Capital Project 1021

Substation Feasibility Assessment - Belcamp 400 kV Connection

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EirGrid

CP1021

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A02	March 2022	Updated following Client Comments	CB	NE	FvdL	HC
A03	April 2022	Final	CB	NE	NE	HS

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Executive Summary

Jacobs was requested to prepare a set of substation feasibility reports for EirGrid CP1021 project analysing three sites – Woodland, Finglas and Belcamp. A new 400 kV circuit will originate in Woodland and terminate at either Finglas or Belcamp. This report describes the 400 kV connection requirements at Belcamp substation.

To connect the proposed 400 kV circuit from Woodland to either Finglas or Belcamp requires combining design and construction works for this project with others taking place at Belcamp, namely:

- CP0966 – Kildare Meath. New 400 kV connection from Woodland to Dunstown, requiring a 220 kV static compensator at Belcamp.
- CP1213 – Construction of a new 220 kV indoor GIS switchroom.

Belcamp 220/110 kV substation was assessed to determine its suitability to receive the proposed 400 kV circuit from Woodland, requiring initial construction of a 400 kV GIS switchroom capable of housing an 8 bay enhanced ring configuration, 2 x 400/220 kV transformers and reactive compensation for the circuit. It shall be expandable in the future to take another 2 x 400/220 kV transformers and additional 400 kV circuits.

EirGrid are acquiring land for the above projects under another project – CP1154. It assumed that this land in the area surrounding Belcamp is available for use for this project. On that basis it is feasible to equip an expansion of the Belcamp 220/110 kV substation to accommodate all new plant required for CP1021. This is considered to be achievable with minimal disruption to the existing network during construction and commissioning.

Based on a review of information received and further consultation with EirGrid, it is considered that the site will be able to accommodate the plant required for the Proposed Project as well as other planned EirGrid projects,. It must be noted though that some assumptions are made here regarding the size of compensation and filtering equipment. A further design exercise is needed to develop an optimal overall site layout considering all development projects currently proposed. A summary of the MCA analysis of each of the options against the scoring criteria is given below.

The potential environmental and social impacts of the proposed connection to Belcamp Substation have been considered. Overall there is a moderate risk of environmental impact and a low risk of social impacts. Both environmental and social impacts will be considered further and in more detail as the proposed project progresses into the next Steps in EirGrid's grid Development Framework.

Summary Of MCA

400 kV Connection Options	Technical Feasibility	Environmental Feasibility	Social Feasibility	Deliverability	Economic Feasibility		Combined Performance
Overhead line initial installation							
Overhead line future expansion							
Cable initial installation							
Cable future expansion							

1. Introduction

Capital Project 1021 (CP1021) is a Proposed Project to reinforce the electricity network between East Meath and North Dublin. Further details are provided in the Proposed Project Overview Report [321084AJ-REP-001], along with more information to explain EirGrid's approach to Grid Development.

The technology options being considered by EirGrid are:

- 400 kV Overhead Line (OHL); and
- 400 kV Underground cable (UGC).

There are two circuit node connection options:

- Woodland substation to Finglas substation
- Woodland substation to Belcamp substation.

This report considers the multi-criteria feasibility of a connection to Belcamp substation. Please see report 321084AJ-REP-006 CP1021 for the assessment of Finglas as a suitable termination for the circuit.

1.1 Scale used to assess each criteria

The effect on each criteria parameter is presented along a range from "more significant"/"more difficult"/"more risk" to "less significant"/"less difficult"/"less risk". The following scale is used to illustrate each criteria parameter:

More significant/difficult/risk Less significant/difficult/risk

In the text this scale is quantified by text for example mid-level/moderate (Dark Green), low-moderate (Green), low (Cream), high-moderate (Blue) or high (Dark Blue).

1.2 Relationship to other technical documents

For an in-depth introduction on the Capital Project 1021, please refer to report 321084AJ-REP-001 Proposed Project Overview Report. Parallel to this report, Technical Feasibility, Environmental and a Social Impact studies have been prepared to investigate the impact of proposed the technical solution options (i.e. Underground cable or overhead line) on the study area. These reports have considered the feasibility and constraints of connections to Finglas substation and Belcamp substation from Woodland substation. The findings of these assessments are not directly relevant to this report, however they form part of the wider feasibility assessment for CP1021 and so should be considered in that context.

Please read in conjunction with the following reports:

- 321084AJ-REP-001 CP1021 Proposed Project Overview
- 321084AJ-REP-002 CP1021 Cable Feasibility Report
- 321084AJ-REP-003 CP1021 OHL Feasibility Report
- 321084AJ-REP-004 CP1021 Environmental Constraints Report
- 321084AJ-REP-005 CP1021 Strategic Social Impact Assessment Scoping Report
- 321084AJ-REP-006 CP1021 Substation Feasibility Report Finglas
- 321084AJ-REP-007 CP1021 Substation Feasibility Report Woodland

- 321084AJ-REP-008 CP1021 Substation Feasibility Report Belcamp – this report

2. The Project

2.1 Site Description

Belcamp 220 kV substation is an existing substation located in Dublin and is surrounded by farmland and the M50 motorway. An aerial view of the substation and surrounds is shown in Figure 2-1.

The existing substation contains 220 kV and 110 kV equipment. All switchgear is indoor gas insulated switchgear (GIS). There are separate buildings for the 220 kV and 110 kV switchgear. There is one 220/110 kV transformer connected to the system. The 220 kV building is currently empty, but will be equipped under project CP0984, which is also installing a new 220/110 kV transformer. This work is anticipated to complete in 2023. The 110 kV building contains 10 x 110 kV GIS circuit breaker panels and 1 x temporary 220 kV circuit breaker panel. This temporary panel will be removed as part of CP0984.

Existing connections to the site are all underground cable.

Figure 2-1 Aerial View of Belcamp Substation

EirGrid are in the process of acquiring an area of land to the north of Belcamp under project CP1154. This land will accommodate expansion works for the below two projects:

- CP0966 – Kildare Meath. New 400 kV connection from Woodland to Dunstown, requiring a 220 kV static compensator at Belcamp and may also require harmonic filters.
- CP1213 – Construction of a new 220 kV indoor GIS switchroom at Belcamp.

The proposed land acquisition area (red line) and expansion area (blue) are shown in Figure 2-2.

