



ART DATA CENTRES



Proposed Art Data Centres 110kV GIS Grid Substation and associated Transmission Line Connections – Report

Art Data Centre

Ennis Campus

London Blackfriars

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05	23/05/2022	Final	23/05/2022_RT	23/05/2022_RT	Contestable works list updated
06	09/06/2022	Final	09/06/2022_RT	09/06/2022_RT	Drawings updated from CSEA

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1 Introduction

This report has been prepared by HDR on behalf of Art Data Centres in support of an Electricity Transmission application to An Bord Pleanála (ABP) under Section 182 of the Planning and Development Act for a new 110kV GIS grid substation, transmission line connections, and associated development.

The substation development is to be made of two elements, the first being a new node on the Irish electricity grid at Ennis which will be handed over and be operated by EirGrid ESO as the transmission system operator (TSO), the second element will be comprise the transformation to a lower voltage to enable distribution to the Art Data Centre Development.

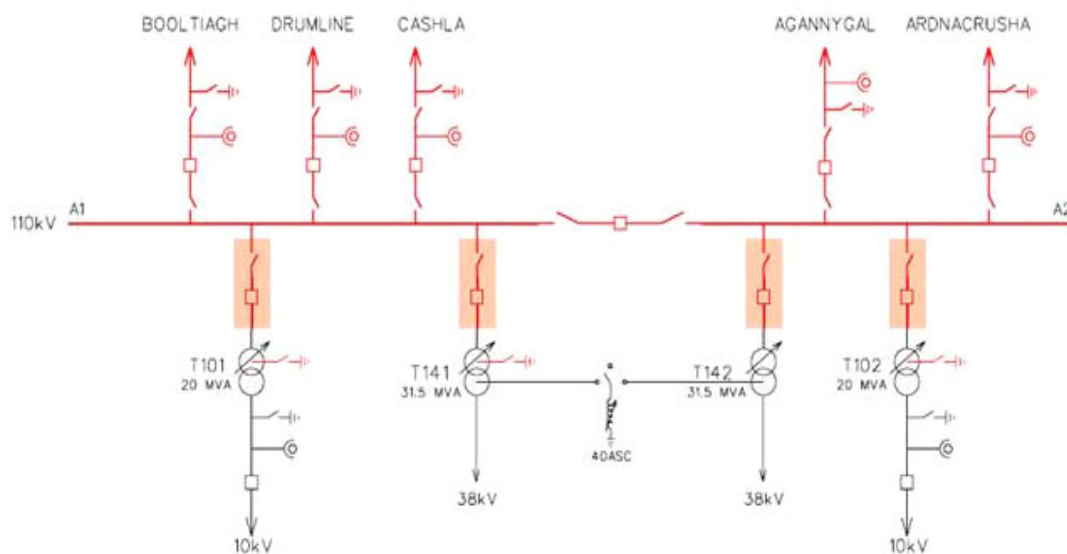
This report defines the existing condition of the Eirgrid Ennis Substation identifying reasons for not being able to extend the existing site and how it is proposed to overcome this by extending Eirgrid's transmission system and allowing power connections to be taken to the Art Data Centre site with spare bays for future development in Ennis. The report also discusses other necessary measures required including the undergrounding of two of the existing 110kV overhead lines that cross the site and the removal of the resulting obsolete stretches of overhead line and associated supporting towers.

All of the works that are intended to be handed over to Eirgrid will be specified, procured and constructed to Eirgrid's standards and requirements for a grid substation at a node. Liaison with Eirgrid has already commenced and reference has been made to all relevant drawings and documentation for the development of this design.

2 Existing Condition

The existing Ennis grid substation comprises of five 110kV lines joining together on a single set of busbars with a bus-tie in the centre; all switchgear is of the air insulated type (AIS). In addition to the 110kV circuits there are also step-down transformers to 38kV and 10kV for distribution to the local area around Ennis. This arrangement is shown schematically in Figure 2-1 and physically in Figure 2-2.

Figure 2-1. Ennis Grid Substation – Existing Schematic



Source: Eirgrid

The schematic in Figure 2-1 shows the heavily interconnected node at Ennis providing good resilience and interconnected from diverse areas on the Western side of the isle of Ireland.

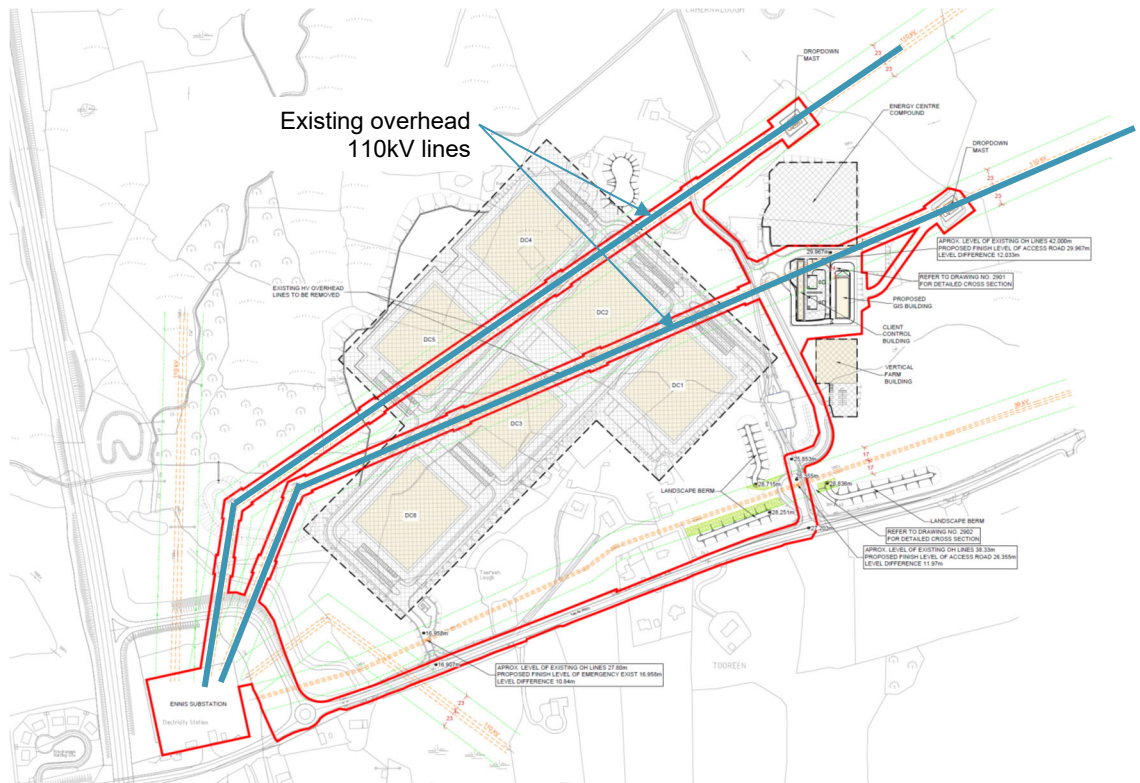
Figure 2-2 shows how the existing substation is physically constrained by virtue of the road network around it and the other distribution equipment already in place for the local area. In discussion with Eirgrid, they have confirmed that it would not be possible to extend this substation due to the physical constraints around the existing substation. To extend the facility, it would instead need further land to extend the grid substation at another location.

Figure 2-2. Ennis Grid Substation – Existing Physical Arrangement



Source: Google maps

Figure 2-3. Art Project Site – Existing 110kV Overhead Lines



Source: CSEA / ARC:MC / HDR

The existing Ennis Grid Substation is owned and operated by Eirgrid ESO and TSO and has dedicated access from the local road, the R352. The M18 runs to the West of the substation and has an access road when exiting / entering the Southbound lanes of the M18.

