to facilitate the required current and potential future substation arrangement;
- Avoid major areas of blanket peat[2] as indicated by available geotechnical mapping;
- Be located on suitable, relatively flat topography;
- Avoid areas which have been subject to flooding; and
- Avoid areas of internationally or nationally recognised ecological and cultural heritage significance.

With respect to peat, it is our experience that the depth of the peat in extensive peat deposits is highly variable, even over short distances, and when alternative site options are available, and in the absence of geotechnical investigations confirming depth, we consider it is preferable to avoid substation sites located in areas of blanket peat.

[1] http://www.bing.com/maps/

[2] The review at Stage 1 has considered areas removed from blanket peat as designated by geological mapping sourced from Geological Survey of Ireland. Detailed environmental analysis of substation site area will be undertaken during the next stage of the project. At this stage the overall impact to sites including substantial blanket peat is considerable and therefore identified sites have avoided these areas. Initial identification locations (based on GSI mapping) which bordered or included sections of blanket peat were dismissed due to their heightened impact on constraints.

These sites were then reassessed against heat mapping to ensure that they were not located in areas of significant ecological, cultural heritage, landscape and other constraints, which could reasonably be avoided.

The evaluation of the potential sites was based on a subjective evaluation of the different sites within each study area against a number of criteria, as discussed in the following sections.

As defined in the Glossary of this report, the following terminology has been used:

- *Substation Site*: A generic term used in this report for an area of land with sufficient area to accommodate the projected ultimate development of the substation, sited so as to avoid as many environmental constraints as possible. At this stage in the project specific substation sites have not been identified.
- *Substation Site Area*: A general area of land within which a substation site could be identified.
- *Substation Location:* A zone of land, typically 1 km in diameter, sited so as to avoid as many environmental constraints as possible, and within which a substation can later be positioned.

2 SUBSTATION EVALUATION CRITERIA

2.1 SUBSTATION EVALUATION CRITERIA

The substation sites have been evaluated against each of the substation site evaluation criteria as detailed in Table 2-1. This evaluation has incorporated the quantitative expertise of specialists to provide a reflection of if a site area or location is more or less constrained.

As described in the Volume 3 Appendix 6.1 *Route Corridor and Substation Site Identification and Description Report*, the study area for the Bellacorick node was much larger than for the other two nodes as it was not essential to locate the substation as close as possible to the existing Bellacorick 110/38kV substation. As one key purpose of this new substation was to facilitate connection to the Gate 3 wind farms in the area, it was considered that optimising the connections to these wind farms should be an important criterion. This was assessed by estimating the length of the 110kV connections required to each wind farm as described in more detail below.

Table 2-1 Substation Site Evaluation Criteria

Evaluation criteria	Considerations and comments
1 Proximity to existing substation: The ease of connection to the existing substations at all proposed sites will be influential in the evaluation of any potential substation site. The further away the substation site the greater the length of connecting line with the associated requirements of additional land take, technical complexity, cost, and environmental impact. Adjacent sites will allow connection to the existing busbar by short sections of overhead conductor, busbar or cable. They offer a number of advantages, including minimising system operations and interconnection implications, simplifying maintenance, rationalising construction and allowing existing facilities and services to be used for the new substation. A remote site requires an additional 110kV or 220kV busbar with associated switchgear and equipment.	Considerations: • Remote or adjacent site. • Distance from existing substation. • Difficulty of implementing and constructing the connecting line(s).
2 Impact on length of 110kV connections to wind farms (Bellacorick substation specific): The driving force of Grid West is its ability to harness the proposed Gate 3 wind generation planned for the Bellacorick area. Therefore the efficiency of connecting the new wind farms to the new substation has been included as a criterion. This is evaluated by estimating the length of the 110kV connecting lines from the identified Bellacorick wind farms to the new substation locations	Considerations: • The total length of 110kV line connecting to the new substation has been estimated, as set out in Section 2.3 below.

Evaluation criteria	Considerations and comments
and the interconnecting line to the existing 110/38kV substation (See Section 2.3).	
3 Topography: A substation site preferably needs to be relatively flat to avoid extensive earthworks and provide level ground necessary for the construction of substation. Thus a generally flat terrain is preferred due to reduced civil engineering requirements and associated impacts.	Comment: • Available survey mapping with 5m contours was used to assess the topography of each site in conjunction with site visits.
4 Geotechnical conditions / subsoil: Only areas which were likely to provide soil types of suitable bearing strength for the typically heavy equipment, particularly transformers, installed in substations have been considered for the substations sites to reduce the civil engineering requirement and the associated impact.	Comment: • No geotechnical surveys have been carried out at this early stage. • Ground conditions were assessed subjectively from available mapping and site visits. • Areas which are underlain by blanket peat or karstified rock have been avoided.
5 Access - proximity to suitable public road: The development of a substation site will require the supply and delivery of the large high voltage equipment, particularly power transformers, therefore the availability of suitable roads to deliver this equipment is a key criterion for evaluation.	Considerations: • The distance from a public road. • The type and nature of that public road. • The use of that road and its proven ability to transport large heavy loads.
6 Routing of transmission lines to substation: A new 400kV substation establishes a major new infrastructure facility, with significant capability to meet future development in the area. The substation site will need to facilitate the connection and route of the transmission lines connecting to it initially and in the future, at any voltage level as applicable. The potential for establishing routes for new transmission lines in the substation site is a key criterion.	Considerations: • Connection to the existing substation, and how these will impact on the existing substation. • Requirements for relocation of existing lines. • Requirements for undergrounding and sealing ends. • Routing options for future transmission lines at all applicable voltages.
7 Proximity to houses / other occupied buildings: Where possible, substation sites have been located so as to be as far as practical from any housing and other buildings, to minimise the impact on local residents.	Considerations: • The number of houses potentially directly affected by the substation development was assessed by use of postal address geo-directory data and site visits. • For site areas the number of house indirectly (100m from centre of site) affects.

Evaluation criteria	Considerations and comments
8 Impact on local infrastructure: The construction and future operation and maintenance of the substation will impact on the local infrastructure. This impact should be minimised or mitigated as far as practical.	Considerations: • The location of local infrastructure that could be used to facilitate a new substation. • Any requirement to disrupt local services such as the relocation of roads, power distribution lines etc. Comment: • Potential sites were located so as to achieve this where possible from the early stage.
9 Location in relation to least constrained route corridor: The substation site will allow connection to the least constrained route corridor.	Considerations: • Substation sites that are not located within or immediately adjacent to the least constrained route corridor were considered highly constrained.
10 Landscape and visual impact: Substation sites have the potential to impact negatively on the landscape in which they are implemented, therefore the potential at each substation site to mitigate or absorbed the proposed visual impact of the substation has been considered as an evaluation criteria.	Considerations: • The impact that the substation development will have on its proposed surroundings, viewpoints, landscapes, wilderness etc. • The opportunities to mitigate visual impact through measures such as screening, backdrops, etc. • The visual impact of connecting overhead power lines to the substation and opportunities for mitigating the visual impact of these has.
11 Landownership: Landownership has been considered at a pre-feasibility level as it is advantageous to select a substation site which has a single land owner.	Considerations: • Sites contained within one physical boundary were preferred e.g. within one field or paddock. • Land ownership directly adjacent to the Cashla and Flagford site areas. Comments: • The review did not incorporate a full review of the land registry data as this will be undertaken during subsequent stages once preferred site locations have been determined and following consultation on this Stage 1 Report.

Evaluation criteria	Considerations and comments
12 Cultural Heritage: Wherever cultural heritage is impacted by the substation development, the associated impact has been considered and included within the evaluation. It should be noted that although all cultural heritage will be reviewed, significant cultural heritage constraints have been avoided during the substation site identification as much as practical with the expectation that only localised constraints will be affected at this evaluation stage.	Considerations: • Location of all known cultural heritage potentially impacted by the substation developments. Comments: • Due to the compact nature of the substation sites the primary cultural heritage constraints have been avoided where possible.
13 Ecology: Wherever ecology is impacted by the substation development, the associated impact has been considered and included within the evaluation. It should be noted that although all ecology will be reviewed, the avoidance of significant ecological constraints has been applied during the substation site identification as much as practical with the expectation that only localised constraints will be affected at this stage.	Considerations: • All known ecological constraints affected by the substation development were assessed. Comments: • All substation sites have been positioned away from areas of know ecological significance.

2.2 SUBSTATION EVALUATION PROCESS

The project team identified a diverse range of issues which influence the evaluation of a substation site. These issues derived from the professional expertise of the project team, from international used guidance and from the technical and environmental constraint assessments carried out in respect of the substation locations/site areas. These issues were then set out as the evaluation criteria as documented in the following section.

The evaluation process is illustrated in Plate 2-1 below.

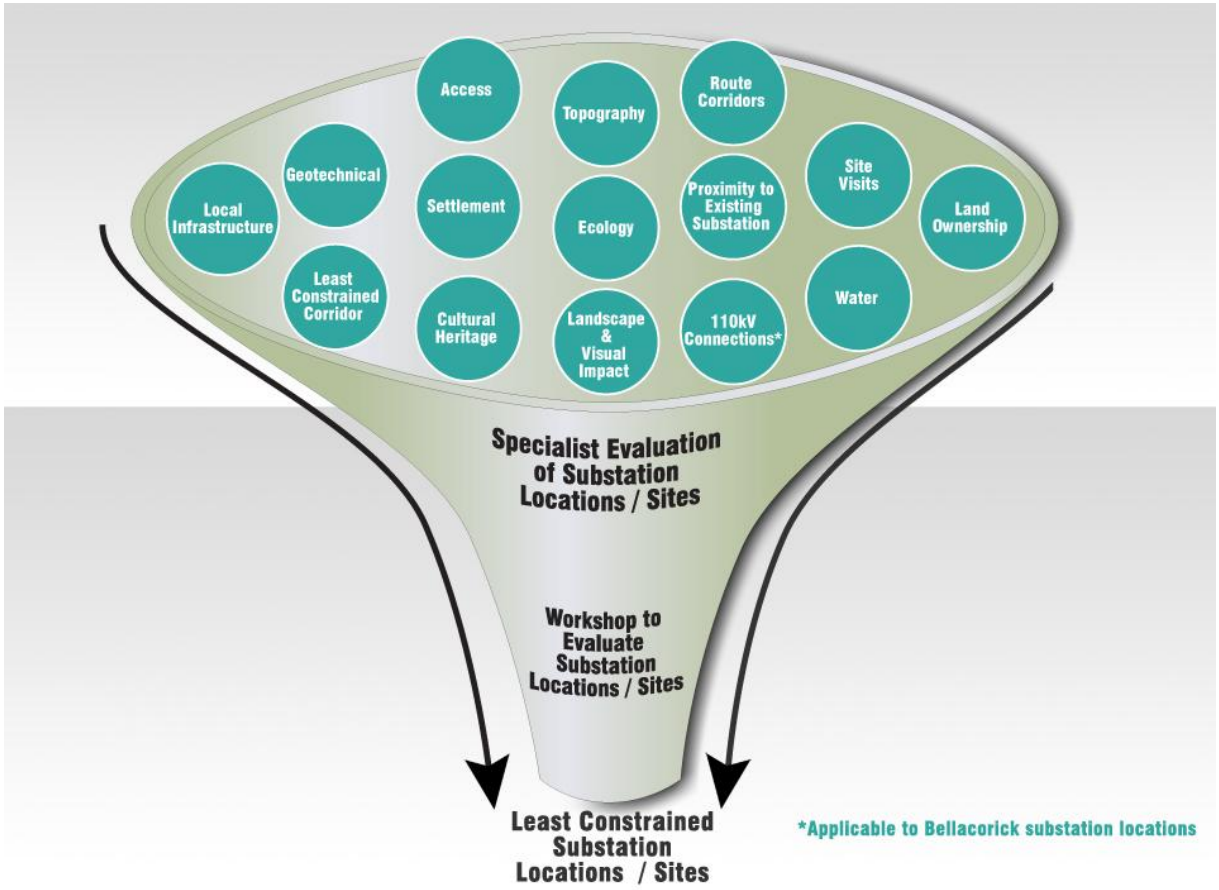


Plate 2-1 Least Constrained Substation Evaluation Process

As set out in the Volume 3 Appendix 6.1 *Route Corridor and Substation Site Identification and Description Report* all substation sites and locations investigated within this report are considered to be technically feasible in that they were selected so as to:

- Provided sufficient area to facilitate the potential future substation requirements;
- Avoid major areas of blanket peat, as indicated by available geotechnical mapping;
- Be located on suitable relatively flat topography;
- Avoid areas which have been subject to flooding; and
- Avoid areas of internationally or nationally recognised ecological and cultural heritage significance.