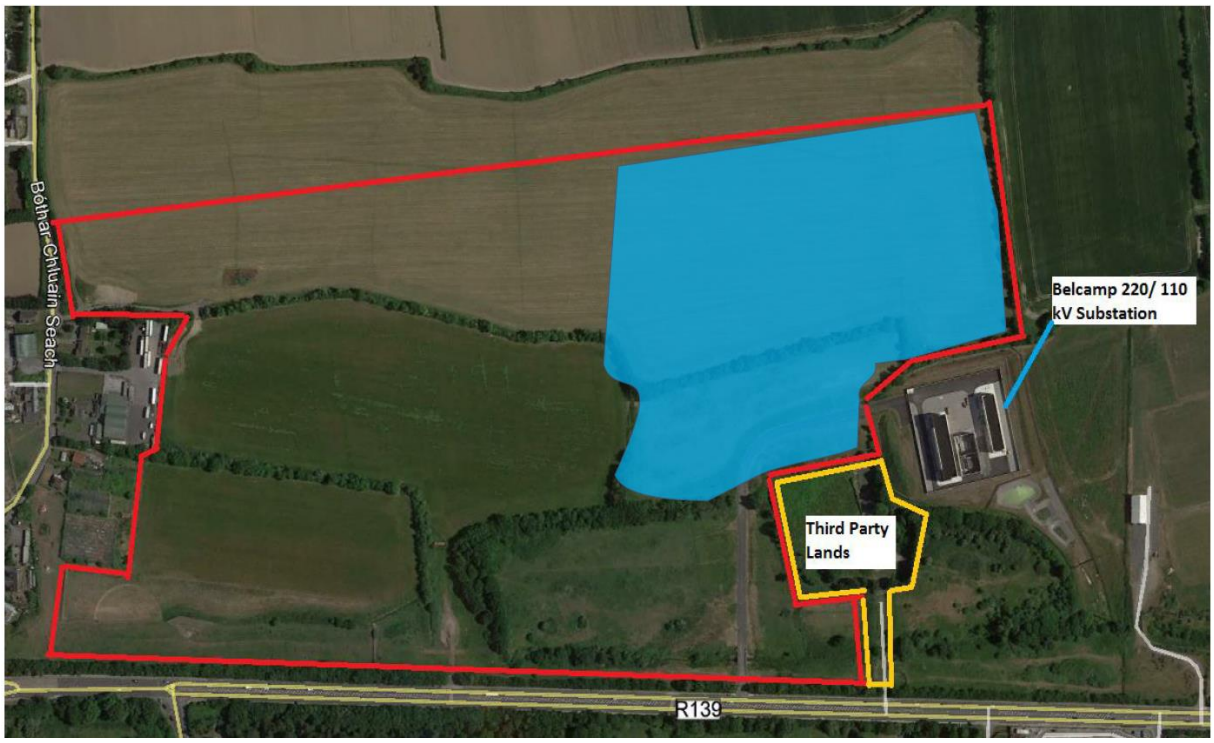

Figure 2-2 Proposed land acquisition

2.2 Objective

This feasibility report considers the option to connect a new 400 kV circuit from Woodland into Belcamp as part of CP1021. It describes the site issues with installing new 400 kV cable or overhead line connection along with all new primary plant and equipment as described in the EirGrid Request for Proposal document SCF17112L1. These requirements have been confirmed in project meetings between Jacobs and EirGrid.

2.3 Assumptions

- The land in the area surrounding Belcamp indicated in blue in Figure 2-2 is available for use for this project
- Reactive compensation is required for the 400 kV circuit from Woodland. This is estimated as a 100 MVAr shunt reactor.
- Reactive compensation for future 400 kV cable circuits can be sited in the unallocated space within the expanded site boundary.
- Reactive compensation for 220 kV circuits planned under CP1213 is not considered.
- Entry of the cable or overhead line from Woodland will be generally from the west of the site. The exact entry point will be determined during the next phase of the project.
- If a cable option from Woodland is selected that the cable size will be $\leqslant$ 3000 mm^2. Implications of a larger sized cable are discussed in section 2.4.4.
- It is only required to consider two 400/220 kV transformers. This is as per email from EirGrid 07/01/2022.
- Harmonic filter requirement is for one set, connected at 220 kV. This requirement is not certain and there may be no need for any filters. It will be confirmed pending the outcome of later cable integration studies for CP0966 and CP1021.

2.4 Technical Feasibility

2.4.1 Project Requirements

A new 400 kV circuit connection is to be made from Woodland 400 kV substation. The receiving site for this shall be either Finglas or Belcamp Substation. The circuit will be either overhead line (OHL) or underground cable (UGC). If UGC is selected it will consist of one conductor per phase only. The initial equipment to be installed at the receiving substation is, (Ref SCF17112L1 section 1.2.4.1):

- The new 400 kV busbar will initially consist of two circuit bays, two transformer bays, two bus sectionalisers and one wing coupler (C-type arrangement).
- One or two 400/220 kV transformers will be initially installed (to be determined during the course of Step 3).
- Compensation and filters (see below)

Belcamp must also be assessed for its suitability for future expansion. Section 1.2.4.1 states:

- The 400 kV substation must be expandable to 4 circuit bays, 4 transformer bays, and two wing couplers, and four 400/220 kV transformers (8 bay enhanced ring arrangement).
- Space may be required at this new substation for reactive compensation and harmonic filters if a new cable circuit is selected. The size of any required reactive compensation or filters will be determined in the course of Step 3.
- Cable circuit approaches to the new 400 kV busbar must be considered in the design to ensure future circuits can connect to the busbar.

Reactive compensation must be considered as it has significant space requirements as well as a high likelihood of being required. Harmonic filters require more space, albeit a lower likelihood of being required. However, the presence of harmonic filters cannot be discounted at this stage.

2.4.2 Other Requirements

There are existing projects in progress and planned at Belcamp substation. These include:

- CP0984 – Installation of 220 kV switchgear in existing building and installation of one additional 220/110 kV transformer. This is expected to be complete in 2023.
- CP0966 – Installation of static compensation connected at 220 kV. This will be outside the current site boundary. There is a risk that this project will also trigger installation of 220 kV harmonic filters at Belcamp.
- CP1213 – Construction of a new 220 kV GIS switchroom to extend the CP0984 220 kV switchboard with 12 bays; installation of 2 x 220/110 kV transformers and up to 6 x 220 kV feeder circuits. This will be outside the current site boundary.

Construction of the new 220 kV switchroom under CP1213 is a dependency for this project as the 400/220 kV transformer installed for CP1021 will connect to this new switchboard.

EirGrid have indicated that there is potential for additional 400 kV or 220 kV connections from various offshore projects. These are not considered in this report.