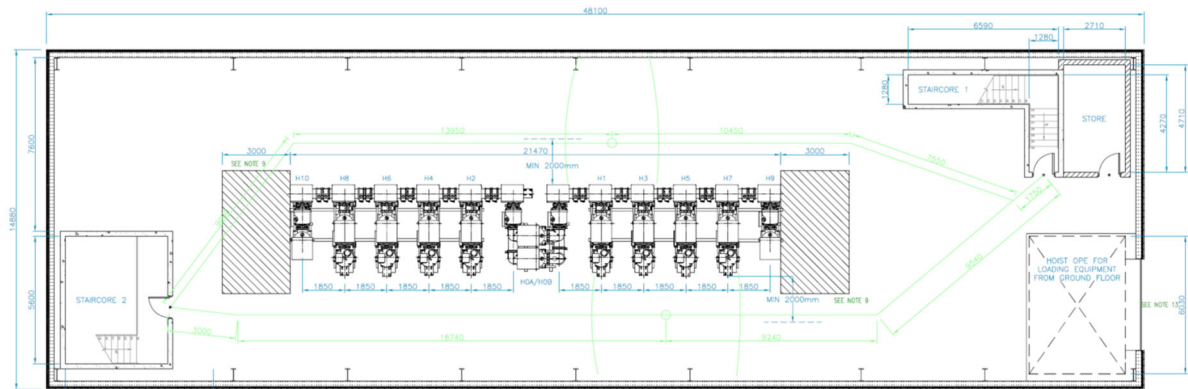
All of the 110kV lines come into the substation from the Northern side, all using overhead lines on wooden or steel towers. Two of the 110kV lines cross the proposed Art Data Centre development site as shown in Figure 2-3. Eirgrid have advised that there is no possibility to expand the existing Ennis grid substation, so in discussion and agreement with Eirgrid proposals have been developed to provide a further grid substation and to drop the two 110kV lines on the site to then run underground. This is discussed further in the next section.

3 Proposed Changes

The proposed development requires a new power connection from the Ennis Grid Substation, however, as the substation cannot be extended land on the Art Data Centre site is required to house an extension or new Grid Substation. This allows two of the five 110kV circuits to be rerouted in the new Grid Substation and allow new 110kV feeders to be given to the Art Data Centre development and provides for two additional spare bays for future connections.

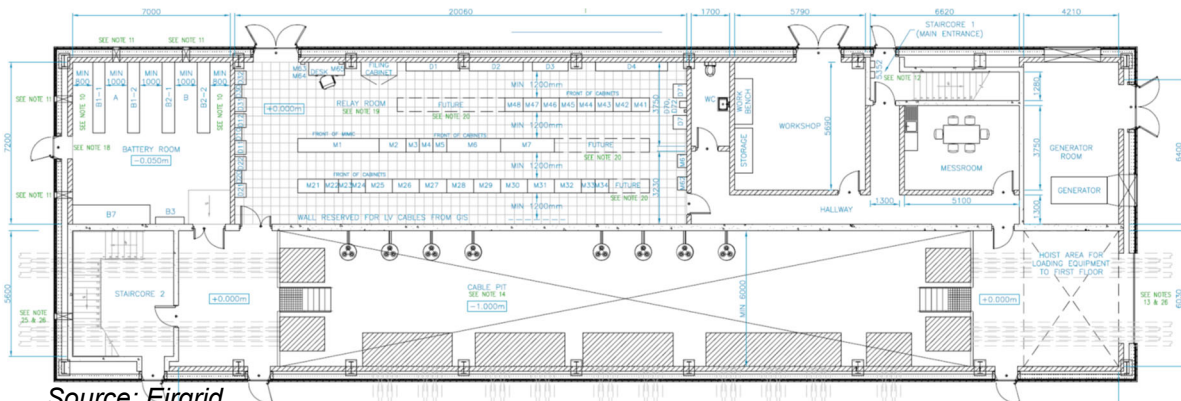
The proposed new gas insulated switchgear (GIS) grid substation is to be based on Eirgrid’s standard arrangements for an 8-bay 110kV based switchboard. Trials were carried out to see if AIS based gear could be used (similar to that at the existing Ennis substation) but test fits showed that the area required was too great. In addition, it is highly preferable for data processing that High Voltage lines are kept away from buildings and screened using metalclad structures or armouring. Eirgrid also have standard arrangements for GIS (gas insulated switchgear) that they use on their network, these require the switchgear to be housed in a 2 storey building to enable safe operation and cable entry. Figures, 3-1, 3-2 and 3-3 show the standard arrangement for an 8-bay GIS Station, refer to Appendix A for the full version of the drawings.

Figure 3-1. First Floor 8-bay GIS Station



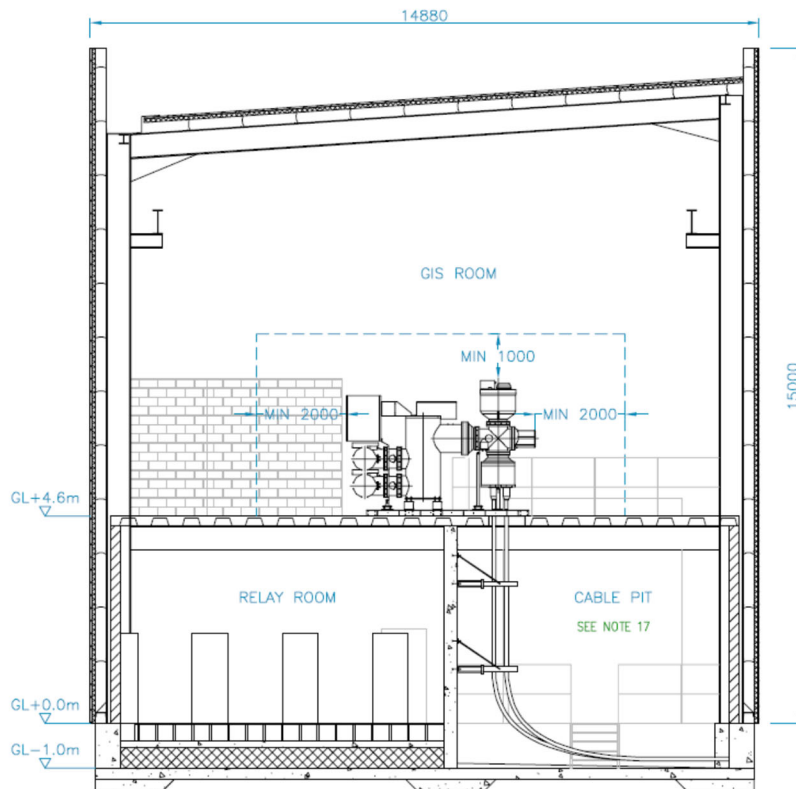
Source: Eirgrid

Figure 3-2. Ground Floor 8-bay GIS Station



Source: Eirgrid

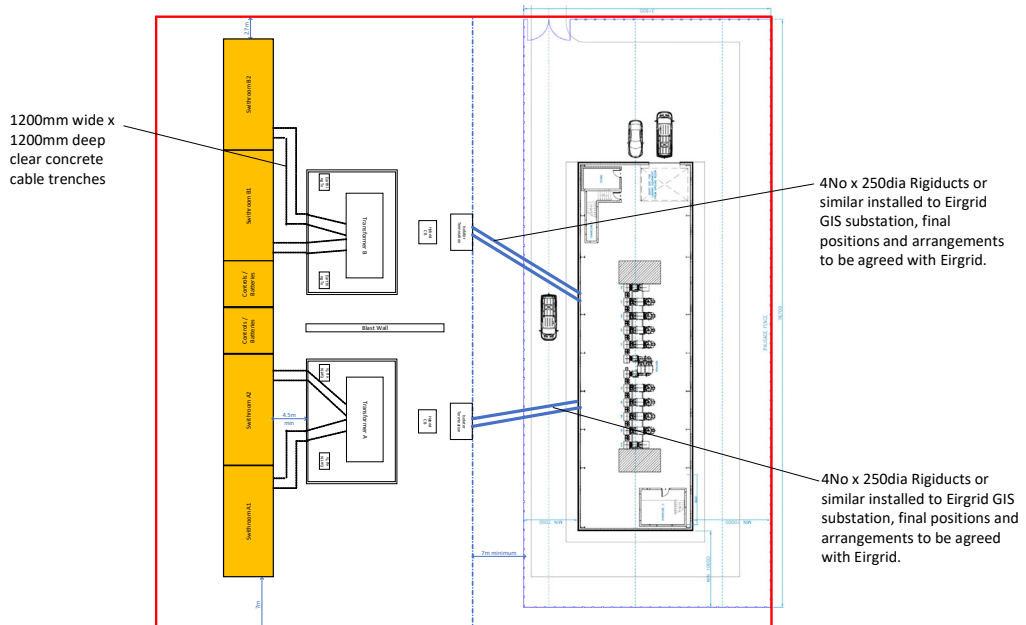
Figure 3-3. 8-bay GIS Station Section



Source: Eirgrid

Using this standard arrangement for a GIS station, the substation on the Art Data Centre development has been arranged to have two sections, the first to fully incorporate the arrangement of the Eirgrid 8-bay GIS station and the second section to incorporate the local distribution and step-down transformers for the data centre development itself. This proposed arrangement is shown in Figure 3-4.