This first stage of the evaluation process reviewed and reconfirmed the suitability of the site areas / locations identified during the substation site identification process.

However it is important to understand that the selection of the least constrained substation site at each node is intrinsically linked to the identified least constrained route corridors, and that it is not possible to determine a least constrained substation location / site area in isolation from the least constrained route corridor. The selection of the substation site has to follow the selection of the route corridor and thus the least constrained substation site has to be associated with the least constrained route corridor. However, it should be recognised that the least constrained route corridor may not emerge as the preferred corridor for a variety of reasons and therefore it is important that all the different substation locations/site areas be evaluated so as to inform any future discussions.

Each site was visited and evaluated qualitatively by the technical, cultural heritage, landscape and ecological specialist against the criteria listed in Table 2-1, from 'less constrained' to 'more constrained', the results of which were used to furnish a matrix for each node as seen in Tables 4-1 to 4-3 of section 4 of this report. The site visits made by the specialists during the identification process were an important element of this evaluation process.

The substation location / site areas identified had initially been selected so as to minimise the environmental impact of the construction of a substation. In the evaluation process the specialists considered any localised constraints which would impact on the potential to locate the substation at each site. Where any such localised constraints were identified, the evaluation was amended accordingly.

2.3 WIND FARM CONNECTION DISTANCES

As indicated above, the new substation at the Bellacorick node should facilitate connection to the Gate 3 wind farms in the area and that the total length of the 110kV connections to these wind farms should be optimised.

Referring to Figure 2-1, the proposed 110kV connections to the following wind farms have been reviewed for the purpose of this evaluation:

- Connection to Oweninny wind farm, the Phase 2 110kV connection point shown as proposed Substation 2 (5a) of the Oweninny wind farm study area.
- Connection to Oweninny wind farm, the Phase 3 110kV connection point shown as proposed substation 4 (5b) of the Oweninny wind farm study area.
- Connection to Cluddaun wind farm, the closest Cluddaun wind farm substation as indicated on Figure 2-1 Bellacorick Wind farm Connections
- For a remote substation location, a single circuit 110kV connection to the existing Bellacorick substation.
- Distribution System Operator (DSO) connection to other wind farms, based on the closest border of the closest of the DSO connected wind farms, Bunaveala (Keenagh), Gortnahurra, Dooleeg More and Tawnaghmore 1 & 2 and 3.
- Dooghbeg Wind Farm 110kV connection point based on this wind farm's proposed site.

The different wind farms boundaries and, where known, the locations of their proposed substation sites (110kV connection points) are shown in Figure 2-1 herein.

The connection distance assumed that the use of the proposed Grid West corridors would be acceptable. If these cannot be used, then line lengths may be significantly longer. Where it was necessary to deviate from the Grid West corridor and the shortest route was influenced by constraints, the estimated length of the connection included additional length to allow deviation around these constraints.

Where wind farm boundaries are adjacent to the proposed substation sites, an indicative distance of 1km has been applied to facilitate the expected connecting line.

Figure 2-1
Bellacorick Potential Substation Locations

N

0 2.5 5 10
Kilometres

88000 96000 104000 112000 120000

335000 330000 325000 320000 315000

CLUDDAUN SUB 2
CLUDDAUN SUB 3
CLUDDAUN SUB 1
OWENINNY SUB1 PHASE 1
Tawnaghmore WF
OWENINNY SUB 3 PHASE 2
OWENINNY SUB 4 (5b)
Gortnahurra WF
OWENINNY SUB 2 (5a)
Existing Bellacorick Substation
Dooleg More WF

B1 B2 B3 B4 B5 B6 B7 B8 B9 B11

Tawnaghmore
Béal Deirg
Maumakeogh
Gortleatilla
Benmore
Ballinglen
BALLYCASTLE
Baile an Chaisil
Killogeary
Carrowmore
Glenamoy
Gleann Ina Muaidhe
Inagh
Keerglen River
Ballyglass
Creevagh
Glenedagh
Cluddaun
Kilcon
Sheskin
Sorvoley
Rathoma
Garranard
Moygawnagh
Furnought
Rathnamagh
Gortnahurra
Ballyneety Cross Roads
Cloonagh L
Knockadangan Bridge
Knockanillaun
Bellacorick Béal Átha Chomhraic
Dooleeg
CROSSMOLINA
Crois Mhaoiliúna
BALLINA Béal an Átha
Garrycloonagh
Rake Street
Corcullin
Deel Br
Deel River
Owenmore River
Owenniny River
Knocklettercuss
Croaghaun
Slieve Alp
Corslieve
Carrafull
Bangor Baingear
Bellanaboy Br
Sliev Fyagh
Ballykass Megalithic Tomb
Carrowkilleen Megalithic Tomb
Breastagh Ogham Stone
Rathfran
Ratl Leacan

R314 R315 R312 N59

Legend

- Bellacorick Study Area
- Bellacorick Corridors
- Windfarm Boundaries
- Wind Farm Substation
- Location SB1
- Location SB2
- Location SB3
- Location SB4
- Location SB5

Notes:
Distances provided are approximate. Final lengths will depend on approved line routes to be determined

Wind Farms: Dooleg More, Gortnahurra & Tawnaghmore are connected to form DSO connection.Boundaries of the closest Wind Farm has been used to represent line optimisation.

Notes:

Information is based on public available data and is indicative only.
Cluddaun locations are based on Cluddaun Site Map www.coillte.ie/coillteenterprise/renewable_energy/cluddaun_windfarm/project_details.
Oweninny location are based on Figure 7 Proposed Project Phasing Plan http://oweninnywindfarm.ie.
Information on other windfarms identified on this map can be found on the EirGrid website at: http://www.eirgrid.com/customers/gridconnections/completedgenerationapplications/

3 REVIEW OF POTENTIAL SUBSTATION LOCATIONS/SITES

This section sets out the review of potential substation location/site area options against the evaluation criteria. No quantitative or weighting system has been applied to the criteria in order to evaluate the substation sites. It is a qualitative evaluation based on professional expertise and experience which is applied to each substation site against the identified criteria, as set out in Table 2-1 Substation Site evaluation criteria, above. This qualitative approach thus records whether in respect of a certain criterion, a site is "more constrained" or "less constrained", based on information and knowledge obtained to date. This does not imply that one criterion is of greater or lesser importance than another. This evaluation method allows a clear, logical and transparent rationale for the conclusions reached.

The nodes are split into two distinct sub-groups.

(i) Bellacorick - which will facilitate the connection of the wind farms, is located in a highly constrained area characterised by extensive areas of blanket and cutover peat and important ecological environments. The new substation will be required to meet the significant current and future infrastructure developments in the region. The new Bellacorick substation will act as a collector/distributor of electric power.

(ii) Cashla and Flagford - which will form the connection nodes to the existing Irish Grid. These are established sites with fixed locations, having quite different (from Bellacorick) geological conditions and technical responsibilities. Either node will act as a connection point to the existing grid.

3.1 AIR INSULATED SWITCHGEAR (AIS) VS GAS INSULATED SWITCHGEAR (GIS) SUBSTATIONS.

The initial identification of substation sites endeavoured to identify both suitable AIS and GIS sites without preference. However through the review it became apparent that GIS technology provides significant advantages that makes its application more suitable for the Grid West project. Full details of the review of AIS and GIS substation technology have been provided within Volume 3 Appendix 3.2 *Technical Foundation Report*.

AIS technology utilises air as an insulator to prevent electricity travelling to surrounding objects. As air is a relatively poor insulator and high voltages (400kV, 220kV and 110kV) will be used for the Grid West project, it is necessary to provide large distances (approximately 4m at 400kV) between live conductors and between live conductors and earth. For this reason AIS substation layouts inherently occupy large areas.

GIS technology confines the live equipment within chambers filled with a specialised gas, sulphur hexafluoride SF_6, which is a very good insulator allowing the conductors to be much closer together. As a result the equipment occupies significantly less space, allowing the substation to occupy a significantly smaller area. The equipment is more complex, which is reflected in both its capital and maintenance cost.

In comparison to a GIS substation, the equivalent AIS substation for Bellacorick is approximately 5 times larger for an adjacent site and 11 times larger for a remote site, for Flagford and Cashla the adjacent AIS sites are 8 times larger and 11 times for the remote sites. This substantially larger footprint needed for an AIS substation has a negative impact on many of the key selection criteria used for the substation evaluation.

The larger area of the AIS site is likely to have a much greater impact on the local ecology and any local cultural heritage sites. The much larger equipment makes the overall visual impact of the substation greater and it is more difficult to screen effectively. The larger area associated with AIS substation commonly requires a considerably higher level of civil engineering works, including the removal of top soil, levelling of the site, roads, drainage and landscaping. This in turn impacts on the local infrastructure, particularly the local roads.

GIS as well as being physically smaller in size and naturally providing reduced visual impact also provides a variety of design options to further absorbed its development into the surrounding landscape. These can include confining the substation within a building which is in keeping with the appearance of the area, partially constructing the building below ground level reducing the profile and possibly to utilise the flexibility of the smaller footprint to position the development so that it takes full advantage of the natural occurring visual reduction features such as screening, backdrops etc.

It became apparent, that when assessed against the evaluation criteria, all AIS sites were rated as significantly more constrained than the GIS sites. It was therefore decided that only GIS substation sites would be considered further within this report.

Notwithstanding this, it should be noted that certain non-environmental issues, such as comparative cost, suitability for phasing of substation development etc. have not been considered at this first stage of considering substation technology options, and substation site identification. These are matters which can be evaluated when a more detailed understanding of the specific nature and requirements of the project are confirmed. As such, they will be considered as part of ongoing technical and other analysis, and evaluation of substation development. Thus while GIS is the current emerging preference – primarily from an environmental perspective - and on the basis of information gathered in Stage One of the Roadmap process, this does not exclude further consideration of AIS technology when these other non-environmental issues are fed into the ongoing evaluation of the project elements in Stage Two of the Roadmap process.

3.2 REVIEW OF BELLACORICK SUBSTATION LOCATIONS

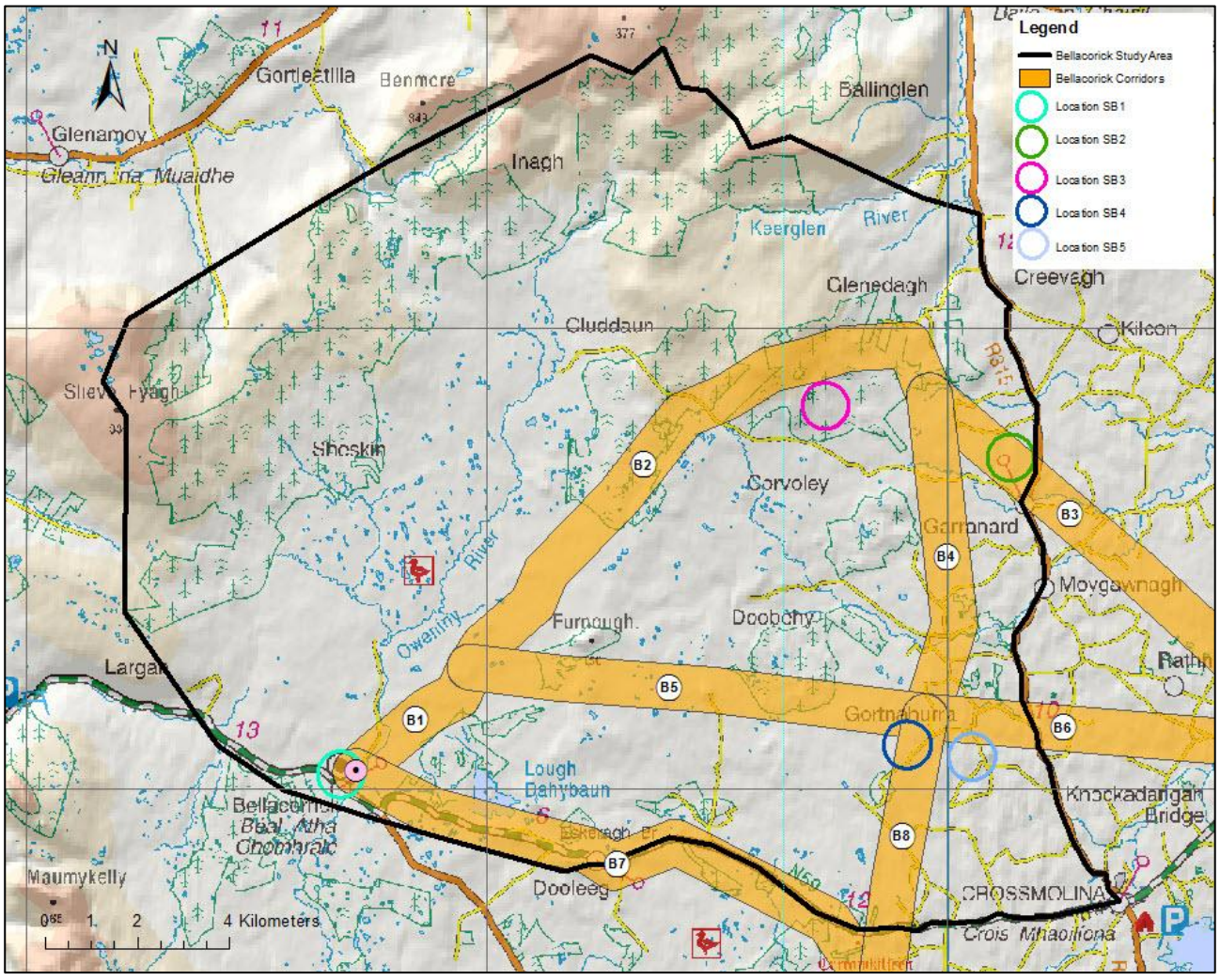
At Bellacorick the principal driver for the substation development is to allow the connection to the transmission system of the wind power harnessed by the proposed Gate 3 wind farms assigned to the Bellacorick node. Therefore the optimum site needs to facilitate the efficient connection of these wind farm developments.