2.4.3 Design Options

This report will examine the suitability of Belcamp as an end point for the Woodland 400 kV circuit. Development of a full site layout incorporating all known and potential future works is outside the current scope. The basis of design is the WSP drawing 70080035-WSP-001, showing indicatively the future 220 kV switchroom planned

under CP1213 along with an indicative arrangement of the 400 kV switchroom. The 400 kV arrangement shown in this drawing doesn't include reactive compensation and may be affected by choice of cable size, see below.

2.4.4 Impact of Cable Size on GIS

Discussion with 400 kV gas insulated switchgear manufacturers indicated that the largest cable box compatible with the switchgear is a Pfisterer size 8. This can take cable up to 3000 mm^2. This is likely to be the case with all major manufacturers. If a cable larger than this is selected, it would not be possible to terminate it directly into the GIS or a gas insulated busbar (GIB) extension from it. In this case, the cable would need to terminate to an outdoor sealing end structure, then connect via open busbar to the reactive compensation and AIS bushings connected to the GIS. This will affect the size of the 400 kV plant footprint.

2.4.5 Connection of Reactive Compensation

It is assumed for this assessment that a 100 MVAr shunt reactor will be needed at each end of the 400 kV circuit as reactive compensation. This is assumed for purposes of this report to be case for both the UGC and OHL options. The actual requirement will not be confirmed until further studies are carried out. EirGrid have indicated that the reactor does not need to be switchable independent of the circuit.

Options considered for connection:

1) Terminate incoming cable / overhead line to an AIS busbar compound; tee the reactor off the busbar; connect the busbar to a cable, GIB or AIS bushing interface and continue to the GIS. This is shown in Figure 2-3

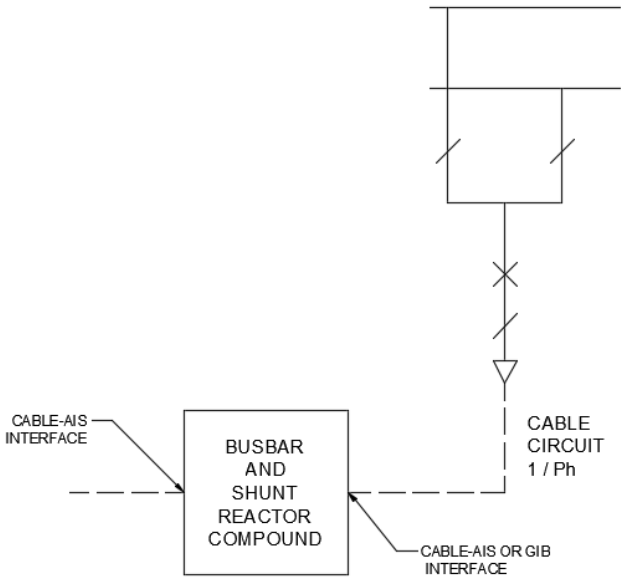

Figure 2-3 AIS Compound Connection

2) Cable or GIB connection directly to GIS by dual cable box or similar. This would be to the same panel that the Woodland circuit terminates to. Alternatively, this connection could be banked onto the same GIS circuit breaker. This would allow the reactor to be independently switchable, however EirGrid have indicated that this is not required. This is shown in Figure 2-4

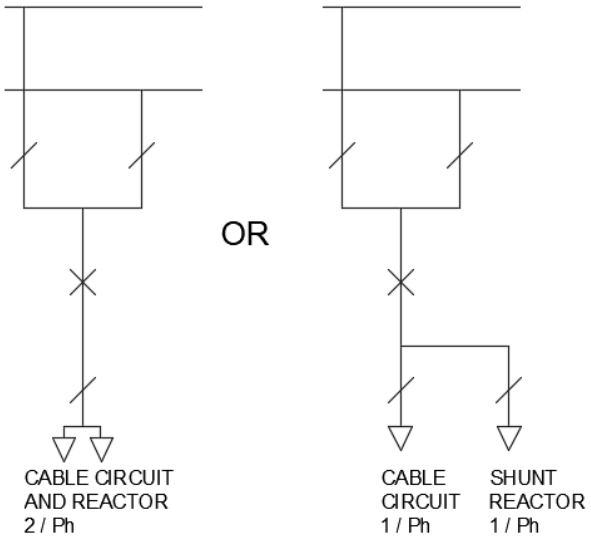

Figure 2-4 GIS Direct Connection

3) Three ended GIB connection from GIS to incoming circuit and reactor. This is shown in Figure 2-5

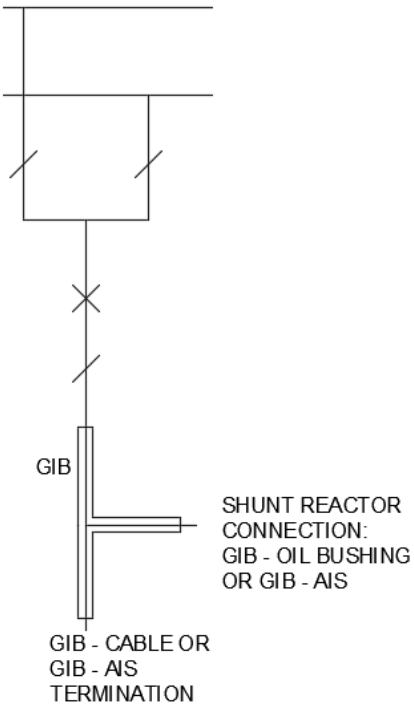

Figure 2-5 GIB Connection

Application to Belcamp:

- Option1: This option has the largest footprint and the most exposed 400 kV conductor and is therefore the least preferred. If a cable larger than 3000 mm2 is used for the cable circuit, this would be the only feasible option.
- Option2: This is a feasible option for Belcamp as long as the cable is ≤ 3000 mm2. If a GIB interface directly onto the shunt reactor is not acceptable to EirGrid, then this would be the preferred solution.

- Option3: This is a feasible option for Belcamp as long as the cable is ≤ 3000 mm^2. If a GIB interface directly onto the shunt reactor is acceptable to EirGrid, this option means there will be less exposed 400 kV at Belcamp. This would be considered as the preferred solution in this case.

Site layouts

Figure 2-6 and Figure 2-7 show layout options for overhead and underground cable connection of the Woodland – Belcamp 400 kV circuit. The base layout of the expanded site with 220 kV switchroom and static compensator is from drawing 70080035-WSP-001, provided by EirGrid. These drawings should be considered to be indicative and for concept design only. There is a separate design exercise being carried out to create an overall arrangement of Belcamp incorporating new plant from all of the known projects being considered for the site.