Figure 3-4. Proposed New Substation Arrangement



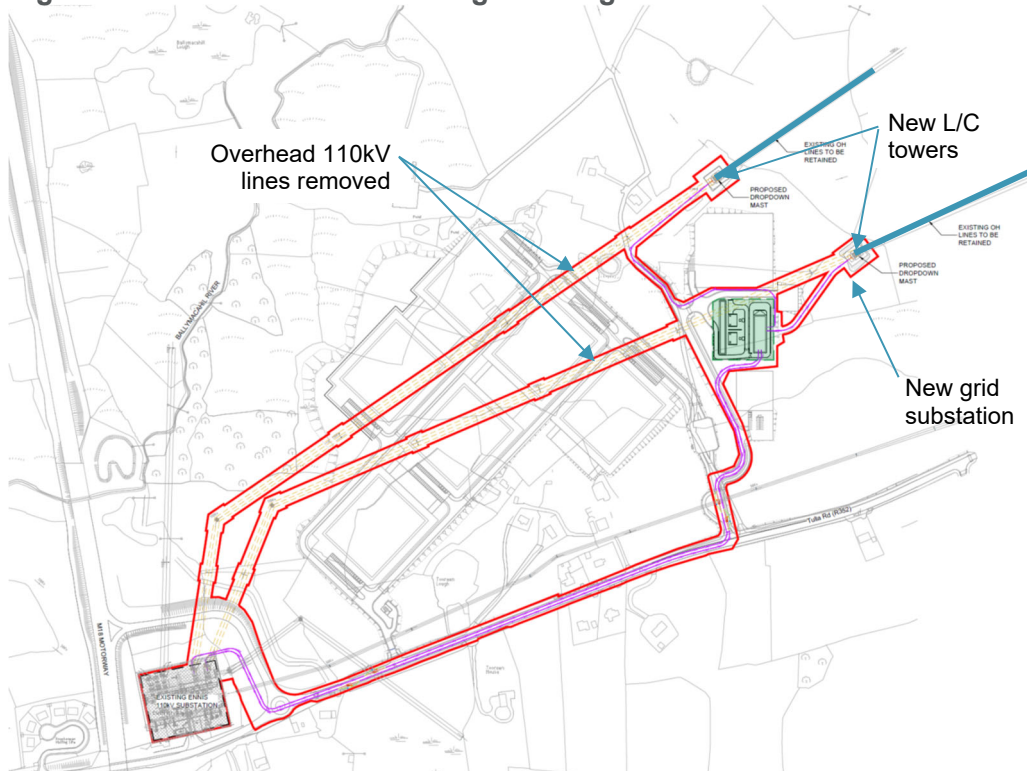
Source: Eirgrid

Looking at Figure 3-4 above, the right-hand side shows the standard arrangement for an 8-bay GIS substation and the left-hand side shows the distribution side of the substation to serve the Art Data Centre site. The left-hand side is made up of the following components:

- Ducting from the new Eirgrid GIS station
- Set off of 7m minimum from the fence line around the Eirgrid GIS station
- 2 x 110kV hybrid GIS circuit breakers, isolators and metering equipment
- 2 x 110/10kV dual output step down transformers
- 4 x 10kV medium voltage output switch rooms for distribution to the site and connection to the onsite energy centre generators.

Access to these two sections is provided separately albeit via single entry, but the Eirgrid area can be fully secured and controlled by Eirgrid TSO, see Civil Engineers, CSEA, drawings for details. The location of the new substation on site is shown in Figure 3-5 below.

Figure 3-5. Substation and Undergrounding of 110kV Overhead Lines

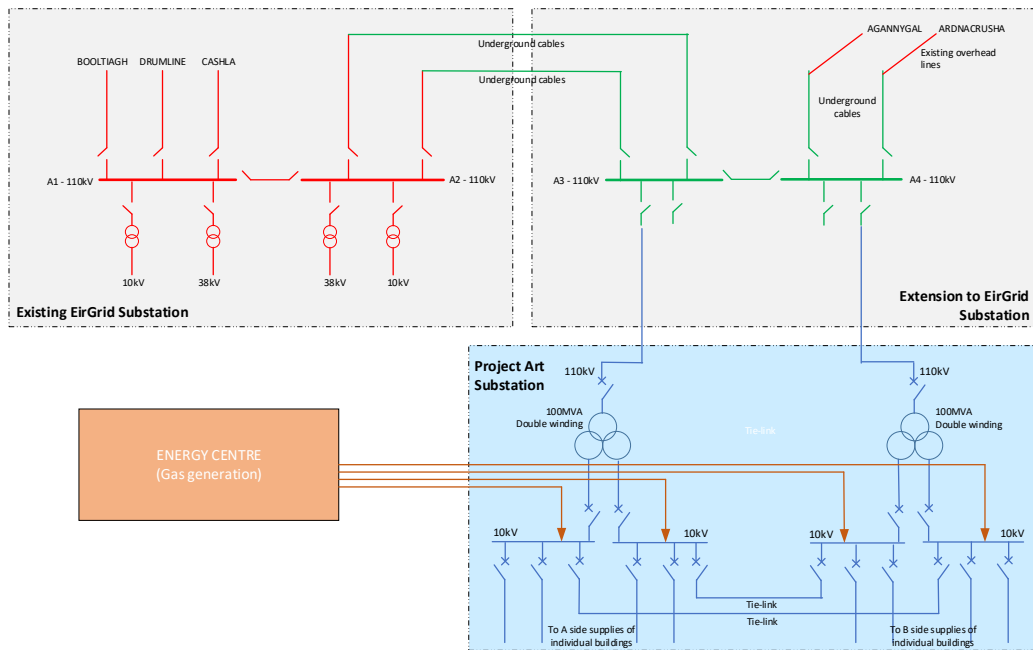


Source: CSEA / ARC:MC / HDR

Also shown on Figure 3-5 are two positions where the existing overhead 110kV cables are proposed to be terminated and then diverted underground. Termination of the overhead lines will have to be by new single circuit L/C interface towers, similar to that shown in Figure 3-6 below, more definitive drawing is shown in Appendix B.

The new cables are to be run in ducts, conforming with Eirgrid’s standards, run South to the edge of the site and then along the Tulla Road to the roundabout adjacent to

Figure 3-7. New Proposed Schematic Arrangement



Source: HDR

In terms of undergrounding of the two 110kV transmission lines, this will comprise of two dropdown masts (c. 17 metres in height) and associated overhead transmission lines, transitioning to underground transmission lines set within ducts that will subsequently progress into the 110kV GIS Substation building, which will in turn connect to the existing Ennis Grid substation and the feeders to the Art Data Centre site.

The overall substation development will include access paths, landscaping, security fencing, provision of internal access roads and car parking within the GIS substation compound.