The second specific characteristic is the geology of the Bellacorick area, which is predominately blanket peat. Although significant areas have been harvested for fuel, the ecological and technical constraints imposed by the peat limited the number of viable locations for the new substation and are an important factor in the evaluation of the different sites.

3.2.1 Bellacorick Substation Locations

The potential locations for the substations in the Bellacorick Study Area are illustrated in Figure 3-1 Potential Bellacorick Substation Location below. Each location is then described in detail herein.

Figure 3-1 Potential Bellacorick Substation Locations



3.2.2 Bellacorick Substation Location SB1 Evaluation:

Location SB1[3] will require extending the existing 110/38kV substation at Bellacorick to the adjacent vacant ground previously occupied by the now demolished peat-fired power plant. The site is elevated above the surrounding bog and river which flanks the raised proposed substation location to the west and south. The precise positioning of the substation extension will be confirmed upon site investigation of this brownfield site at detailed design stage.

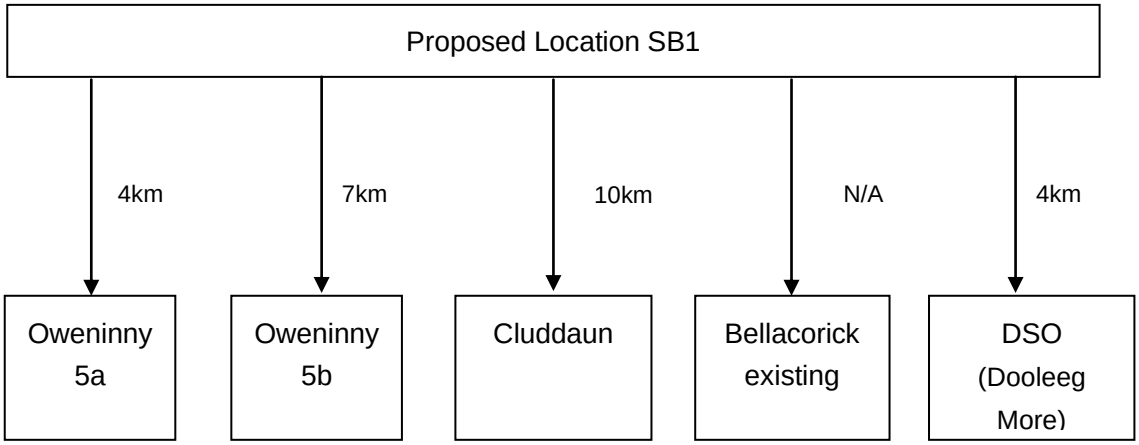
Due to the proposed site's position being adjacent to the existing Bellacorick substation, the location offers the only Bellacorick option which does not require an additional 110kV line route to connect to the existing 110/38kV Bellacorick substation, but will require a link from the existing 110kV busbar, to the new 110kV busbar.

Proximity to existing Bellacorick substation:

- The site is located directly adjacent to the existing 110/38kV substation and hence is the less constrained.

Impact on length of 110kV connections to wind farms:

Figure 2-1 herein shows the location of the wind farms in relation to Location SB1. Based on these locations and the assumptions as to the distance to each wind farm set out in section 2.3 above above, the following schematic sets out the estimated lengths of the 110kV connections.



Total length of 110kV connections for location SB1 is approximately 25km.

- The location SB1 is located in the centre of the Bellacorick area thus facilitates the connection to the Gate 3 wind farms.
- The connection to the Cluddaun wind farm is likely to require crossing the Oweninny wind farm. This access would need to be facilitated by the developers of the Oweninny wind farm and will require coordination.

[3] SB1 is effectively a substation site (not a location) but for consistency within this section of the report is referred to as a location.

Topography:

- The proposed site is predominantly made ground which provides a level surface. This has been confirmed by the site visit.
- Topographical mapping indicates that height variations across the site are minimal.

Geotechnical conditions / subsoil:

- Location SB1 includes the area of the now demolished peat fired power station and is located on an area of made ground with signs of good bearing capacity, to be confirmed at detailed design stage.
- Desk top investigation of the soil conditions and a site visit indicate that the site is suitable for the location of the substation. Full geotechnical studies including soil resistivity investigation will need to be completed to confirm this.
- The area around the existing substation is an area of extensive peat. This will impact on the transmission solution costs and construction requirements.

Access - proximity to suitable public road:

- Location SB1 is located adjacent to the N59. This national primary road does facilitate good access.

Routing of transmission lines to substation:

- The location offers opportunities to the north and east for the routing of future transmission lines. However the presence of the extensive internationally and nationally designated areas around Bellacorick and the wind farm developments significantly limit the opportunities for the routing of future lines.
- Locating the substation adjacent to the existing 110/38kV Bellacorick substation removes the requirement for an additional 110kV line to connect to the new 400/110kV substation, which would be required if this was a remote location.
- The location of this substation site is further west than the other proposed Bellacorick substation site locations, thus the 400kV transmission line will be longer. This will be a consideration in the site and route selection; however the evaluation of this will also need to consider the reduced length of the connections.
- Connection of the Grid West line will need to be coordinated with the Oweninny and Cluddaun to ensure sufficient route corridor width is available.

Proximity to houses/other occupied buildings:

- The location is in close proximity to two existing dwellings on which the substation could potentially impact negatively. However these two houses are both located immediately adjacent to the existing substation and the former power station.

Impact on local infrastructure:

- The site is serviced by existing infrastructure services which can be utilised for the extension.

Location in relation to least constrained route corridor:

- The location is within least constrained route corridor B1.
- Access across the Bellacorick peat complex for the additional 110kV lines and future 400kV transmission lines is highly constrained. This would impose limitations on the future utilisation and development of the 400kV substations at Bellacorick, which is a negative factor against the selection of the SB1 location.

Landscape and visual impact:

- The site is naturally screened from the south and east by mature trees.
- The northern and western aspects are uninhabited.
- The site's location is removed from the view of passing traffic, reducing the overall visual impact from the public road.
- SB1 is adjacent to the start of the Western Way walking route.
- Adjacent site location centralises the impact of the construction, which is a positive factor.

Landownership:

- The proposed substation location could potentially be contained within the single site on land previously used for power generation purposes.

Cultural Heritage:

- There are no cultural heritage constraints in the immediate vicinity.

Ecology:

- The existing site location consists of made ground. An extensive area of additional made ground also exists adjacent to the existing site. Surrounding this area are habitats including peat bog, forestry, improved grassland and scrub. The Owenmore River (significant salmonid fishery) is also adjacent.

3.2.3 Bellacorick SB2 Substation Study Area Evaluation

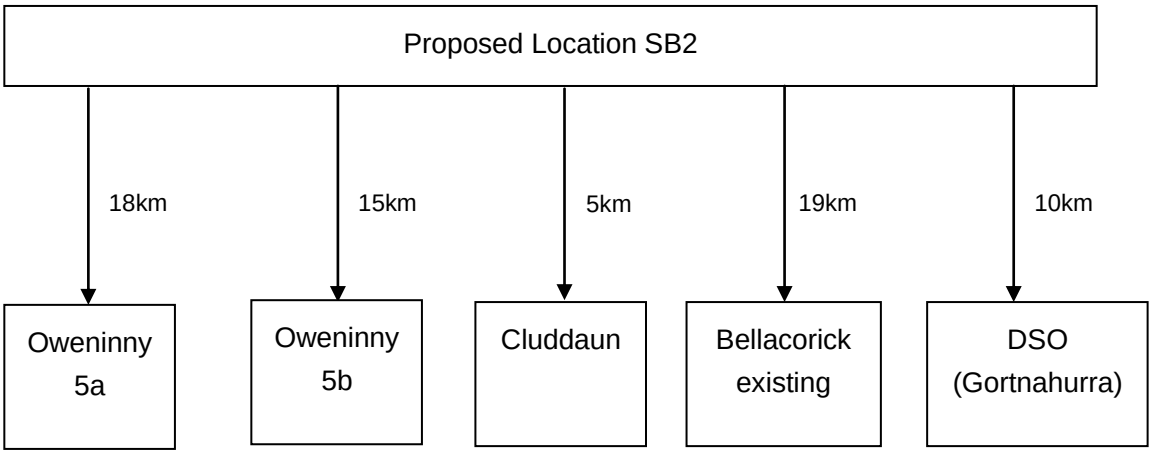
Location SB2 proposes a new site to the north-east of the study area. This site has been identified as being suitable to locate the proposed 400/110kV GIS substation. The existing Bellacorick 110/38kV substation will be connected via a new 110kV transmission circuit. The site offers sufficient area and acceptable geotechnical conditions to facilitate further assessment.

Proximity to the existing Bellacorick substation:

- Locating SB2's position to the north-eastern side of the Bellacorick study area will require an additional 110kV line and associated substation equipment to connect to the existing Bellacorick substation.
- The connection length of the new 110kV circuit to the existing Bellacorick substation is approximately 19km over blanket peat. This connection will require coordination with the Oweninny and Cluddaun wind farms.

Impact on length of 110kV connections to wind farms:

Figure 2-1 herein shows the location of the wind farms in relation to Location SB2. Based on these locations and the assumptions as to the distance to each wind farm set out in section 2.3 above, the following schematic sets out the estimated lengths of the 110kV connections.



Total length of 110kV connections for location SB2 is approximately 67km.

- The location's northern position aids in the connection to the Cluddaun wind farm.
- All other Gate 3 connections will need to coordinate with the Cluddaun wind farm or require longer routing to the south and then along the infrastructure corridor established by the N59 (approximately 28km).
- Location SB2's easterly location will extend the 110kV line length to the western wind farms.
- The increased length of 110kV transmission line and 38kV distribution lines (if required) will require additional easements and add to the visual impact of the project.

Topography:

- The location offers the most extensive area of suitable land of all of the Bellacorick substation locations and thus may offer more opportunities for optimisation during the selection of the final substation site.

Geotechnical conditions / subsoil:

- Desk top investigation of the soil conditions and a site visit indicate that the site is suitable for the location of the substation. Areas of cutover peat have been determined to the south of the site but are localised and can be avoided. A full geotechnical study including soil resistivity investigation will need to be completed to confirm this.
- The easterly location of this site within the study area will reduce the requirement to position 400kV towers within the Bellacorick peat complex. However additional 110kV towers or poles and/or underground cables will be required to connect the existing Bellacorick substation and the wind farms.

Access - proximity to suitable public road:

- The location is accessible via a short length of local road, off the R315. The suitability of the road will need to be checked to determine if it is suitable for the delivery of substation equipment. Access is likely to be more difficult than to SB1.

Routing of transmission lines to substation:

- The location is near the eastern boundary of the study area thus the length of the 400kV line to connect to either Flagford or Cashla via the least constrained route corridor would be reduced.
- Access for the construction of the 110kV lines and any future transmission lines would generally be good.

Proximity to houses/other occupied buildings:

- The location has a low concentration of houses with only one property being shown at the boundary of the location area on the geo-directory; however 3 properties were identified during the site investigation survey as having aspects towards the proposed study area.
- Location SB2 is positioned at the base of a low valley/ area, and two houses are located on the ridge above the site. These dwelling's aspects could be affected by the substation development.
- The proposed location contains a number of farm buildings.

Impact on local infrastructure:

- New services will need to be supplied to this location.
- There are no existing services in the area which are likely to be disrupted.

Location in relation to least constrained route corridor:

- This substation location is located is within the least constrained route corridor B3.

Landscape and Visual impact:

- The location in a valley below a ridge line limits the visual impact of the substation.
- A number of hedgerows exist in the location but due to the size and location they offer limited screening opportunities.