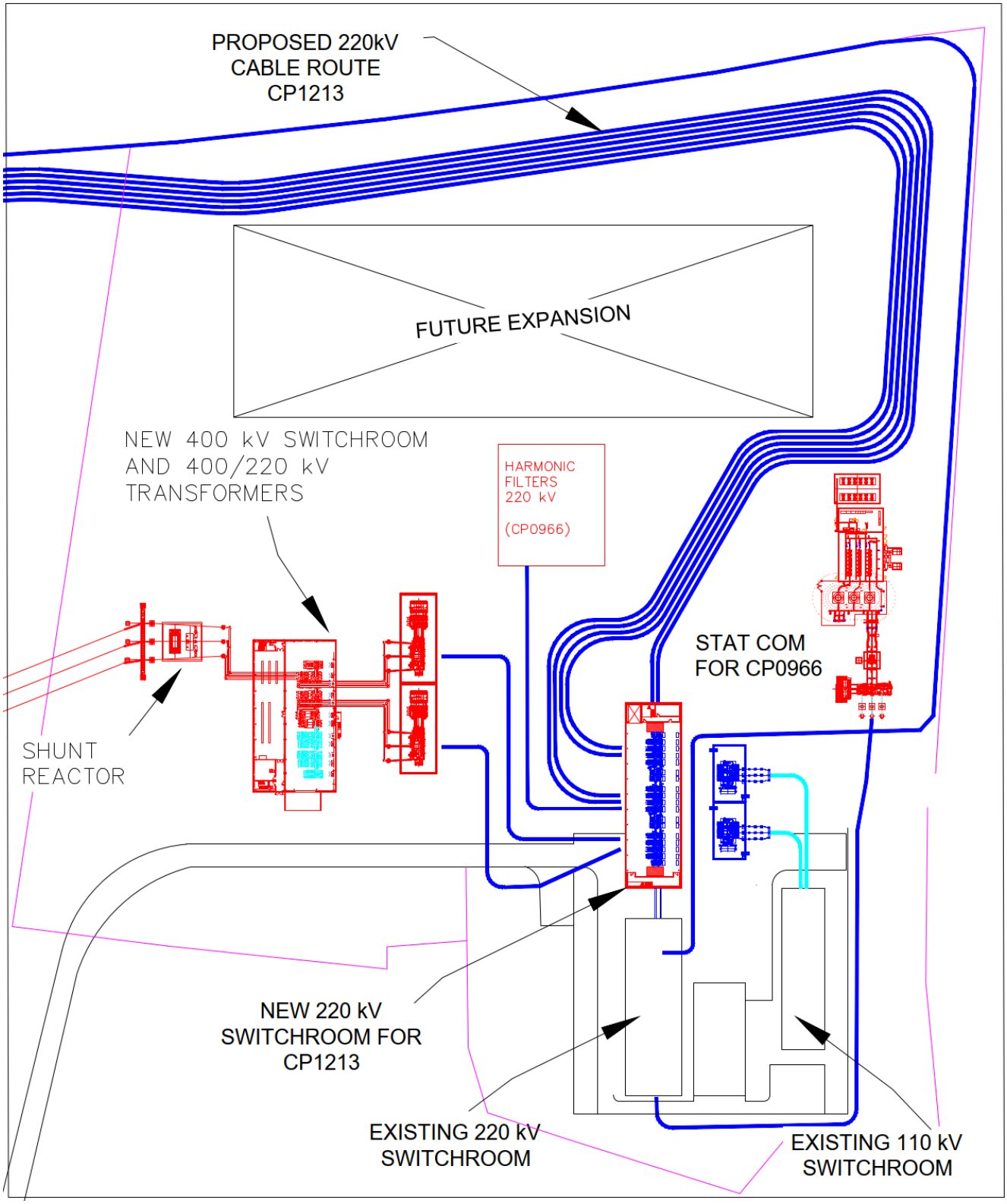

Figure 2-6 Belcamp 400 kV layout option – Overhead line

Figure 2-6 shows a potential orientation for the new 400 kV switchroom and transformers. Other alignments are feasible and the optimal arrangement of the overall site is still to be developed. In this arrangement the reactive compensation is located beneath the oversailing conductors between OHL gantry and the 400 kV AIS bushings at the end of the GIB, connecting to the GIS. Note that if a cable > 3000 mm^2 is used, a similar arrangement of overhead conductor would be required.

GIB connection is shown for external connections from the switchgear. Cable could also be used. It is assumed that the GIB can be run either above or below the auxiliary control room.