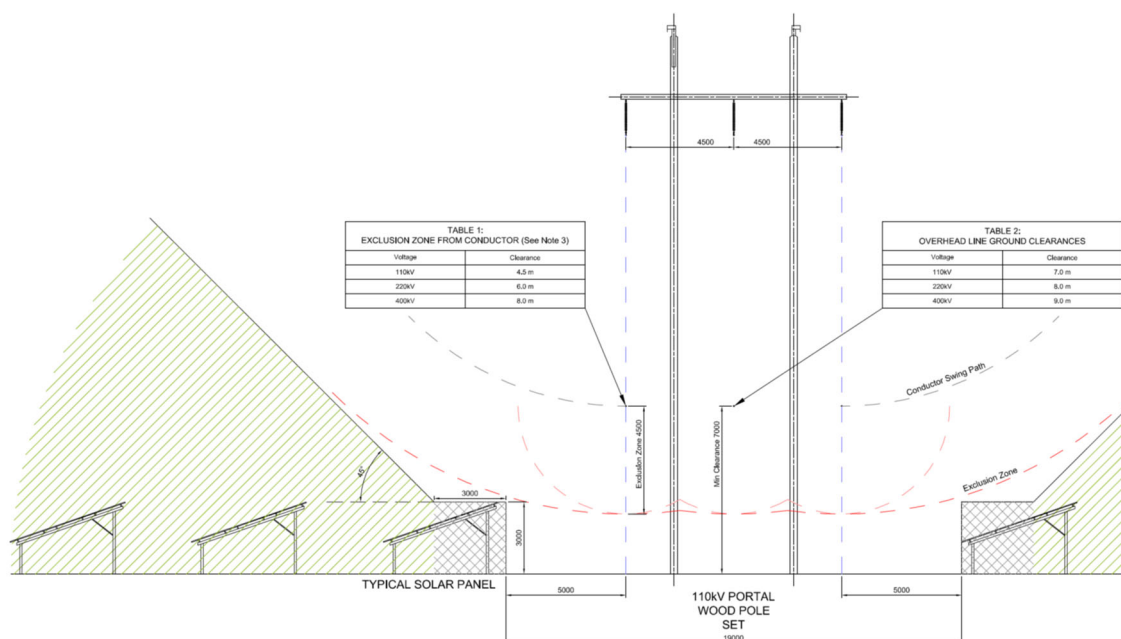
4 Proximity to 110kV Overhead Lines

The Art Data Centre site has a number of 110kV overhead lines crossing the site, these are proposed to be re-routed and undergrounded via the new Grid Substation as discussed earlier in Section 3. The two key lines to be re-routed and underground are shown in Figure 3-5. The line nearest to the new Grid Substation has been assessed for its proximity to the building housing the Grid Substation. There is good information available from Eirgrid on what is acceptable in terms of proximity, links to this information, which includes Eirgrid’s own documents and drawings and 3rd party information provided on their behalf, is included in the links below:

<https://www.eirgridgroup.com/site-files/library/EirGrid/Solar-Farm-Clearances-Report-Rev-A.PDF>
<https://www.eirgridgroup.com/site-files/library/EirGrid/8-Transmission-Line-and-Solar-Farm-Guideline-Clearances.pdf>

The most relevant information relating to the position of the new Grid Substation and the nearby existing 110kV line comes in the form of a drawing provided for 110kV transmission lines solar farms which are in close proximity to these lines. An extract of this drawing is shown below in Figure 4-1, the full drawing is included in Appendix C.

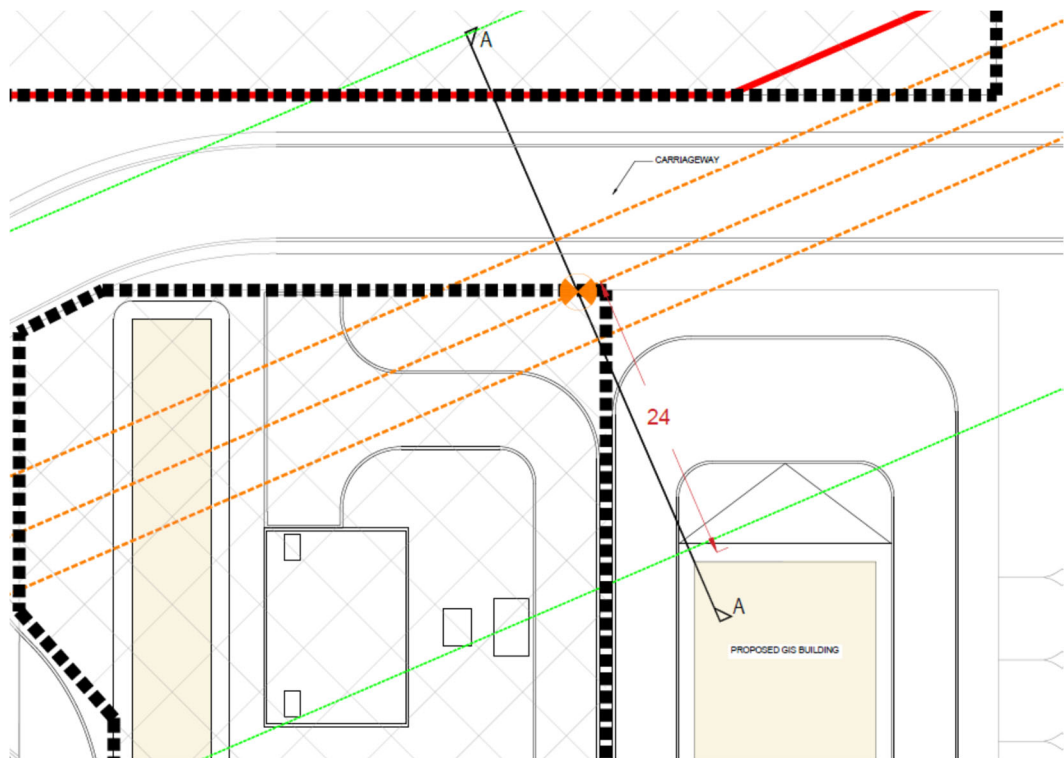
Figure 4-1. Extract of 110kV Overhead Line Clearances Drawing Solar Farms



Source: Eirgrid

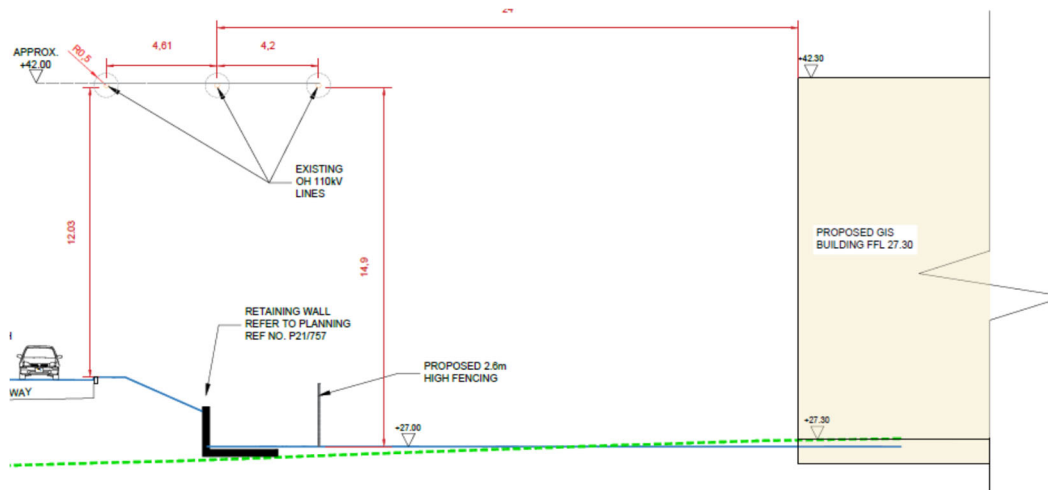
The new Grid Substation, as noted in Figure 3-3 and in full in Appendix A, will have a height above ground level of 15m. This is clearly much greater than that of solar panels therefore attention has to be given to where the building will sit in relation to the 45 degree line shown in Figure 4-1 above which commences 5m from the edge of the overhead lines. This has been applied and it can be shown therefore that a minimum distance of 15m (height of the building) and the 5m minimum distance noted above, giving 24m overall, will be required for the new Grid substation to be away from the edge of the overhead line. This arrangement is shown in Figures 4-2 and Figure 4-3 below (the full drawing from CSEA is included in full in Appendix D).