Landownership:

- Multiple substation site options exist within the substation locations providing greater flexibility during landowner engagement.

Cultural Heritage:

- There are two megaliths within this potential substation location (MA21:208 & 029) – both were inaccessible during the site visit so it's not possible to say how well preserved they are. These sites however can be avoided.

Ecology:

- Location SB2 consists of improved farmland with an existing access track. Hedgerow field boundaries and wetter rush pasture are also present. A tributary of the Duvowen River drains the site.

3.2.4 Bellacorick Substation SB3 Study Evaluation

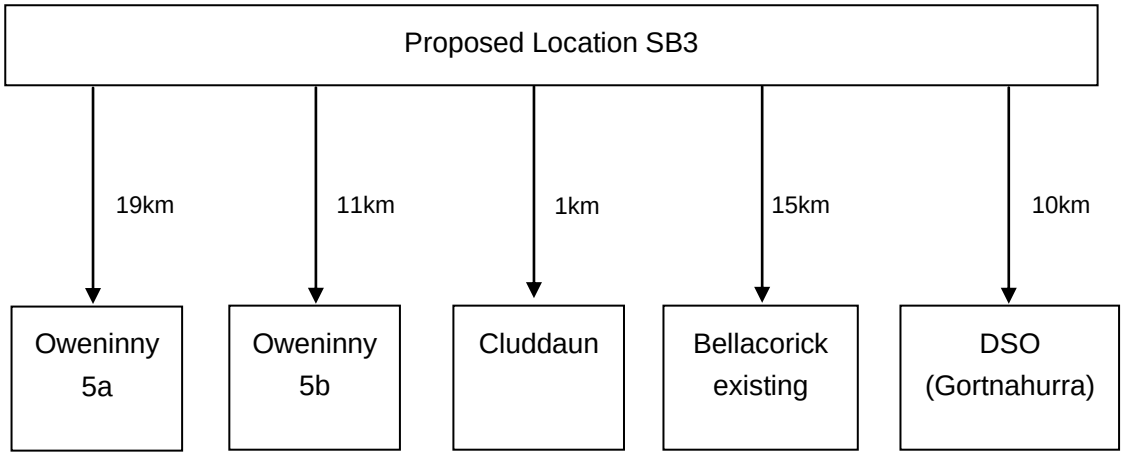
Location SB3 will require a new site to the northeast of the study area. It lies within the boundaries of the Cluddaun Wind Farm. The location offers an area with suitable geotechnical conditions to facilitate the 400/110kV GIS substation and would be connected to the existing Bellacorick substation by a new 110kV line. The location is positioned on the slope of a hill in an area of planted forestry and hence earthworks and tree felling will be required to develop the site. The location offers natural visual screening and not located close to any known dwellings.

Proximity to the existing Bellacorick substation:

- The location offers the next shortest connection distance at approximately 15km to the existing Bellacorick substation options, of all the feasible Bellacorick Study Area options, with the exception of SB1.

Impact on length of 110kV connections to wind farms:

Figure 2-1 herein shows the location of the wind farms in relation to Location SB3. Based on these locations and the assumptions as to the distance to each wind farm set out in section 2.3 above, the following schematic sets out the estimated lengths of the 110kV connections.



Total length of 110kV connections for location SB3 is approximately 56km.

- The northern location facilitates the connection to the Cluddaun wind farm.
- All other Gate 3 connections will need to coordinate with the Cluddaun wind farm.
- SB3's easterly location will extend the line length to the western.

The increased length of 110kV transmission line and 38kV distribution lines (if required) will require additional easements and add to the visual impact of the project.

Topography:

- Topography has been visually assessed and a potentially suitable substation location identified. However a detailed survey will need to be completed to confirm the development potential.

Geotechnical conditions / subsoil:

- Desk top investigation of the soil conditions and a site visit indicate that the site is suitable for the location of the substation. Full geotechnical studies including soil resistivity investigation will need to be completed to confirm this.

Access - proximity to suitable public road:

- The location is accessible by a relatively long local road, the suitability of which would need to be confirmed.

Routing of transmission lines to substation:

- The location is predominantly in forestry which will require clearing to allow corridors to connect.
- The easterly location reduces the connection distance to the electricity transmission network connection points at Flagford or Cashla, compared with a site adjacent to the existing Bellacorick substation.
- The location is within the proposed Cluddaun wind farm study area thus construction will require coordination with the wind farm and will limit opportunities for routing of future lines.

Proximity to houses/other occupied buildings:

- SB3 is not located close to any known dwellings.

Impact on local infrastructure:

- The location is removed from any local infrastructure and will need services supplied.
- Although limited there would be significant impact to users of the local road used for access.

Location in relation to least constrained corridor:

- The substation location is within the least constrained route corridor B2,

Landscape and Visual impact:

- The location is surrounded by forestry and thus offers potential for naturally screening.
- The location is located against a hill providing opportunities for reducing visual impact.

Landownership:

- The area is within Cluddaun wind farm and land acquisition would need to be negotiated with the owners of this wind farm site.
- The location is predominantly forestry which would require clearing to allow development.

Cultural Heritage:

- There are no cultural heritage constraints in the immediate vicinity.

Ecology:

- SB3 is located in extensive conifer forest plantation close to Bellacorick SAC. Fiddawnboy stream, a tributary of the Owenmore River drains the site. There may be a requirement to upgrade existing tracks for road access. Tree clearance work will be required on the site and pollution control measures during construction and operations so as to protect the Owenmore River downstream will therefore be required. The area also forms part of the upstream drainage to Bellacorick Bog SAC.

3.2.5 Bellacorick Substation Study Area SB4 Evaluation

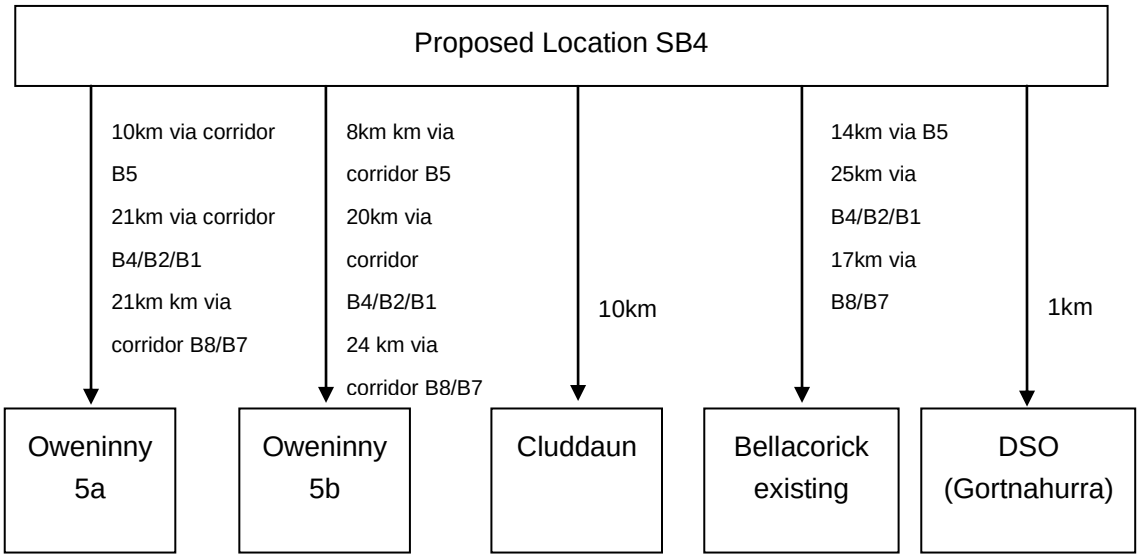
Location SB4 is located to the southeast of the study area. The location offers a suitable area and geotechnical conditions to facilitate a new 400/110kV GIS substation. The site can be connected to the existing 110kV substation via the proposed Grid West line corridor B5, which travels through a highly constrained area, including an SPA. If a corridor through this area is not obtainable, then an alternative route to the north and/or to the south along the N59 would be required, adding considerable length to the to the connecting 110kV lines.

Proximity to the existing Bellacorick substation:

- 110kV connections to the existing Bellacorick substation will be required to either traverse areas of high constraints, including a known SPA, via the northern corridor or within the limited corridor potentially available along or within the N59.

Impact on length of 110kV connections to Wind Farms:

Figure 2-1 herein shows the location of the wind farms in relation to Location SB4. Based on these locations and the assumptions as to the distance to each wind farm set out in section 2.3 above, the following schematic sets out the estimated lengths of the 110kV connections.



If corridor B5 was to be used, the total length of 110kV connections for location SB4 is approximately 43 km.

If the lines have to be routed north through corridors B4/B2/B1, the total length of 110kV connections for location SB4 is approximately 77km.

If the lines have to be routed south through corridors B8/B7, the total length of 110kV connections for location SB4 is approximately 73km.

Topography:

- A small hill exists within location SB4 thus the substation site will need to be located away from this.
- Suitable areas of flat topography have been identified within location SB4.

Geotechnical conditions / subsoil:

- Desk top investigation of the soil conditions and a site visit indicate that the site is suitable for the location of the substation. Full geotechnical studies including soil resistivity investigation will need to be completed to confirm this.
- The location includes areas of cutover and fen peat which need to be avoided if sufficiently deep to cause significant construction difficulties.

Access - proximity to suitable public road:

- The location is accessible by a regional road, with a short length of access over an existing surfaced local road.

Routing of transmission lines to substation:

- The location to the southeast of the study area reduces the route length of the 400kV line.
- The location to the east of the Oweninny and Cluddaun substation and the designated areas makes access for the 110kV lines and future lines to the west difficult.
- Access for future lines is generally good to the south, east and north.

Proximity to houses/other occupied buildings:

- The boundary of the location is approximately 500m from the nearest house in an area with a low concentration of dwellings.

Impact on local infrastructure:

- It is expected that services will need to be run from the R315 however some services may be available from local road.

Location in relation to least constrained corridor:

- The substation location is outside of the least constrained route corridor.
- The substation is located within Corridors B4, B5, B6 and B8 however these do not form part of the least constrained corridor.

Landscape and Visual impact:

- The location is exposed and open and offers little or no screening; however it is removed from housing.

Landownership:

- The location is predominantly large blocks of farm land, which are sufficient to locate a substation.

Cultural Heritage:

- There are no cultural heritage constraints in the immediate vicinity.

Ecology:

- Location SB4 is located in an area of improved farm land with good adjacent road access. There are no significant natural rivers in the vicinity (there are only drains which are within the River Deel (Louth Conn) catchment).

3.2.6 Bellacorick Substation Study Area SB5 Evaluation

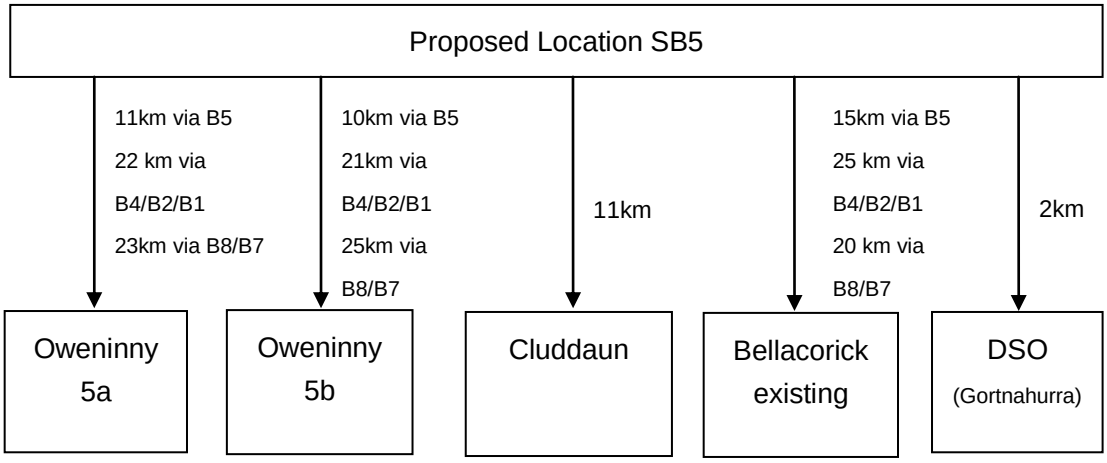
Location SB5 is located to the southeast of the substation study area. From initial investigation the site has suitable areas from a geotechnical perspective with a limited number of constraints and acceptable access roads. The location also contains a number of dwellings and will require additional line/lines to connect to the existing Bellacorick substation and wind farms. The topography is varied across the location however suitable locations for substation sites are available from the preliminary investigations.