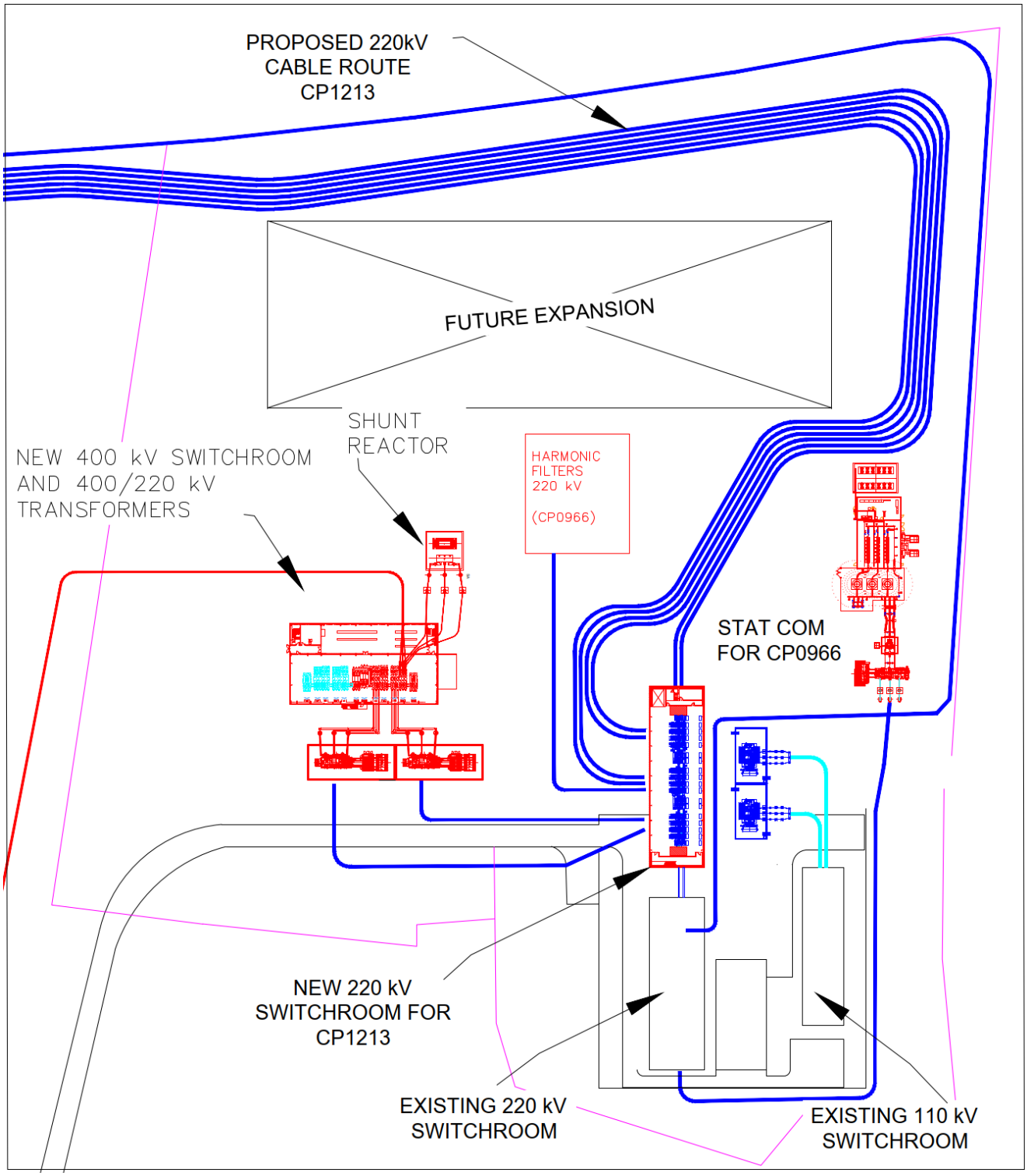

Figure 2-7 Belcamp 400 kV layout option – Underground Cable

Figure 2-7 shows a potential orientation for the new 400 kV switchroom and transformers. Other alignments are feasible and the optimal arrangement of the overall site is still to be developed. This layout shows option 2 of connection of the reactive compensation, with two sets of 400 kV cables connecting to multiple cable boxes on the 400 kV switchgear. It is based on an elevated building design with the control / auxiliary room at 1st floor level allowing cables to run beneath.

2.4.6 Overhead Line vs Underground circuit options

The cable and overhead line feasibility reports 321084AJ-REP-002 and 321084AJ-REP-003 indicate that entry of circuits will be generally from the west (north west or south west, to be determined once the final route selection is made) and able to reach a termination point in the expanded area north west of the existing substation boundary.

For an overhead line scenario there would be a terminal tower outside the site with droppers to a standard gantry structure within the site. From here connection to the switchgear would be by either air or gas insulated busbar, with a suitable tee to reactive compensation if it is needed.

A cable circuit may be brought to a suitable termination point at or near the 400 kV switchroom. The size of the cable will determine the options for termination as per the preceding sections of this report. The cable option would allow greater flexibility in the final layout of the site. At this point it is only an assumption that the 400 kV switchroom will be sited on the west of the expanded site. There is a future exercise to develop a comprehensive layout incorporating all known future development and examining the interaction of 220 kV and 400 kV cable corridors. However, it may be concluded there is a feasible solution for location of all required plant and equipment for CP1021 at Belcamp.

2.4.7 Site Expansion

For Belcamp to be a suitable site to receive the 400 kV connection from Woodland and be able to accommodate the future expansion as detailed in the Project Requirements, the existing site will need expansion. Requirement for expansion of Belcamp has already been triggered by projects CP0966 and CP1213. It has been established that the surrounding land is potentially available for further development.

2.5 Feasibility Assessment

As per Section 0, the following scale is used to assess the technical feasibility of this option.

More significant/difficult/risk Less significant/difficult/risk

400 kV Connection Options	Technical Feasibility
Overhead initial installation	
Overhead line future expansion	
Cable initial installation	
Cable future expansion	

2.6 Environmental Constraints

The potential environmental impacts of the Proposed Project at Belcamp are largely related to the potential for land take associated with the extension to the existing substation that is required to accommodate the additional equipment for CP1021 to connect to the substation. The design options do not have a measurably different impact on environmental topics once the land take is taken into consideration. Therefore, the technical options are not included in this assessment, only the overall likelihood of impacts from any extension to the north.

2.6.1 Biodiversity, Flora and Fauna

There are no designated sites near Belcamp Substation. Baldoyle Bay SAC and SPA are the closest at approximately 4km distance. These are, however, hydrologically linked to the substation site by the water body Mayne_010 and its tributaries. There is a ditch immediately to the north of the substation which drains into one of the segments of Mayne_010 and Mayne_010 itself flows immediately north of the R139, from which access to the substation is gained. The access road to the substation crosses this water body. There are no NHA sites near to the site.

Biodiversity features of interest within the surrounding area of the substation include a number of mature hedgerows, the Mayne_010 water body and the ditch to the north of the site.

Potential impacts during construction include:

- Temporary loss of terrestrial habitat within the footprint of the extension to facilitate access roads and construction compounds; and
- Potential pollution of local water bodies with the potential for onward impacts on Baldoyle Bay SAC; and
- Disturbance, and temporary displacement of birds and mammals in habitats within or in close proximity to the Project footprint.

Potential impacts during operation include:

- Permanent loss of existing ditch habitat;
- Loss of foraging grassland; and
- Loss of hedgerows.

With respect to the ditch, it is not proposed to culvert it through the middle of the extended substation, rather to divert it around the extended substation. It is assumed for this assessment that the diversion will include features of biodiversity interest and will lead to an improvement on ecological value of the ditch, compared to the baseline situation.

Colour coding for MCA – Biodiversity

As a result of the potential impacts during construction, in the absence of mitigation, the hydrological connection to the SAC and the potentially permanent loss of habitat, there is a moderate to high risk of a significant impact on biodiversity.

2.6.2 Soils and Water

As is set out in Section 2.6.1 Biodiversity, there are two water bodies in close proximity to the substation; Mayne_010 and a ditch which flows into a segment of Mayne_010 further north of the site.

The Mayne_010 has Poor WFD Status and is At Risk of not achieving its objective of Good ecological Status. It suffers from significant pressures relating to urban runoff. It is hydrologically connected to Baldoyle Bay SAC; at 4km from the site, the potential for impacts on the SAC exists but is limited. The SAC is, however, close enough at

less than 5km to mean that Mayne_010 is considered to be a more sensitive water body than its Poor Status would normally suggest.

There is no history of flooding on the site; there is some evidence of pluvial flooding (PFRA) immediately to the north of the existing substation (105 Annual Exceedance Probability (AEP); and some potential for fluvial flooding (10%AEP) along the banks of the Mayne_010 to the south of the substation and across the route of the existing access track.