Figure 4-2. Offset Distance from 110kV Overhead Line to Grid Substation



Source: CSEA drawing 20_110A - CSE - ZZ - XX - DR - C – 2901 P01

Figure 4-3. Section A-A shown in Figure 4-2



Source: CSEA drawing 20_110A - CSE - ZZ - XX - DR - C – 2901 P01

5 Contestable & Non-contestable Works

Through the CER, now the CRU (Commission for the Regulation of Utilities) an amendment was brought into law in 2009 (SI226) amending Section 34 of the Electricity Regulation Act of 1999. This allowed for works to extend or modify electrical supply networks to be determined as contestable or non-contestable works. The assumed definition of these terms is as follows:

Non-contestable works: works that have to be carried out by Eirgrid or ESB or their agents

Contestable works: works that can be carried out by an accredited contractor to the standards acceptable to Eirgrid and ESB, paid for directly by the employer.

In terms of procurement of the works, it is accepted that there will be both non-contestable and contestable works to deliver the overall works as part of this SIDS application. A listing has been identified of the proposed works to be included in each of these two categories. It is possible that the same party, e.g. ESB, could be called upon to carry out both elements of work subject to agreement by all parties.

The proposed listing is shown in Table 5-1 below:

Table 5-1. Contestable and Non-Constable Works

Scope of Work Item	Contestable Works?
All and any works in existing Ennis substation	No
Removal of existing overhead lines	No
Disconnection of existing overhead lines	No
Foundations for the two LCIMs	Yes
Supply and erect the two LCIMs	Yes
Cable ducting on Art Data site	Yes
Cable ducting in public roadway	Yes
Supply and install 110 kV cable in ducts	Yes
Supply and install communications cables in ducts.	Yes
Install and make HV cable joints (if any)	Yes
Termination of existing overhead lines onto new LCIMs	No
Termination of underground cables on new LCIMs	Yes
Provision and fit out of GIS substation building	Yes
Supply and install GIS in new building	Yes
Terminate all 110 kV cables in GIS building	Yes
Install 110 kV cables between GIS building and Art Substation	Yes

Scope of Work Item	Contestable Works?
Install PLC equipment on new LCIM	No
Terminate existing fibre wrap on new LCIM	No
Terminate fibre optic cables in new GIS station	No
Art Data Centre 110kV/20kV switchgear, transformers, VT/CTs, circuit breakers and isolators	Direct works by Employer

In Table 5-1 above, where noted as “No” under “Contestable Works”, this is to indicate that these works would need to be carried out by Eirgrid/ESB.

6 Summary

This report considers how the existing grid arrangement at Ennis could be developed to provide electrical utility power to the Art Data Centre project site to the East of Ennis. It shows that whilst there is spare power available at the Ennis Grid substation, due to the existing physical arrangement, it would not be possible to simply extend this Grid Substation for this new data centre development.

The proposals that have been developed, with input from representatives from Eirgrid, include the provision of space for an extension 8 bay GIS Grid substation on the Art Data Centre project site. Using Eirgrid's standard arrangement for this type of substation, space has been identified both a compound and building for Eirgrid's use and operations together with a step-down transformer station to be used for distribution to the Art Data Centre development buildings and on-site Energy Centre.

Two existing overhead 110 kV transmission cables circuits traversing the site from south-west to north-east will be undergrounded via 2 no. dropdown masts with two proposed 110kV underground transmission cables to connect the proposed dropdown masts with the proposed 110kV GIS substation. Each of the two new circuits will terminate in a cable – overhead line/cable (L/C) interface compound containing air-insulated electrical equipment mounted on concrete plinths. Adjacent to each L/C interface compound, an overhead line tower will be erected to facilitate connection of the new underground cables to the two existing 110 kV overhead lines. Each proposed dropdown mast will be c. 17 metres in height, set on concrete foundations. The obsolete sections of the two existing overhead 110kV lines from the proposed dropdown towers to the existing Ennis 110kV substation, including the supporting poles /masts will be removed / demolished.

Two proposed 110kV underground transmission cables will run from the proposed 110 kV GIS grid substation, connecting to the existing Ennis 110 kV Grid Substation via a route southwards along the proposed main campus internal road (proposed under concurrent application Reg. Ref.: P21-757) , then turning west along the Tulla Road (R352) until they reach the existing Ennis 110kV substation.

Consideration has also been given to the process of the construction of the GIS grid substation and its proximity to the most southerly 110kV overhead line. An assessment has been carried out and shown that the substation will be 24m away from the nearest conductor of the overhead line, this has been shown to be sufficient to meet the minimum distances required by Eirgrid.

In terms of procurement of the works, it is accepted that there will be both non-contestable and contestable works to deliver the overall works as part of this SIDS application. A listing has been identified of the proposed works to be included in each of these two categories. It is possible that the same party, e.g. ESB, could be called upon to carry out both elements of work subject to agreement by all parties.

Appendix A

This appendix includes the following Eirgrid standard drawings:

Reference	Description	Revision
XDN-LAY-ELV-STND-H-012	110kV GIS Station Layout – Plan View – 8 Bay Station Engineering Drawing – Sheet 1	00
XDN-LAY-ELV-STND-H-012	110kV GIS Station Layout – Plan View – 8 Bay Station Engineering Drawing – Sheet 2	00
XDN-LAY-ELV-STND-H-012	110kV GIS Station Layout – Plan View – 8 Bay Station Engineering Drawing – Sheet 3	00

Appendix B

This appendix includes the following HDR provided drawings:

Reference	Description	Revision
20_110A-CSE-GEN-XX-DR-C-2102	Proposed Site Layout - Overall	P01
10299317-SC063-01	Existing and Proposed 110kV Circuit Schematics	01
Sketch	Art Data Centres Substation Layout	5
20_110A-CSE-GEN-XX-DR-C-2915	Proposed Drop Down Masts Sections	P01