Proximity to the existing Bellacorick substation:

- 110kV connections to the existing Bellacorick substation will be required to either traverse areas of high constraints, including a known SPA, via the northern corridor or within the limited corridor potentially available along or within the N59.

Impact on length of 110kV connections to wind farms:

Figure 2-1 herein shows the location of the wind farms in relation to location SB5. Based on these locations and the assumptions as to the distance to each wind farm set out in section 2.3 above, the following schematic sets out the estimated lengths of the 110kV connections.



If corridor B5 was to be used, the total length of 110kV connections for location SB5 is approximately 49 km.

If the lines have to be routed north through corridors B4/B2/B1, the total length of 110kV connections for location SB5 is approximately 81km.

If the lines have to be routed south through corridors B8/B7, the total length of 110kV connections for location SB5 is approximately 81km.

Topography:

- The location has undulating topography limiting the number of possible locations. However visual assessment has identified potential substation locations. A detailed survey will need to be completed to confirm their development potential.

Geotechnical conditions / subsoil:

- Desk top investigation of the soil conditions and a site visit indicate that the site is suitable for the location of the substation. Full geotechnical studies including soil resistivity investigation will need to be completed to confirm this. The location includes areas of cutover and fen peat which may need to be avoided (depending on remaining depth).

Access - proximity to suitable public road:

- The location is accessible via a local road, which will need to be assessed to confirm that it is suitable for the vehicles necessary to deliver substation equipment.

Routing of transmission lines to substation:

- The location to the east of the study area reduces the route length of the 400kV line.
- The location to the east of the Oweninny and Cluddaun substation and the designated areas makes access for the 110kV lines and future lines to the west difficult.
- Access for future lines is generally good to the south, east and north.

Proximity to houses/other occupied buildings:

- No houses are situated within the location.
- The location includes 6 houses which will potentially be impacted by the substation development.

Impact on local infrastructure:

- Services will need to be supplied to the site.

Location in relation to least constrained corridor:

- The substation location is outside of the least constrained route corridor.
- The substation is located within corridors B6 however this does not form part of the least constrained corridor.

Landscape and Visual impact:

- A number of established hedge rows exist within the location which may enhance screening.

Landownership:

- The location is predominantly large blocks of farm land sufficient to locate a substation.

Cultural Heritage:

- There is a ringfort (MA029:19) within this study area to the rear of some dwelling houses. Examination of aerial photos indicates that this site is visible and extant. There is another ringfort just outside this study area to the NE (MA029:48). This site is a cropmark and does not appear to be visible. These sites should be avoided.

Ecology:

- This location is located in improved fields/wet grassland with low hedgerow boundaries. The site appears slightly elevated (sloping). There is a drainage stream linked to the Tooreen River and hence River Deel within the area of the location.

3.3 REVIEW OF CASHLA SUBSTATION OPTIONS

The Cashla study area comprises of an area with a 1km radius from the existing substation. Sites located further than 1km have not been considered due to the associated impact of constructing the interconnecting line and do not comply with the sequential development principle. Apart from the area to the west, the study area has a limited number of constraints. Consideration was given to the quarry site to the south-west, other residential dwellings in the study area and land ownership.

The orientation of the existing site and the connecting 220kV and 110kV transmission lines limits the future connection options to Cashla to the eastern, southern and northern substation boundaries. However it is envisioned that any of these options may require undergrounding of the final connections from the transmission lines to the substations to reduce the number of overhead line crossings.

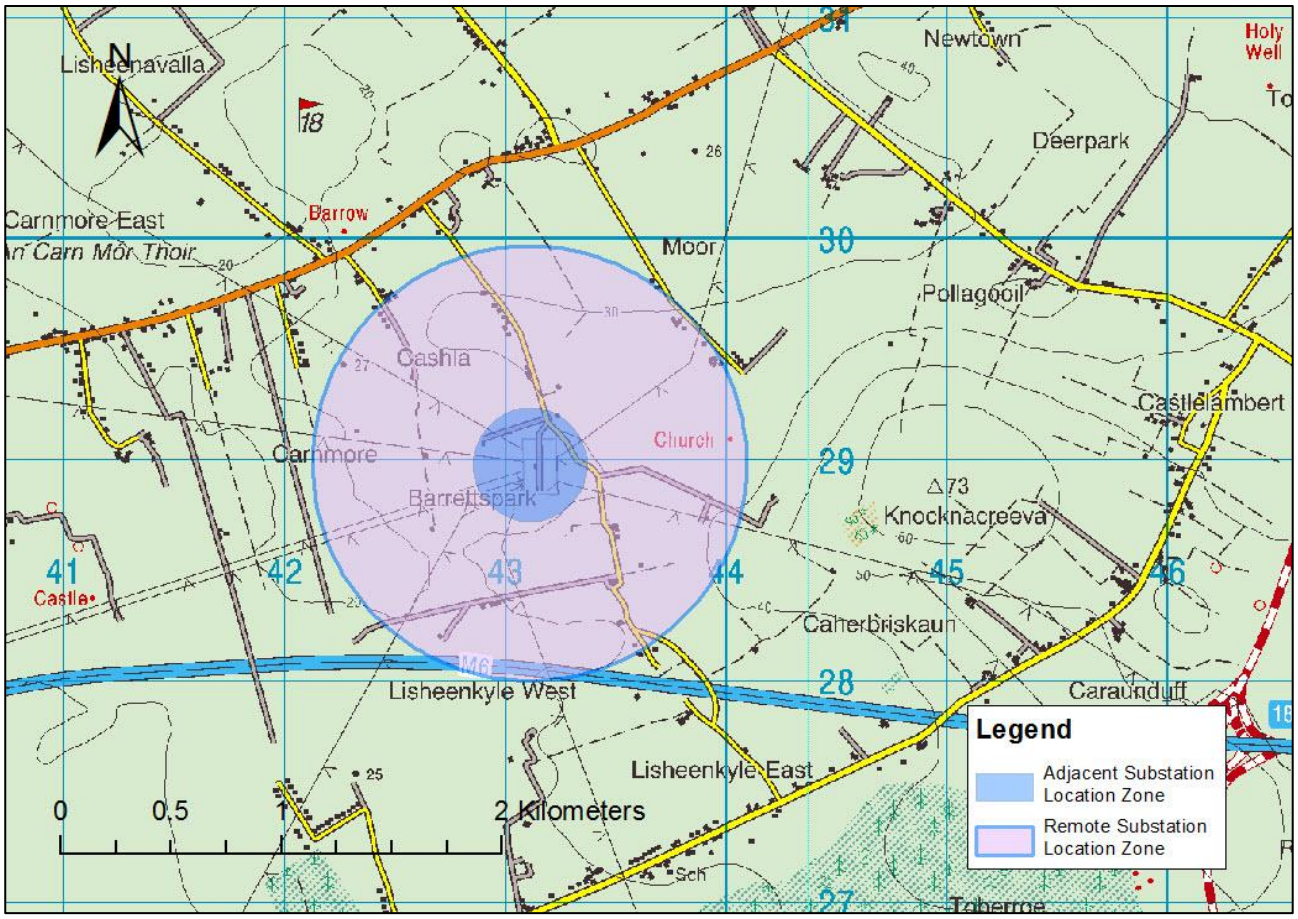
Although feasible, the remote options will require additional connecting circuits and 220kV busbar and associated equipment to connect to the existing site. The requirement and impact of these connections is considered to be significant, thus will only be considered in the future if all the adjacent options prove to be unsuitable.

3.3.1 Cashla Substation Sites

Substation site options at Cashla have been broadly classified into an Adjacent Substation Location Zone, and a Remote Substation Location Zone. The adjacent substation zone is an area immediately around the existing substation, while the remote substation location zone is the area within the study area, outside of the adjacent zone.

The potential substation location zones are identified in Figure 3-2 below. Within each of these zones, a number of potential substation site areas were identified and are described below. Prior to Stage 1 consultation, specific substation sites have not been identified. Specific substation sites will be identified following the Stage 1 consultation and further detailed site and technical investigations. While options for both AIS and GIS site areas were examined, only GIS options were taken forward for evaluation, for reasons already explained.

Figure 3-2 Cashla Substation Location Zones



3.3.2 Cashla Substation Site Area SC1 Evaluation

Site area SC1 is located directly adjacent the northern boundary of the existing Cashla substation on a section of land suitable for a new GIS substation. Underground cables to the 220kV busbars will be required to connect the existing Cashla substations southern bus sections. The substation access road and other existing infrastructure located on the land would need to be relocated to allow construction of the new substation.

Proximity to the existing Cashla substation:

- The site area is adjacent to the existing substation.
- Direct connection to the existing 220kV substation and no requirement for an additional 220kV line and corridor.

Topography:

- Site area topography is suitable for a new substation.

Geotechnical conditions / subsoil:

- As the site area is expected to have similar geotechnical characteristics to the existing substation site it is assumed that the site area is suitable for the construction of a new substation.

Access - proximity to suitable public road:

- The site area is in close proximity to the M6 and accessible via local road which has previously facilitated the delivery of substation equipment.

Routing of transmission lines to substation:

- The northern location of the site area facilitates direct connection to the Grid West line.
- Connection to the southern 220kV bus sections and any future 400kV lines approaching from the south and are expected to require undergrounding.
- Expansion of the 110kV to the north of the existing substation will no longer be facilitated.
- The location of the adjacent C & F Green Energy factory may limit approaches from the east for future transmission lines.

Proximity to houses/other occupied buildings:

- No houses are situated within the site area.
- The site area will indirectly impact two residential houses and one commercial property however as the site area is located within the existing substation the associated impact is expected to be reduced.

Impact on local infrastructure:

- Services are readily available within thee existing substation.
- An existing distribution line will need to be rerouted to free up room for the proposed substation.
- The existing substation access road will need to be relocated.

Location in relation to least constrained corridor:

- The substation location is within the least constrained corridor C3.
- The substation is also located within corridors C7 and C8 however these do not form part of the least constrained corridor.

Landscape and Visual impact:

- The substation will be an extension of the existing site thus visual impact will be minimised however any development will have an inherent impact on the landscape.
- Adjacent site area location centralises the impact of the construction.

Landownership:

- The substation site area is contained within the existing substation.

Cultural Heritage:

- There are no identified cultural constraints in the immediate vicinity.

Ecology:

- The site area is predominantly “made ground” with existing tree screening and scrub on the boundary. Some limited woody vegetation clearance will be required.

3.3.3 Cashla Substation Site Area SC2 Evaluation

Site area SC2 is adjacent to the southern boundary of the existing substation and offers suitable topography, a low concentration of constraints, suitable geotechnical conditions and facilitates the connection to the existing substation.

Proximity to the existing Cashla substation:

- The site area is adjacent to the existing substation.
- Direct connection to the existing 220kV substation and no requirement for an additional 220kV line and corridor.

Topography:

- The site area is considered to have suitable topography for construction.

Geotechnical conditions / subsoil:

- As the site area is expected to have similar geotechnical characteristics to the existing substation site it is assumed that the site area is suitable for the construction of a new substation. Further studies will need to be completed to confirm this.
- An area of karstified rock has been identified to southwest and south of the proposed site area the extent of which need to be confirmed.

Access - proximity to suitable public road:

- The site area is accessible via a local road which has previously delivered substation equipment.

Routing of transmission lines to substation:

- The location of this site area will facilitate the connection of any future 400kV lines from the south and east.
- The development of site area SC2 will limit the expansion of the 220kV and 110kV bus bars to the south.
- It will be necessary to underground the final section of the Grid West transmission line, with the associated sealing end compound and structures.
- Underground cables would be required to connect the new substation to the northern section of the 220kV busbars in the existing substation.

Proximity to houses/other occupied buildings:

- No houses are situated within the site area.
- There are no dwellings indirectly impacted by the site area. As this site area is effectively bounded to the west and south by the quarry and to the north by the existing substation, this effectively limits the potential for housing in this area.

Impact on local infrastructure:

- Services are readily available within the existing substation.

Location in relation to constrained corridor:

- The substation location is within the least constrained corridor C3.
- The substation is also located within corridors C7 and C8 however these do not form part of the least constrained corridor.

Landscape and visual impact:

- The proposed substation will effectively be an extension of the existing substation thus visual impact will be minimised however the development will have an inherent impact on the landscape.
- Adjacent site area location centralises the impact of the construction.

Landownership:

- The substation site area will be an extension of the existing site hence land requirements will be minimised.

Cultural Heritage:

- There are no identified cultural constraints in the immediate vicinity.

Ecology:

- The site area is located in overgrown grassland adjacent to the existing substation. Some limited clearance of woody vegetation will be required.

3.3.4 Cashla Substation Site Area SC3 Evaluation

Site area SC3 is positioned along the northern boundary of the existing substation on the opposite side of the local road. The site area offers an area of suitable size for a GIS substation where desk top studies and site visits indicate soil conditions[4] and topography are acceptable. Connection to the existing site will require underground cables to link to the existing 220kV busbars in the existing substation, although it may be possible to connect the northern section of the existing busbar using an overhead connection across the road.