Assuming that the diversion of the ditch is designed in the interests of improved biodiversity, hydromorphological features will be improved and this has the potential to be a beneficial impact from the proposed project. For the substation itself, once operational it is unlikely there would be any water quality impacts from it as it is assumed that control measures such as bunding of transformers, for example, would be included in the design of the new equipment.

Therefore, the most significant risk to Mayne_010 is during construction. Potential impacts during construction will include silty water runoff from exposed surfaces following topsoil strip of the greenfield site to the north, changes to the hydrological regime of the drainage ditch, and the potential for works relating to this to lead to onward distribution of increased levels of sediment.

There is potential for new development, on a currently greenfield site, to increase flood risk elsewhere, however it is assumed for this assessment that any design would incorporate SUDs features, in line with local planning policies and other EirGrid substation extensions to attenuate flow to ensure no net increase in surface water runoff.

Colour coding for MCA – Soils and Water

There are potentially significant impacts on the Mayne_010 and as a result the risk is rated as moderate.

2.6.3 Material Assets – Planning Policy and Land Use

Details of policies in the Fingal County Development Plan of relevance to the potential extension of the substation are included in the environmental Constraints Report (Document ref 321084AJ-REP_004). Of particular note, is that the land to the west of the substation, where an extension would be feasible, is zoned for industrial and employment use, although it is currently in agricultural use.

Land Use and Proposed Developments

Belcamp substation is located to the north of the E139 Priorswood, between Malahide Road and the M1, in the northern outskirts of Dublin. The substation is bounded by agricultural fields to west, north and south; a residential community is immediately south of the R139, across the road from the entrance to the existing substation.

In terms of land use in the surrounding area, the land is largely agricultural in use, with residential land to the south as stated. The land is in a zone identified by Fingal Development Plan as being suitable for commercial, office and technology use. Land to the east and north east is zoned for recreational activity/green space.

There are a number of approved planning applications for proposed developments in the vicinity of the substation, an overview of which is given.

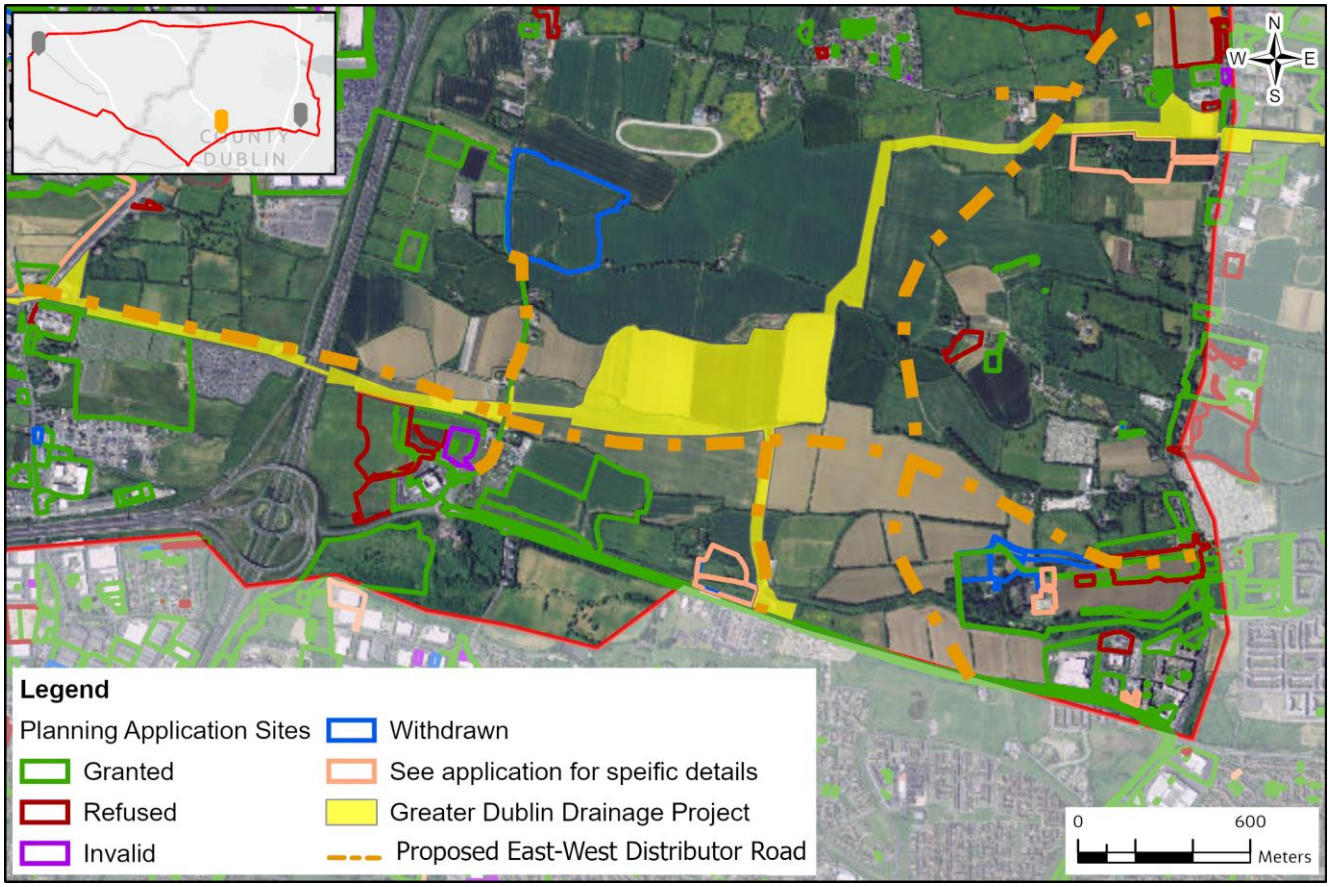

Figure 2-8 Proposed Developments Belcamp Substation

Greater Dublin Drainage Project

There is a proposed development immediately north of the land in which any proposed extension of Belcamp would be constructed: Irish Water's Greater Dublin Drainage (GDD) project (see Figure 2-8). The area shown in this figure includes the orbital sewer from the west, which crosses the M1 and a connecting sewer and an access track for the proposed Waste Water Treatment Plant.

The GDD project was approved by An Bord Pleanála (ABP), however the Board Order was quashed in November 2020 on the grounds that ABP did not consult with the Environmental Protection Agency (EPA) correctly, as it was legally bound to do. The Application will be reconsidered by ABP following updates to environmental information that are now required and consultation with the EPA. It is likely a decision will be made in 2023. If approved, construction could begin in the two to three years following. Construction of CP1021 is unlikely to take place until the late 2020s, which means there is unlikely to be combined impacts from both projects during their construction phases.