ART DATA CENTRES

TOM MCNAMARA & PARTNERS
CONSTRUCTION COST MANAGERS
PROJECT MANAGERS



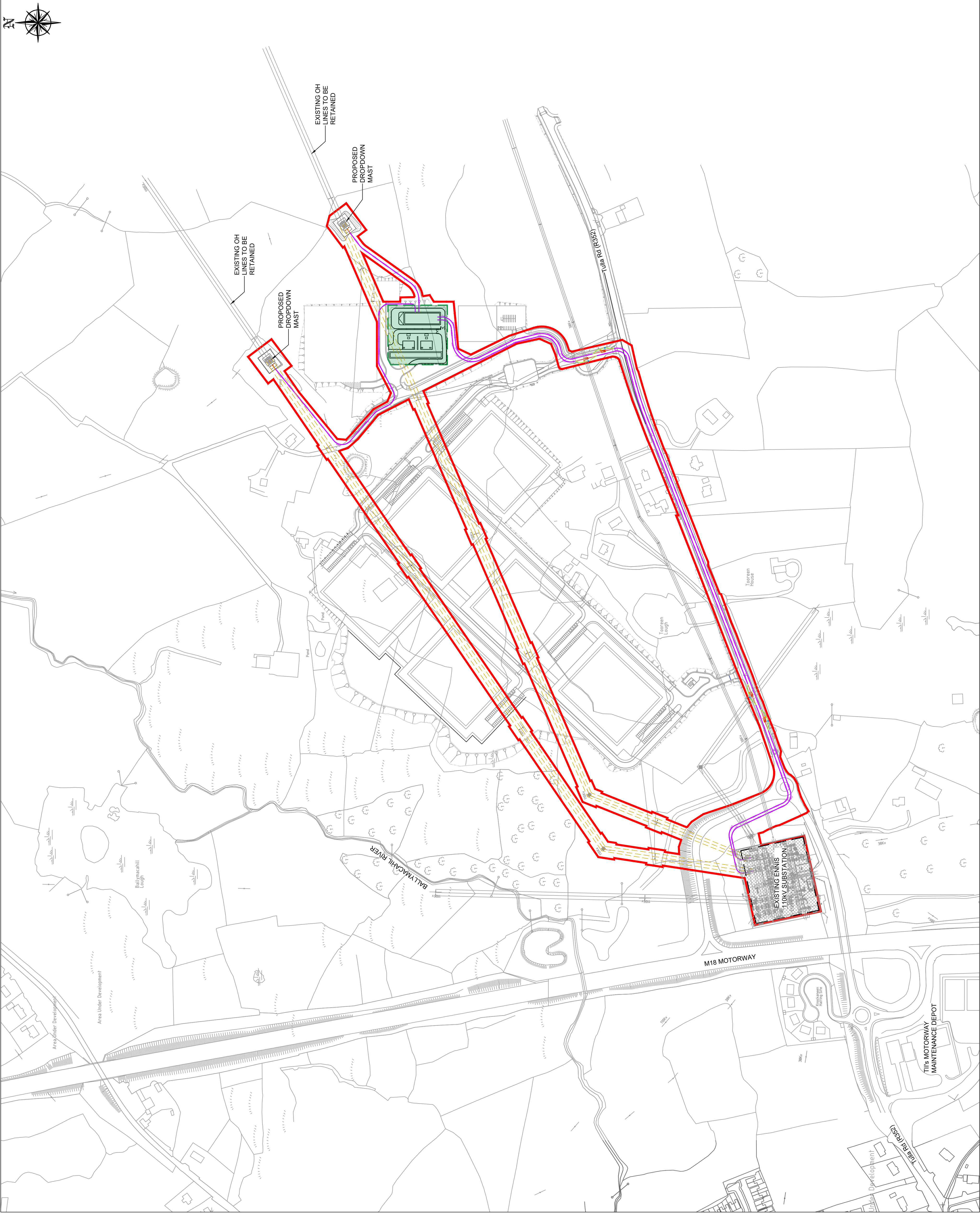
- LEGEND:
- SITE BOUNDARY
 - EXISTING OH LINES TO BE REMOVED
 - PROPOSED 110 kV GRID CONNECTION
 - PROPOSED SUBSTATION COMPOUND
 - EXISTING 110 kV ENNIS SUBSTATION

Rev	Description	PS	RG	Date
P01	FOR PLANNING			03/06/22

Clifton Scannell Emerson Associates
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Client: ART DATA CENTRES
Project: ART DATA CENTRES ENNIS
Dwg Title: PROPOSED SITE LAYOUT - OVERALL
Drawn By: PS Checked By: RG Date: JUN 2022
Project Code: Originator: Phase: Level: Type: Role: Dwg No.:
20_110A - CSE - GEN - XX - DR - C - 2102

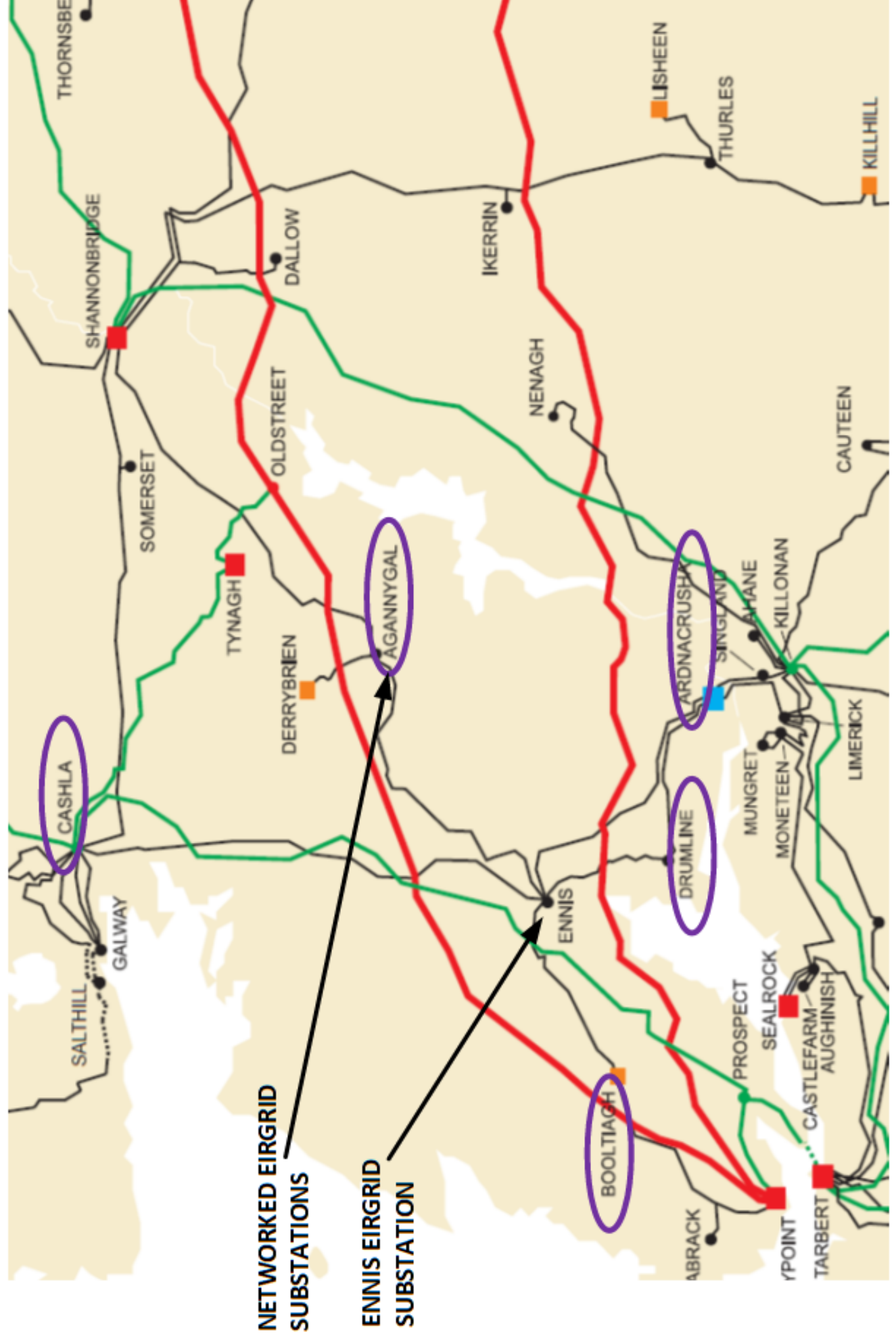
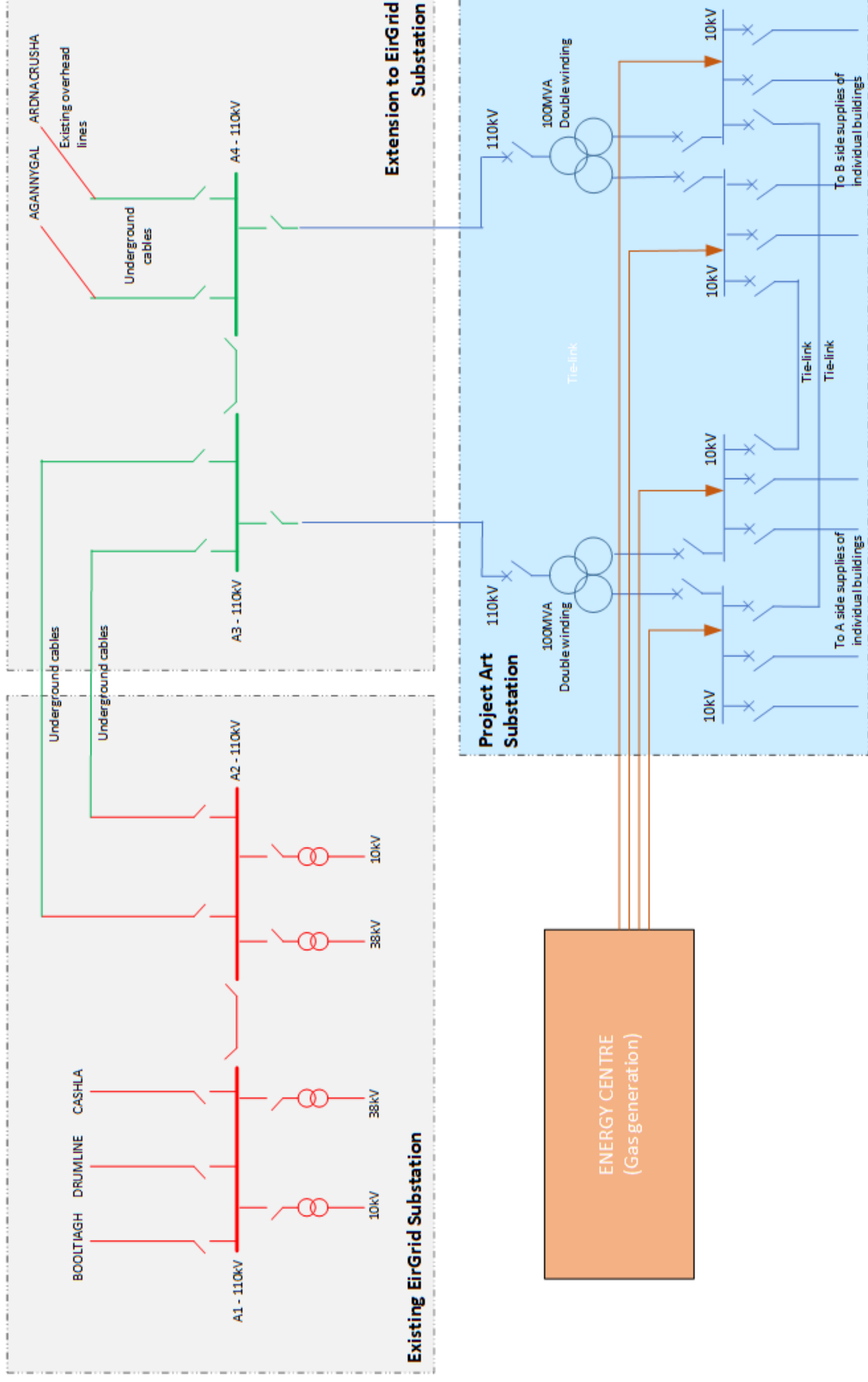
S2 Status Code: Substability Description: PLANNING Scale: @ A1: 2500
P01 Revision: Project Status: PLANNING 20_110A
CSEA Job No.