Proximity to the existing Cashla substation:

- The site area is adjacent to the existing substation; however a short connection over or under the road will be required.
- Direct connection to the existing 220kV substation and there is no requirement for an additional 220kV line(s) and corridor.

Topography:

- The site area offers suitable topography for construction.

Geotechnical conditions / subsoil:

- As the site area is expected to have similar geotechnical characteristics to the existing substation site, it is assumed that the site area is suitable for the construction of a new substation.

Access - proximity to suitable public road:

- The site area is accessible via a local road which has previously delivered substation equipment.

Routing of transmission lines to substation:

- The site area's north western position relative to the existing substation facilitates the connection to the Grid West line.
- Underground cables would be required to connect to the existing substation southern 220kV bus bar sections.
- The site area does not accommodate future lines approaching from the south.
- The location of the adjacent factory may limit approaches from the east for future transmission lines.

Proximity to houses/other occupied buildings:

- No houses are situated within the site area.
- There are a three houses and one commercial property which will be indirectly impacted from the development of the site area.

[4] Full geotechnical studies including soil resistivity investigation will need to be completed to confirm this.

Impact on local infrastructure:

- An existing distribution line will need to be relocated to allow construction.
- Services are readily available within the existing substation and could be extended across into the new site area.

Location in relation to least constrained corridor:

- The substation location is within the least constrained route corridor C3.
- The substation is also located within corridors C7 and C8 however these do not form part of the least constrained route corridor.

Landscape and visual impact:

- The site area would require a significant extension to the existing substation compound increasing the visual impact.
- Adjacent site area location centralises the impact of the construction.

Landownership:

- The substation site area is located in one field which could minimise land acquisition issues.

Cultural Heritage:

- There are no identified cultural constraints in the immediate vicinity.

Ecology:

- The site area is located in overgrown grassland adjacent to the existing substation. Some limited clearance of woody vegetation will be required.

3.3.5 Cashla Substation Site Area SC4 Evaluation

Site area SC4 is located adjacent to the eastern boundary of the existing substation. The location offers a suitable area with acceptable topography and geotechnical conditions to develop a substation. The site area would connect directly to the existing 220kV busbar; however due to the position of the substation between the two existing 220kV towers; the connection to Grid West 400kV transmission line would require underground cables to reduce the number of 220kV crossings.

Proximity to the existing Cashla substation:

- Direct connection to the existing 220kV substation and no requirement for an additional 220kV line and corridor.

Topography:

- The site area offers suitable topography for construction.

Geotechnical conditions / subsoil:

- As the site area is expected to have similar geotechnical characteristics to the existing substation site it is assumed that the site area is suitable for the construction of a new substation. Further studies will need to be completed to confirm this.
- Karstified rock has been identified to the east of the site area. Further investigations into its extent are required to determine the associated impact.

Access - proximity to suitable public road:

- The site area is accessible via a local road which has previously facilitated the delivery of the substation equipment.

Routing of transmission lines to substation:

- The site area is well located for any future lines approaching from the south and east.
- A number of existing 220kV bays will be sterilised by proposed substation.
- There is limited clearance to the existing 220kV lines. Detailed studies will be needed to confirm that this would not restrict the use of this site area.
- The connection of the Grid West line would require crossing the existing 220kV line indicating a requirement for undergrounding of the final section of the line, with the associated requirement for a sealing end compound.

Proximity to houses/other occupied buildings:

- No houses are situated within the site area.
- No dwellings and one commercial building will be indirectly impacted by the development.

Impact on local infrastructure:

- Services are readily available within the existing substation.

Location in relation to least constrained corridor:

- The substation location is within the least constrained route corridor C3.

- The substation is also located within corridors C7 and C8 however these do not form part of the least constrained route corridor

Landscape and Visual impact:

- The site area would require a significant extension to the existing substation compound increasing the visual impact.
- Adjacent site area location centralises the impact of the construction.

Landownership:

- The substation site area would be an extension of the existing site hence land take requirements are minimised.

Cultural Heritage:

- No identified cultural constraints in the immediate vicinity.

Ecology:

- The site area is located in overgrown grassland and scrub adjacent to the existing substation. Some clearance of woody vegetation will be required.

3.3.6 Cashla Substation Site Area SC5 Evaluation

The site area SC5 is adjacent to the south eastern boundary of the existing substation. The site area offers suitable topography and geotechnical conditions to develop a GIS substation. The site area facilitates the direct connection to the existing 220kV busbars and future lines approaching from the south; however it is expected that connection of the Grid West line and northern bus section would be via underground cables.

Proximity to the existing Cashla substation:

- Direct connection to the existing 220kV substation and no requirement for an additional 220kV line and corridor.

Topography:

- The site area is considered to have suitable topography for construction.
- The site area does slope slightly and would require some earthworks to create a level platform for the substation.

Geotechnical conditions / subsoil:

- As the site area is expected to have similar geotechnical characteristics to the existing substation site it is assumed that the site area is suitable for the construction of a new substation. Further studies including soil resistivity investigation will need to be completed to confirm this.

Access - proximity to suitable public road:

- The site area is accessible via a local road which has previously facilitated the delivery of the substation equipment.

Routing of transmission lines to substation:

- The site area is well located for any future lines approaching from the south and east.
- The connection of the Grid West line would require crossing the existing 220kV line suggesting the requirement for an underground approach with associated additional sealing end compound.

Proximity to houses/other occupied buildings:

- No houses are situated within the site area.
- There is one dwelling which will be indirectly impacted by the development of the site area. The site area is closer to these dwellings than site areas SC2 and SC4.

Impact on local infrastructure:

- Services are readily available within the existing substation.

Location in relation to the least constrained route corridor:

- The substation location is within the least constrained corridor C3.

- The substation is also located within corridors C7 and C8 however these do not form part of the least constrained corridor.

Landscape and visual impact:

- The site area would require extending the existing substation to the south increasing visual impact to the southern dwellings.
- Adjacent site area location centralises the impact of the construction.

Landownership:

- The substation site area would be an extension of the existing site, hence land take will be minimised.

Cultural Heritage:

- There are no identified cultural constraints in the immediate vicinity.

Ecology:

- The site area is located in an improved field. Scrub is evident on the site area on the northern boundary.

3.3.7 Cashla Substation Site Area SC8 Evaluation

Site area SC8 is located within the study area but remote from the existing Cashla substation. The site area offers an area of land with suitable geotechnical conditions and topography to construct a GIS substation.

Proximity to the existing Cashla substation:

- Connection to the existing site area will require additional 220kV circuits and corridors including crossing the existing 220kV line.

Topography:

- The site area is considered to have suitable topography for construction.

Geotechnical conditions / subsoil:

- Desk top investigation of the soil conditions and a site visit indicates that the site area is suitable for the location of the substation. Full geotechnical studies including soil resistivity investigation will need to be completed to confirm this.

Access - proximity to suitable public road:

- The site area is accessible via a local road with the addition of a short access road.

Routing of transmission lines to substation:

- Location to the north of the substation facilitates the connection to Grid West line.
- The position of the site area restricts the approach of any future lines from the south and east. It is likely that these would need to be undergrounded on the approach to the substation.

Proximity to houses/other occupied buildings:

- No houses are situated within the site area.
- There no houses which will indirectly impacted by the development of the site area.

Impact on local infrastructure:

- The remote location would require the construction of a completely new substation and all associated services will need to be provided.

Location in relation to the least constrained route corridor:

- The substation location is within the least constrained corridor C3.
- The substation is also located within corridors C7 and C8 however these do not form part of the least constrained corridor.

Landscape and visual impact:

- The site area is screened to the west by large trees.
- The remote location increases the inherent visual impact of the development.

Landownership:

- The substation site area is removed from the existing site, but is located within one field potentially facilitating land acquisition.

Cultural Heritage:

- GA38:026 is located approximately 500m to the north west. No visible surface trace survives. There will be no direct impacts.

Ecology:

- This site area is located in improved farmland with stonewall/ hedgerow boundaries. Existing access present with upgraded road required.

3.3.8 Cashla Substation Site Area SC9 Evaluation

Site area SC9 is located within the study area but remote from the existing Cashla substation. The site area offers an area of land with suitable geotechnical conditions and topography for the construction of a GIS substation. This site area is located in improved farmland with stonewall/ hedgerow boundaries.

Proximity to the existing Cashla substation:

- Connection to the existing site will require additional 220kV circuits and corridors including crossing the existing 220kV.
- Connection to the 220kV may be facilitated by an overhead connection.

Topography:

- The site area is considered to have suitable topography for construction.

Geotechnical conditions / subsoil:

- Desk top investigation of the soil conditions and a site visit indicates that the site area is suitable for the location of the substation. Full geotechnical studies including soil resistivity investigation will need to be completed to confirm this.

Access - proximity to suitable public road:

- The site area is accessible via local road with the addition of a short access road.

Routing of transmission lines to substation:

- The site area will facilitate possible, future lines approaching from the south.
- Connection to Grid West circuit would require a sealing end compound and undergrounding to allow crossing of the existing 220kV lines.
- Connection to the existing substation would require additional 220kV line and corridor.

Proximity to houses/other occupied buildings:

- No houses are situated within the site area.
- Two houses will be indirectly impacted by the substation site area.

Impact on local infrastructure:

- The remote location would require the construction of a completely new substation and all associated services will need to be provided.

Location in relation to the least constrained route corridor:

- The substation location is within the least constrained corridor element C3.
- The substation is also located within corridors C7 and C8 however these do not form part of the least constrained corridor.

Landscape and visual impact:

- The location remote from the existing substation and/or other industrial premises increases the inherent visual impact of the development.

Landownership:

- Consideration to future extraction activities associated with the adjoining quarry would need to be investigated.
- The site area is removed from the existing site, but is located within one field potentially facilitating land acquisition.

Cultural Heritage:

- There are no identified cultural constraints in the immediate vicinity.

Ecology:

- There are no significant ecological constraints known on the site area.

3.3.9 Cashla Substation Site Area SC10 Evaluation

Site area SC10 is a location within the study area but remote from the existing Cashla substation. The site area offers an area of land with suitable geotechnical conditions and topography to construct a GIS substation. This site area is located in improved farmland with stonewall/ hedgerow boundaries.

Proximity to the existing Cashla substation:

- Connection to the existing site will require additional 220kV circuits and corridors including crossing the existing 220kV transmission line.

Topography:

- The site area is considered to have suitable topography for construction.

Geotechnical conditions / subsoil:

- Desk top investigation of the soil conditions and a site visit indicates that the site area is suitable for the location of the substation. Full geotechnical studies including soil resistivity investigation will need to be completed to confirm this.

Access - proximity to suitable public road:

- The site area is accessible via a local road with the addition of a short access road.

Routing of transmission lines to substation:

- Location to the north of the substation facilitates the connection to Grid West line.

Proximity to houses/other occupied buildings:

- No houses are situated within the site area.
- One commercial building will be indirectly impacted by the site area.

Impact on local infrastructure:

- The remote location would require the construction of a completely new substation site area and all associated services will need to be provided.

Location in relation to the least constrained route corridor:

- The substation location is within the least constrained corridor C3.
- The substation is also located within corridors C7 and C8 however these do not form part of the least constrained corridor.

Landscape and Visual impact:

- The remote location relative to the existing substation increases the inherent visual impact of the development.

Landownership:

- The substation site area is removed from the existing site, but is located within one field potentially facilitating land acquisition.

Cultural Heritage:

- GA83:059, a poorly preserved enclosure defined by an overgrown bank of earth and stone from south west through north to east, and elsewhere a degraded scarp is located approximately 100-200m away. There will however be no direct impact on this enclosure.

Ecology:

- There are no significant ecological constraints known on the site area.

3.3.10 Cashla Substation Site Area SC11 Evaluation

Site area SC11 is located within the study area but remote from the existing Cashla substation. The site area offers an area of land with suitable geotechnical conditions and topography to construct a GIS substation. This site area is located in improved farmland with stonewall/ hedgerow boundaries.

Proximity to the existing Cashla substation:

- Connection to the existing site will require additional 220kV circuits and corridors including crossing the existing 220kV.

Topography:

- The site area is considered to have suitable topography for construction.

Geotechnical conditions / subsoil:

- Desk top investigation of the soil conditions and a site visit indicates that the site area is suitable for the location of the substation. Full geotechnical studies including soil resistivity investigation will need to be completed to confirm this.

Access - proximity to suitable public road:

- The site area is accessible via a local road with the addition of a short access road

Routing of transmission lines to substation:

- Location to the north of the substation facilitates the connection to Grid West line.
- The site area restricts the approach of future lines and it is likely that these would need to be undergrounded to connect to the substation.