GDD does, however, present constraints the extension of Belcamp substation to the east and to the north also. This has been takeninto account in the land acquisition project (see Figure 2-2).

Other Projects

To the north, a regional distributor road is proposed, which, if constructed, would form a boundary between the Belcamp development area and GDD. The road is referenced in Fingal's County Development Plan but there are no dates by which it is proposed to be designed and built. .

To the south of the substation, in the R139, it is proposed to install a fuel line which will deliver aviation fuel to Dublin International Airport. This places a constraint on the routeing of cables to the substation along this road; it

also poses a potential risk during the construction stage if it is constructed and in operation ahead of any development at Belcamp.

Land to the west and north west of the station is proposed to be remediated to remove contamination.

There are other EirGrid projects proposed for Belcamp substation, including an extension to the existing 220 kV substation, equipment to facilitate the Kildare Meath Upgrade project, and a potential new substation to facilitate a connection to a proposed offshore wind farm. These will be accommodated in the wider development of Belcamp substation.

Colour Coding for MCA – Land Use and Planning

The substation is constrained by other proposed and existing infrastructure and zoning for green space. There is low risk therefore that it is not compliant with local planning policies, however the constraints from other development present some challenges to the development of this site.

2.6.4 Landscape and Visual

The existing station at Belcamp is screened from the views of residential receptors by existing mature vegetation and as a result of being built down into the ground slightly, reducing the appearance of the overall height. It is surrounding by walls and the existing equipment is enclosed in buildings which are similar to office blocks, minimising the visual impacts for local residents and on the local landscape.

Any additional infrastructure would likely be similarly designed, for both aesthetic and security reasons. As any proposed extension would be to the north of the existing station, it would be screened by existing vegetation and the existing substation.

There would be some loss of hedgerow to facilitate the extension to the north, creating some local adverse impacts on landscape.

Colour Coding for the MCA – Landscape and Visual

There would be some adverse impacts on landscape and visual receptors as a result of the extension, however this is limited. There is a low risk of visual impacts. The overall risk of impacts is therefore considered to be low.

2.6.5 Cultural Heritage

There are no protected structures, monuments or sites within the site of any proposed extension to Belcamp substation.

Colour Coding for MCA – Cultural Heritage

It is considered there is a low risk of impacts upon it from any extension.

2.6.6 Noise and Vibration

The surrounding baseline environment at Belcamp is one of some sources of noise, including the M1 motorway, the R139 regional road, and Dublin International Airport. There are noise sources within the existing substation also from transformers for the existing 220 kV and 110 kV sections of the substation.

The proposed additional equipment required at the substation would include one, or possibly two 400/220 kV transformers. This is a relatively minor addition, compared to the existing situation at the substation. Given the existing noise baseline of the surrounding area, it is unlikely that the additional transformer(s) would be discernible from a noise perspective. In addition, it is likely any new equipment which may emit noise would be enclosed, further reducing the potential for noise impacts.

Colour Coding for the MCA – Noise & Vibration

There is a low likelihood of noise impacts from the proposed new equipment at Belcamp substation.

2.6.7 Climate Change

In terms of the potential impacts of the proposed project at Belcamp, consideration is given to:

- Climate resilience: new energy infrastructure is a long-term investment and will need to remain operational over many decades, in the face of a changing climate; and
- Material use/embodied carbon

As set out in Section 2.6.3, there is some risk of pluvial flooding on the site proposed for the extension; the land to the south of the of the substation is at risk from fluvial flooding. It is not anticipated that the proposed project would increase flood risk elsewhere. There is potential for increased storminess to impact the substation, for example, through increased lightning strikes. This would be taken into account in the design of any extension, through detailed lightning studies, as is standard practice for substation design. It is considered the substation will be resilient to a changing climate.

In terms of material use, land take of approximately 150m by 80m would be required, although this is already triggered by other projects. A range of electrical infrastructure would also be required, as described in Section 2.3. There may be some differences in the amount of material required by each of the design options, as indicated by the economic assessment, however this is unlikely to be significant in climate change terms.

Colour Coding for the MCA – Noise & Vibration

There is a low likelihood of impacts on climate change from the proposed new equipment at Finglas substation.

2.6.8 Summary of Environmental Impacts for Belcamp Substation

The potential impacts on biodiversity both directly through the loss of habitat and indirectly as a result of impacts on water quality and the SAC, in the absence of mitigation during construction, have a moderate to high risk of being significant. Therefore, despite other environmental topics being at low risk of significant impacts, the overall assessment for the environment is that there is a moderate risk of significant impact.

Biodiversity
Soils and Water
Materials Assets
Landscape
Cultural Heritage
Noise and Vibration
Climate Change
ENVIRONMENT

2.7 Social Constraints

As for the environmental constraints, the potential social impacts of the Proposed Project at Belcamp are largely related to the potential for land take associated with an extension. The design options do not have a measurably different impact on social topics once the land take is taken into consideration. Therefore the options are not included in this assessment, only the overall likelihood of impacts from any extension to the north.

2.7.1 Amenity and Health

During construction, there is the potential for impacts on amenity as a result of construction activities. Amenity can be impacted by a combination of the following impacts:

- Views (Visual Amenity): impacts on special or protected views / landscapes as well as personal and property views of local communities as a result of construction activities associated with the project;
- Air quality: in the form of dust and emissions from plant, machinery and traffic. This is only a factor during construction; in the absence of mitigation and control measures, air quality could be an issue for local communities during construction;
- Noise: disruption as a result of the excavations. In addition, construction traffic may also be a potential noise issue; and
- Traffic: disruption in the form of construction activities on local and regional roads.

In operation, amenity impacts are associated with the combined permanent impacts on views and noise. There would be no air quality or traffic impacts during operation.

The construction of new electrical infrastructure at Belcamp would be temporary and have limited impacts on views. As has already been established, whilst there are residential receptors the proposed works at the station would be screened from view by the existing vegetation and substation.

Impacts on air quality as a result of dust during construction would be mitigated using standard dust management procedures and so would not lead to significant impacts for local businesses.

There are sensitive receptors near to the substation that could be impacted by any noise during construction; during operation it has been established that there is a low risk of impacts.

There may be some temporary impacts on local communities as a result of construction traffic accessing the extension area; it is likely a new access track would be required to reach the site as it would not be possible through the substation itself. This could have an impact on local businesses like the quarry that use the local roads near to the substation.