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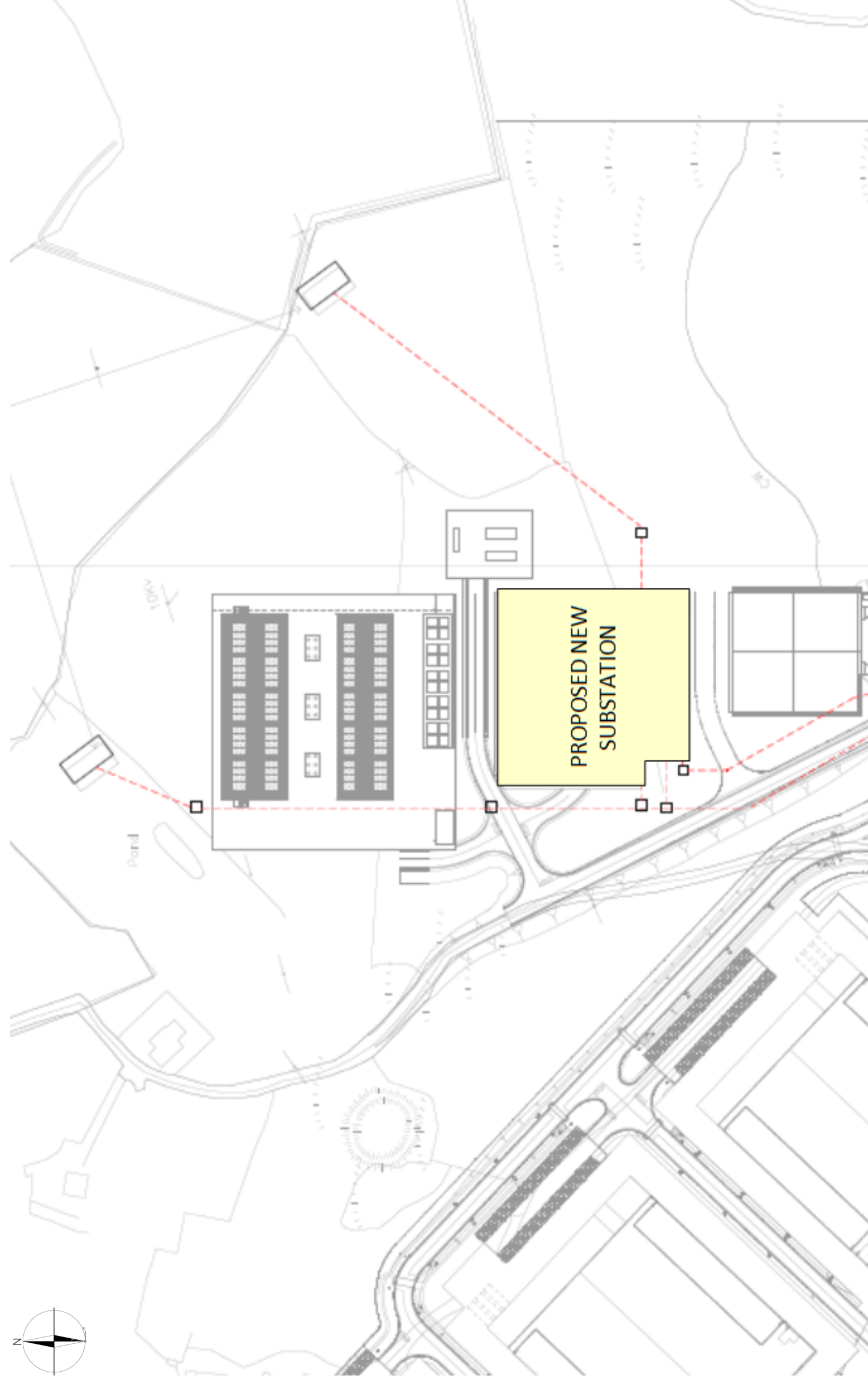
NOTES:

1. THIS DRAWING MUST NOT BE USED FOR CONSTRUCTION OR INSTALLATION PURPOSES UNLESS EXPRESSLY STATED.
2. DO NOT SCALE OFF THIS DRAWING. ALWAYS WORK TO NOTED DIMENSIONS.
3. ALL DIMENSIONS MUST BE VERIFIED ON SITE BEFORE COMPLETING SHOP DRAWINGS OR SETTING OUT THE WORKS.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE SCOPE OF WORKS AS PREPARED BY HDR | Hurley Palmer Flatt
5. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL AND STRUCTURAL ENGINEER'S DRAWINGS AND ASSOCIATED HDR | Hurley Palmer Flatt DRAWINGS.