Proximity to houses/other occupied buildings:

- No houses are situated within the site area.
- Three residential and one commercial building will be indirectly impacted by the site area.

Impact on local infrastructure:

- The remote location relative to the existing substation would require the construction of a completely new substation site area and all associated services will need to be provided.

Location in relation to the least constrained route corridor:

- The substation location is within the least constrained corridor C3.
- The substation is also located within route corridors C7 and C8 however these do not form part of the least constrained corridor.

Landscape and visual impact:

- The remote location increases the inherent visual impact of the development.

Landownership:

- The substation site area is removed from the existing site, but is located within one field potentially facilitating land acquisition.

Cultural Heritage:

- There are no identified cultural constraints in the immediate vicinity.

Ecology:

- There are no significant ecological constraints known on the site area.

3.4 REVIEW OF FLAGFORD SUBSTATION OPTIONS

The Flagford study area comprises an area of 1km radius from the existing substation. Site located further than 1km have not been considered due to the associated impact of constructing the interconnecting line and do not comply with the sequential development principle

The existing Flagford substation is restricted by the Killuken River and the R368 to the west and the Culleenatreen Road to the north-east.

Heat mapping indicated that there are a number of localised constraints which will need to be considered including a high concentration of constraints located to the south of the study area.

Locations to the east of the study area have been avoided due to the additional route length required to connect the proposed 400kV Grid West line.

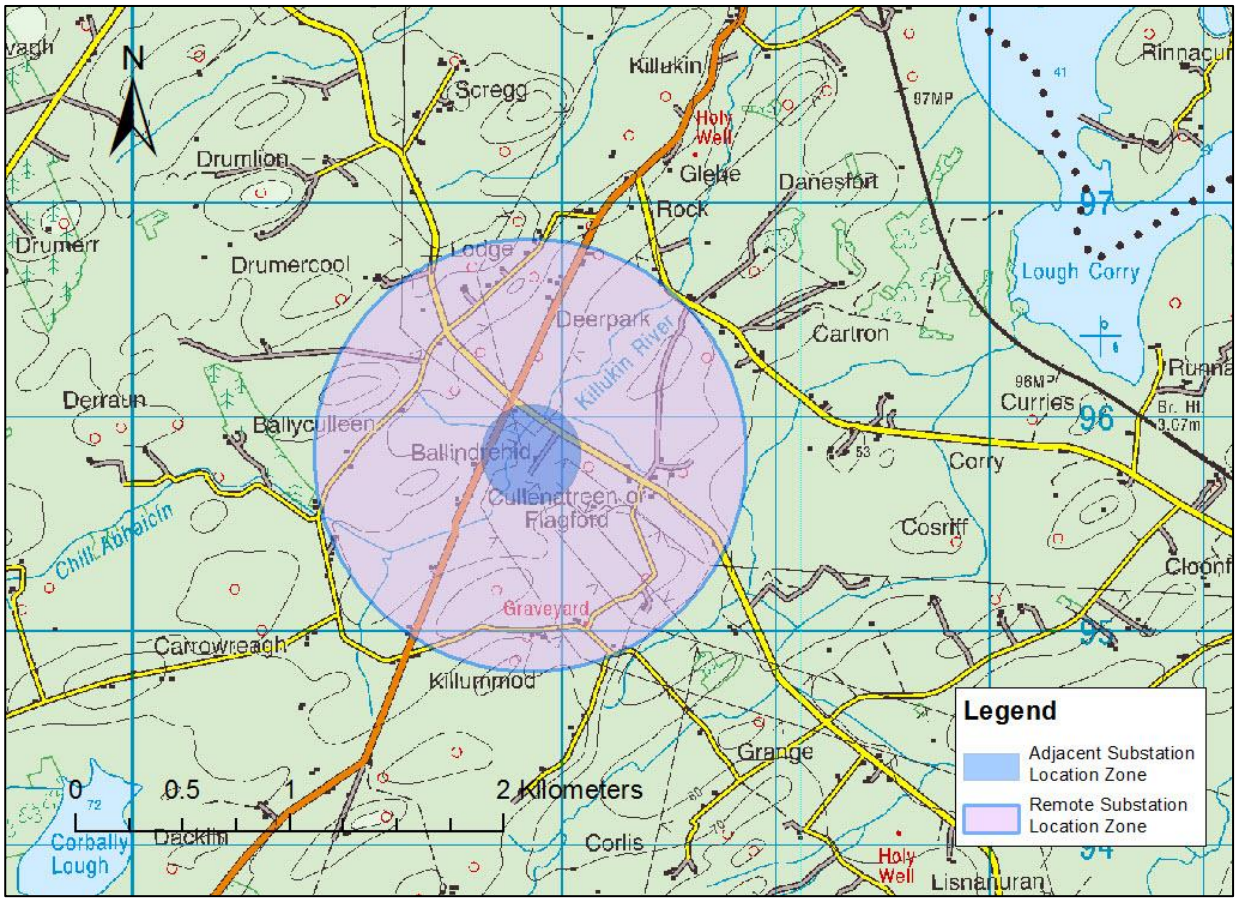
Although feasible, the remote options will require additional overhead lines and high voltage equipment to connect to the existing site. The requirement and impact of these connections is considered to be significant, thus will only be considered in the future if all the adjacent options prove to be unsuitable.

3.4.1 Flagford Substation Sites

As at Cashla, substation site options at Flagford have been broadly classified into an Adjacent Substation Location Zone, and a Remote Substation Location Zone. The adjacent substation location zone is an area immediately around the existing substation, while the remote substation location zone is the area within the study area, outside of the adjacent zone.

The potential substation location zones are identified in Figure 3-3 below. Within each of these zones, a number of potential substation site areas were identified and are described herein. Prior to Stage 1 consultation, specific substation sites have not been identified. Specific substation sites will be identified following the Stage 1 consultation and further detailed site and technical investigations. While options for both AIS and GIS site areas were examined, only GIS options were taken forward for evaluation, for reasons already explained.

Figure 3-3 Flagford Substation Location Zones



3.4.2 Flagford Substation Site Area SF1 Evaluation

Site Area SF1 is situated across the local road from the northern boundary of the existing substation. The site area offers an area of land with acceptable geological and topographical conditions to develop a GIS substation. The connection to the existing substation northern busbar will be achieved via either overhead connection across the road or underground cables. Connection to the southern busbars and possible future 400kV line to the south will be made via underground cable.

Proximity to the existing Flagford substation:

- No requirement for an additional 220kV line corridor due to adjacent location.

Topography:

- The site area is considered to have suitable topography for construction of a GIS substation.

Geotechnical conditions / subsoil:

- Desk top investigation of the soil conditions and a site visit indicates that the site area is suitable for the location of the substation. Full geotechnical studies including soil resistivity investigation will need to be completed to confirm this.

Access - proximity to suitable public road:

- The site area is accessible via a local road which has previously facilitated the delivery of substation equipment.

Routing of transmission lines to substation:

- The location facilitates the direct connection to the Grid West circuit.
- Minimal reconfiguration work would be required to existing connections.
- 220kV connections to the southern end of the existing substations 220kV busbars will need to be via underground cable.
- An underground cable section and sealing end compound will be required to connect to the possible 400kV lines approaching from the south.

Proximity to houses/other occupied buildings:

- The site area does not contain any houses.
- There is a single dwelling which will be indirectly impacted by the development of the site area.

Impact on local infrastructure:

- The location would require crossing the local road either underground or overhead to connect to the existing substation.
- Services are readily available within the existing substation and could be extended across into the new site area.

Location in relation to least constrained route corridor:

- The site area is within least constrained route corridors F2 and F7.
- The site area location is within route corridors F2 however this does not form part of the least constrained corridor.

Landscape and visual impact:

- The substation will be an extension of the existing for the development, thus visual impact will be minimised. However the development will have an inherent impact on the landscape.
- Adjacent site area location centralises the impact of the construction.

Landownership:

- The substation site area is an extension of the existing site hence lands take will be minimised.

Cultural Heritage:

- There are no identified cultural constraints in the immediate vicinity.

Ecology:

- The site area is located in an improved field opposite the existing substation. There is unlikely to be a requirement for significant hedgerow clearance. The site area is adjacent to a small stream tributary of the Killucan River.

3.4.3 Flagford Substation Site Area SF2 Evaluation

Site area SF2 is situated adjacent the eastern boundary of the existing substation between the existing 220kV towers. The site area offers an area of land with suitable topography and ground conditions to develop a GIS substation. The site area can be directly connected to the existing 220kV substation however the impact on the existing 220kV lines and terminal towers will need to be assessed in detail.

Proximity to the existing Flagford substation:

- As this site area is adjacent to the existing Flagford substation there is no requirement for an additional 220kV line corridor due to adjacent location.

Topography:

- The site area is considered to have suitable topography for construction.

Geotechnical conditions / subsoil:

- As the site area is adjacent to the existing site it is expected that the geotechnical conditions will be suitable for the construction of a new substation. Full geotechnical studies including soil resistivity investigation will need to be completed to confirm this.

Access - proximity to suitable public road:

- The site area is accessible via a local road which has previously facilitated the delivery of substation equipment.

Routing of transmission lines to substation:

- Direct connection to the southern sections of the existing 220kV substation busbar.
- Location facilitates the direct connection of any future 400kV line approaching from the east or south.
- Underground cable connection and sealing end compound will be required to connect the Grid West line.
- Underground sections will be required to connect to the northern section of 220kV busbars in the existing substation.
- Technical feasibility of the location due the clearance distances between the existing 220kV transmission lines and the GIS substation building will need to be confirmed.

Proximity to houses/other occupied buildings:

- The site area does not contain any houses.
- There are no dwellings in the immediate vicinity that will be affected by the substation site area.

Impact on local infrastructure:

- Services are readily available within the existing substation.

Location in relation to least constrained route corridor:

- The site area is within least constrained route corridor F7

- The site area location is within route corridors F2 however this does not form part of the least constrained corridor.

Landscape and visual impact:

- The substation will be an extension of the existing for the development thus visual impact will be minimised however any development will have an inherent impact on the landscape.
- Adjacent site area location centralises the impact of the construction.

Landownership:

- The substation site area is an extension of the existing site area hence land-take will be minimised.

Cultural Heritage:

- SF2 is located approximately 120m west of RO11:071, a well-preserved rath defined by a circular grass-covered area defined by a gapped earthen bank. However there will be no direct impact on this monument.

Ecology:

- The site area is adjacent to the existing substation in semi improved grassland. Some tree clearance will be required.

3.4.4 Flagford Substation Site Area SF3 Evaluation

Site area SF3 is adjacent to the southern boundary of the existing Flagford substation. The site area offers an area of land with suitable topography and geotechnical soils to facilitate the development of a GIS substation. The connection to the southern 220kV busbar section can be made via overhead line however the northern section would need to be connected via underground cable.

Proximity to the existing Flagford substation:

- No requirement for an additional 220kV line corridor due to adjacent location.

Topography:

- The site area is considered to have suitable topography for construction.

Geotechnical conditions / subsoil:

- Desk top investigation of the soil conditions and a site visit indicates that the site area is suitable for the location of the substation. Full geotechnical studies including soil resistivity investigation will need to be completed to confirm this.
- Karstified rock has been identified near the proposed site area, the extent of which would need to be confirmed.

Access - proximity to suitable public road:

- The site area is accessible via local road which has previously facilitated the delivery of substation equipment.

Routing of transmission lines to substation:

- The connection to the southern 220kV busbar section can be made by overhead line.
- Underground cable connection and sealing end compound will be required to connect the Grid West line to avoid multiple crossing of the 220kV line.
- The site area would require two 110kV lines to be reconfigured to free up land for the new site area.
- Connection to the other 220kV bus section will require underground cabling or crossings to avoid the existing 220kV lines.

Proximity to houses/other occupied buildings:

- The site area does not contain any houses.
- There are no dwellings in the immediate vicinity that will be affected by the substation site area.

Impact on local infrastructure:

- Services are readily available within the existing substation.

Location in relation to least constrained route corridor:

- The site area is within least constrained route corridor F7.

- The site area location is within route corridors F2 however this does not form part of the least constrained corridor.

Landscape and visual impact:

- The proposed substation will be an extension of the existing substation thus visual impact will be minimised. However the development will have an inherent impact on the landscape.
- Adjacent site area location centralises the impact of the construction.

Landownership:

- The substation site area is an extension of the existing substation hence land-take will be minimised.

Cultural Heritage:

- There are no cultural heritage constraints in the immediate vicinity and SF3 appears to be well screened from rath RO11:071.

Ecology:

- The site area is adjacent to the existing substation in improved grassland. Some tree clearance will be required.