In terms of health, it is unlikely there would be any direct impacts on health, given the temporary nature of any noise impacts during construction.

There are also community considerations to take into account at Belcamp substation. There is a traveller's community amongst the residential community across the road from the station and, anecdotally, it is reported that they graze their horses in the land either side of the access track to the substation. The horses are not currently restricted and are able to cross the access track. This could present a risk both to the horses, their owners and construction workers during any construction at the station; any requirements to restrict the grazing at this location to minimise these risks, would need to be identified in consultation with the local community and in accordance with Fingal's local policies relating to travelling communities.

Colour Coding for the MCA – Amenity and Health

There is some potential for noise and traffic impacts on local residents; there is also potential for impacts on existing uses of the land to the south of the substation by local communities. There is therefore a low to moderate likelihood of impacts on amenity and health from the proposed new equipment at Belcamp substation.

2.7.2 Economy

The land to the north, which is proposed to be used for any extension is zoned for commercial land and is owned by the Industrial Development Agency (IDA); it is intended that this land will be developed and will therefore no longer be in agricultural use in the near future.

Economic effects are anticipated to be positive in nature in terms of employment and expenditure. There is potential for disruption to local businesses and communities as a result of traffic impacts during construction, however this is assessed under Amenity and not considered again here.

There are no tourism assets in the local area and so no impacts on tourism are anticipated.

Colour Coding for the MCA – Economy

There is therefore a low likelihood of impacts on amenity and health from the proposed new equipment at Finglas substation.

2.7.3 Utilities

The proposed extension site is a greenfield site. There are no underground cables in the vicinity; there are unlikely to be any other existing utilities.

Colour Coding for the MCA – Utilities

There is a low likelihood of impacts on amenity and health from the proposed new extension at Belcamp substation.

2.7.4 Summary of Social Impacts

Amenity and Health
Economy
Utilities
SOCIAL

2.8 Deliverability

2.8.1 Construction

Construction and installation of the building and plant required for this project can take place outside the existing live substation compound. There is space within the proposed expanded land area to create a site welfare compound and carry out construction works without affecting the in-service 220 kV or 110 kV networks.

Historical ground investigations provided indicative make-up of the soil. The stiff, gravelly clay layer immediately underlying the made ground is expected to provide an allowable bearing capacity for structural foundations.

Site investigation showed excavations were found to be generally stable, with some instability exhibited in the made ground layer. Moderately low volumes of perched water within the made ground is anticipated to have a negligible impact upon construction.

2.8.2 Outage Requirements

As the 400 kV connection at Belcamp will be to a newly built switchboard, which will be constructed outside the existing live substation, it will not require any outages to make the circuit connection to Woodland. The transformers and reactive compensation may similarly be installed and connected offline.

The connection from the new 400/220 kV transformer for CP1021 will be to a GIS bay in the new 220 kV switchroom being constructed under project CP1213 as an extension of the existing 220 kV busbar. It is assumed that the GIS bay, including busbar protection will be fully tested and commissioned as part of CP1213. Commissioning the transformer and connections, be that cable or GIB, may require a half section busbar outage depending on the access for HV test equipment.

For future expansion of the 400 kV switchgear, the bus-section circuit breaker panels will be installed as part of CP1021. The presence of these along with the additional gas buffer zones specified as standard by EirGrid means that the four bay extension can be installed and commissioned without requiring a busbar outages on the original sections.

2.8.3 Deliverability Feasibility

As per Section 0, the following scale is used to assess the deliverability feasibility of this option.

More significant/difficult/risk Less significant/difficult/risk

400 kV Connection Options	Deliverability Feasibility
Overhead initial installation	
Overhead line future expansion	
Cable initial installation	
Cable future expansion	

2.9 Economic

The plant costs of switchgear, transformers, busbars and main conductors (UGC or OHL) will be determined by market prices. Requirements at this site are generally in line with industry standards. EirGrid require additional gas buffer zones within the 400 kV GIS as standard, which will increase price somewhat. The availability of extra land at Belcamp allows flexibility in the external connection options to the GIS, which may have some moderate cost benefit in being able to select cheaper options.

The bulk of the construction works will be able to take place outwith a live substation compound. Although all of the land acquired in advance for of these works may be designated as operational and be bounded by a fence making it part of the live compound, there will be little to no exposed high voltage equipment in the vicinity, making it easy to set up a construction compound with no safe working restriction imposed due to proximity of live equipment. These issues would otherwise increase the cost of delivering the construction works.

To accommodate all initial and future circuits and plant, the site must be expanded. This is taking place under project CP1154 and therefore no additional land is required for CP1021. Some of the acquisition cost of that land may be apportioned to this project.

As per Section 0, the following scale is used to assess the economic feasibility of this option, relative to necessary works for this project at Finglas substation.

More significant/difficult/risk Less significant/difficult/risk

400 kV Connection Options	Economic Feasibility
Overhead initial installation	
Overhead line future expansion	
Cable initial installation	
Cable future expansion	

3. Conclusion

Belcamp 220/110 kV substation was assessed to determine its suitability to receive the proposed 400 kV circuit from Woodland, requiring initial construction of a 400 kV GIS switchroom capable of housing an 8 bay enhanced ring configuration, 2 x 400/220 kV transformers and reactive compensation for the circuit. It shall be expandable in the future to have capacity for 2 x 400/220 kV transformers and additional 400 kV circuits.

The presence of projects preceding this one, namely CP1154, CP0966 and CP1213, means that expansion of the existing site boundary is already occurring. The space required to accommodate this project can be incorporated into the planning and negotiations associated with those projects, although some assumptions are made here regarding the size of compensation and filtering equipment.

The assumed amount of land available allows installation of all required plant without undue restriction. If the Woodland – Belcamp cable were to be > 3000 mm^2, there would be a larger footprint required to accommodate the extra outdoor AIS busbar and terminations.

Belcamp is a suitable site to receive the 400 kV circuit from Woodland. There is space to accommodate both the initial and future installations as described in the project scoping documents.

The potential environmental and social impacts of the proposed connection to Belcamp Substation have been considered. Overall there is a moderate risk of environmental impact and a low risk of social impacts;. Both environmental and social impacts will be considered further and in more detail as the proposed project progresses into the next Steps in EirGrid's grid Development Framework.

This overall assessment has been presented in the table below.

400 kV Connection Options	Technical Feasibility	Environmental Feasibility	Social Feasibility	Deliverability	Economic Feasibility		Combined Performance
Overhead line initial installation							
Overhead line future expansion							
Cable initial installation							
Cable future expansion							

Appendix A. Drawings