3.4.5 Flagford Substation Site Area SF5 Evaluation

Site area SF5 is a location within the study area but remote from the existing Flagford substation. The site area offers an area of land with suitable geotechnical conditions and topography to locate a GIS substation.

Proximity to the existing Cashla substation:

- 220kV connections to the existing 220kV bus will need to be via underground connections.
- Line corridors for the 220kV interconnections will be required, including crossings of the 110kV lines.
- Additional high voltage equipment and land will be required to facilitate the additional 220kV connection to the existing substation.

Topography:

- The site area is considered to have suitable topography for construction.

Geotechnical conditions / subsoil:

- Desk top investigation of the soil conditions and a site visit indicates that the site area is suitable for the location of the substation. Full geotechnical studies including soil resistivity investigation will need to be completed to confirm this.

Access - proximity to suitable public road:

- Site area is accessible via a local lane. A short access road will need to be constructed.

Routing of transmission lines to substation:

- 220kV connections to the existing 220kV busbars will need to be via underground connections.
- Line corridors for the 220kV interconnections will be required, including crossings of the 110kV lines.

Proximity to houses/other occupied buildings:

- The site area does not contain any houses.
- There are no dwellings in the immediate vicinity that will be affected by the substation site area.

Impact on local infrastructure:

- The options will require crossing the local road either underground or overhead.
- The remote location would require the construction of a completely new substation site area and all associated services will need to be provided.

Location in relation to least constrained route corridor:

- The site area is within least constrained route corridor F7.
- The site area location is within route corridors F2 however this does not form part of the least constrained corridor.

Landscape and visual impact:

- The remote location increases the inherent visual impact of the development.

Landownership:

- The site area is removed from the existing site, but is located within one field potentially facilitating land acquisition.

Cultural Heritage:

- There are no cultural heritage constraints in the immediate vicinity and SF3 appears to be well screened from rath RO11:071.

Ecology:

- The site area is located in a network of small fields. Hedgerow clearance may be required. The site area is also bisected by a stream.

4 EVALUATION

The matrices presented herein represent the results of a qualitative evaluation by the specialists on the project team for each of the substation locations/site areas. These should be read in conjunction with Table 1-1 in chapter 2 of this report.

These have been produced as an indication of the relative merit associated with each site. It is recognised that each of the options evaluated herein could potentially be developed as a substation site, but the identification of the least constrained substation location/site area has to be linked to the identification of the least constrained corridor.

4.1 BELLACORICK SUBSTATION EVALUATION

Table 4-1 Bellacorick Substation Location Evaluation Matrix

Evaluation criteria	Bellacorick Proposed Substation Locations				
	SB1	SB2	SB3	SB4	SB5
Proximity to existing substation					
Impact on length of 110kV line connections to Wind Farms					
Topography					
Geotechnical conditions / subsoil					
Access proximity to suitable public roads					
Routing of transmission lines to substation					
Proximity to houses/other occupied buildings					
Impact on local infrastructure					
Proximity to least constrained route corridor					
Landscape and visual impact					
Landownership					
Cultural heritage constraints					
Ecological constraints					

In accordance with the evaluation criteria, as set out in Table 4-1 above, the least constrained substation location is SB1. This location has the advantages of being adjacent to the existing 110/38kV substation, on a site formerly used for a power station with good road access. The site is within the least constrained route corridor, B1/B2/B3/B9, which forms part of the least constrained corridor to either Flagford or Cashla. However the potential impact on the routing of the required 110kV lines and any future transmission lines is a factor in the evaluation, which could have implications that, if not accommodated by a degree of co-design, could limit the future development opportunities of the site. This location will only be suitable if a route for the 400kV line, can be confirmed as acceptable, under EirGrid overhead line design standards, through the wind farm developments.

Substation location SB2 is the next less constrained offering potentially good technical sites removed from major environmental constraints and is located within the least constrained route corridor, B1/B2/B3/B9. It is however a greenfield location, compared to the already established land use at SB1. The location to the east of the Bellacorick peat complex means that the Grid West 400kV line will be shorter and there will also be reasonable opportunities for the routing of future transmission lines to the north, south and east. However this should be considered in conjunction with the additional 30km of 110kV lines connecting to the substation and the requirement for any future 100kV lines. The routing of

the 110kV transmission lines to the existing Bellacorick substation and the Gate 3 wind farms connecting to the substation is also highly constrained and will need to be developed in coordination with the wind farm developers. Potentially significant cultural heritage sites have been identified within the area of location SB2. However it is likely that these can be avoided during final site selection.

Location SB3 is the next less constrained. It offers similar advantages to location SB2. However its position within the wind farm could present land acquisition difficulties as well as impose restrictions on the routing of future transmission lines.

Substation location SB4 is the next less constrained following SB1, SB2 and SB3. It offers a location with a limited number of technical and environmental constraints and provides reasonable opportunities for the routing of future transmission lines. However it does not fall within the least constrained route corridor and due to its southern location, 110kV connections into Bellacorick and the wind farms will be more difficult and longer with an associated greater impact. Again coordination with the wind farms developers will be required.

Substation location SB5 is a more constrained location within of the proposed Bellacorick substation study area. It offers similar advantages and disadvantages to SB4. However the location would also impact on a number of houses and two ringforts that been identified within the location SB5. These additional constraints have resulted in this site being ranked more constrained.

It should be noted that the substation site option evaluation at Bellacorick has been carried out on the environmental and technical constraints listed in the evaluation matrix, without embarking upon detailed site investigation either at the brownfield location adjacent to the existing substation, or at the other locations, and without commencing any land acquisition discussions.

In this regard, it is emphasised that all substation location options remain active as alternatives, (subject to alignment with the least constrained route corridor) with respect to any other constraints emerging at detailed design stage.

4.2 CASHLA SUBSTATION EVALUATION

Table 4-2 Cashla Substation Site Area Evaluation Matrix

Evaluation criteria	Cashla Substation Site Area Options								
	Adjacent Substation Location Zone					Remote Substation Location Zone			
	SC1	SC2	SC3	SC4	SC5	SC8	SC9	SC10	SC11
Proximity to existing substation									
Topography									
Geotechnical conditions / subsoil									
Access proximity to suitable public roads									
Routing of transmission lines to substation									
Proximity to houses/other occupied buildings									
Impact on local infrastructure									
Proximity to least constrained route corridor									
Landscape and visual impact									
Landownership									
Cultural heritage constraints									
Ecological constraints									

All Cashla substation site areas are located within the least constrained route corridor thus the effect of the least constrained route corridor has been considered as neutral in the evaluation.

In accordance with the evaluation criteria, as set out in Table 4-2 above, the least constrained substation site area for Cashla is SC1, located within the adjacent substation location zone. It offers suitable technical and environmental conditions to facilitate the construction of a GIS substation, with the added advantage of being contained within the existing substation site.

SC2 and SC4 are the next less constrained substation site areas, again located within the adjacent substation location zone. They also offer suitable technical and environmental conditions to facilitate the construction of a GIS substation. These are directly adjacent to the existing substation but the land requirement is unlikely to be completely contained within the existing site boundary. Substations located on these sites may require an underground section to connect to the Grid West line approaching from the north.

SC3 and SC5 are the next less constrained of the adjacent site area options which also have suitable technical and environmental conditions to facilitate the construction of a GIS substation. These would require short connections, however the development of a new substation compound will increase the impact of the development.

Substation site area evaluation at Cashla has been carried out on the environmental and technical constraints listed in the evaluation matrix, without detailed site investigation or landowner consultation.

All site area options identified within the adjacent substation location zone at Cashla are feasible, and their ordering in terms of degree of constraint, is subject to review in the event that other constraints emerge related to ground conditions, or land availability. All of the substation site area options remain active as alternatives with respect to any other constraints emerging at detailed design stage.

SC8, SC9, SC10 and SC11 lie in the remote substation location zone, and are more constrained than the adjacent options as they required overhead lines or cable routes to connect to the existing site, a larger substation compound and additional access. Although site areas within the remote substation location zone (the outer circle defined on Figure 3-3.) are technically feasible, and remain as alternative options, they would be considered 'in reserve' against the less constrained adjacent substation location zone options.

4.3 FLAGFORD SUBSTATION EVALUATION

Table 4-3 Flagford Substation Site Area Evaluation Matrix

Evaluation criteria	Flagford Substation Site Area Options			
	Adjacent Substation Location Zone Options			Remote Substation Location Zone Option
	SF1	SF2	SF3	SF5
Proximity to existing substation				
Topography				
Geotechnical conditions / subsoil				
Access proximity to suitable public roads				
Routing of transmission lines to substation				
Proximity to houses/other occupied buildings				
Impact on local infrastructure				
Landscape and visual impact				
Proximity to least constrained route corridor				
Landownership				
Cultural heritage constraints				
Ecological constraints				

All Flagford substation site area options are located within the least constrained route corridor to Flagford and thus the effect of the least constrained route corridor has been considered as neutral in the evaluation.

As evident in the evaluation matrix as set out in Table 4-3 above, substation site area SF2 is considered to be the least constrained as it has suitable technical and environmental conditions to facilitate the construction of a GIS substation, while being directly adjacent to the existing substation. There are a number of transmission lines on this side of the substation, which have been considered in the above evaluation. This also considers impact on existing infrastructure and neighbouring properties, of a substation site located in this area.

SF1 is the next less constrained adjacent site area, offering suitable technical and environmental conditions to facilitate the construction of a GIS substation. However the site area would be positioned within lands separated by a local road from the existing substation, which will require either an underground or overhead connection.

Site area SF3, positioned within lands on the south western side of the substation, is the next less constrained site area. It is directly adjacent to the existing substation but its proximity to a cultural heritage monument and slightly more difficult approach for other transmission lines, ranks it lower than site areas SF2 or SF1.

SF5 is a more remote site area, which as for the Cashla remote site areas, is technically feasible but considered 'in reserve' and the associated impact of providing a line or corridor route and new substation site in the area of SF5 would only be fully assessed after all adjacent options have been dismissed.

It should be noted that all site areas SF1, SF2 and SF3, located in the adjacent zone are relatively similar in ranking on the environmental and technical constraints listed in the evaluation matrix. This would be reviewed following site investigation and the outcome of any consultations with landowners.

All site area options at Flagford are feasible, and all of the substation site area options remain active as alternatives with respect to any other constraints emerging at detailed design stage. However those site areas located in the remote substation location zone would be considered in reserve to those in the substation location zone.

Chapter 8 of this Stage 1 Report discusses the bringing together of least constrained route corridors, with least constrained substation site area options, to achieve a least constrained combination at the substation nodal points.

GLOSSARY

Adjacent Substation Location Zone: is an area directly surrounding the existing substation site where development, for technical, environmental and planning purposes can be considered an extension of the existing site.

Constraint: A constraint is any physical, environmental, topographical, socio-economic or other condition that may affect the location, development and other aspects of a proposal

Other Constraint: constraints which should be taken into account which cumulatively can influence corridor selection but individually do not influence corridor selection. Examples include gas pipelines, railway lines

Geo-Directory: A database of building in the republic of Ireland which provides the precise address and location of residential and commercial properties established by An Post and ordinates survey Ireland

Required substation arrangement: The required area that accommodates the substation requirements.

Node: A termination point of the Grid West transmission line. One node is in the Bellacorick area with the other nodes being at Cashla and Flagford.

Potential Route Corridor: A linear band of land, of a notional 1 km in width, between the nodal substations, routed so as to avoid as many environmental, technical and other constraints as possible, and within which a high voltage line route can later be positioned. In areas where there were white space/ least constrained area, length of corridor was considered

Substation Site: A generic term used in this report for an area of land with sufficient area to accommodate the projected ultimate development of the substation, sited so as to avoid as many environmental constraints as possible. At this stage in the project specific substation sites have not been identified.

Remote Substation Locational Zone: is an the area within the substation study area, that excludes the adjacent substation locational zone, where the development is considered for technical, environmental and planning purposes can be considered for a new substation site linked to the existing substation site.

Substation Site Area: A general area of land within which a substation site could be identified.

Substation Location: A zone of land, typically 1 km in diameter, sited so as to avoid as many technical and environmental constraints as possible, and within which a substation can later be positioned.

Sequential approach / Sequential test: A planning principle that seeks to identify, allocate or develop certain types or locations of land before others. For example, brownfield housing sites before greenfield sites or town centre retail sites before out-of-centre sites.

Substation Site Area: A general area of land within which a substation site could be identified.

ACRONYMS

AIS	Air Insulated Switchgear
BPC	Bellacorick Peat Complex
DSO	Distribution System Operator
GIS	Gas Insulated Switchgear
SAC	Special Area of Conservation
SPA	Special Protection Area

The Grid West Project

Lead Consultant's Stage 1 Report

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