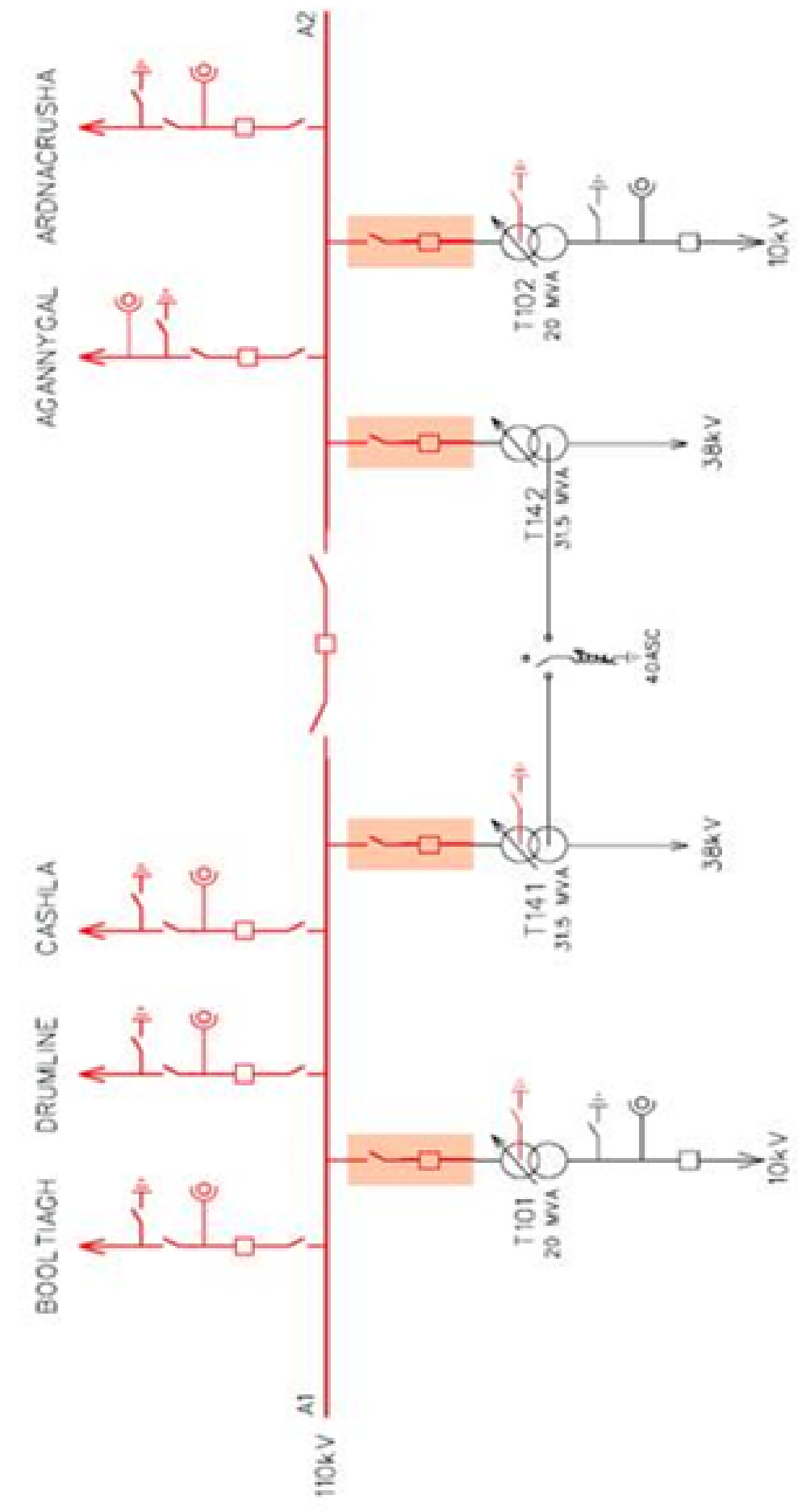


EXISTING EIRGRID LOCAL AREA

PROPOSED EXTENSION TO ENNIS SUBSTATION & NEW ON-SITE PROJECT ART SUBSTATION



PROPOSED ON-SITE SUBSTATION POSITION



EXISTING ENNIS EIRGRID SUBSTATION SCHEMATIC

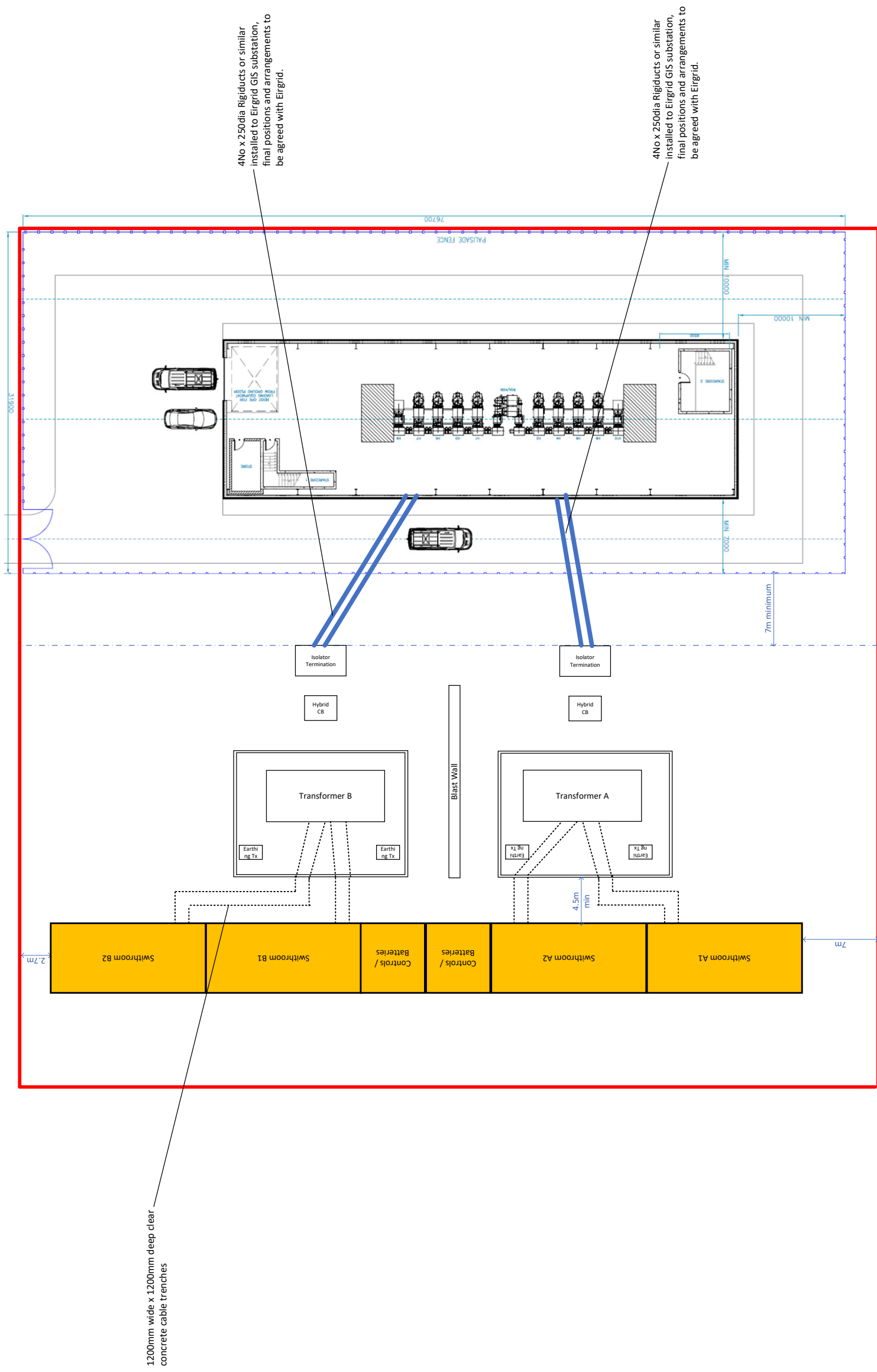


Revision	Description	Date

Drawing Status:	
Information	Stability

HDR Hurley Palmer Flatt
240 Blackfriars Road SE1 8NW United Kingdom
t: +44 (0) 20 7429 3333 e: info@hurleypalmerflatt.com w: www.hurleypalmerflatt.com
Client: ART DATA CENTRES
Architect: ARC MC
Project: ART DATA CENTRE - ENNIS CAMPUS
Title: EXISTING AND PROPOSED 110KV CIRCUIT SCHEMATICS

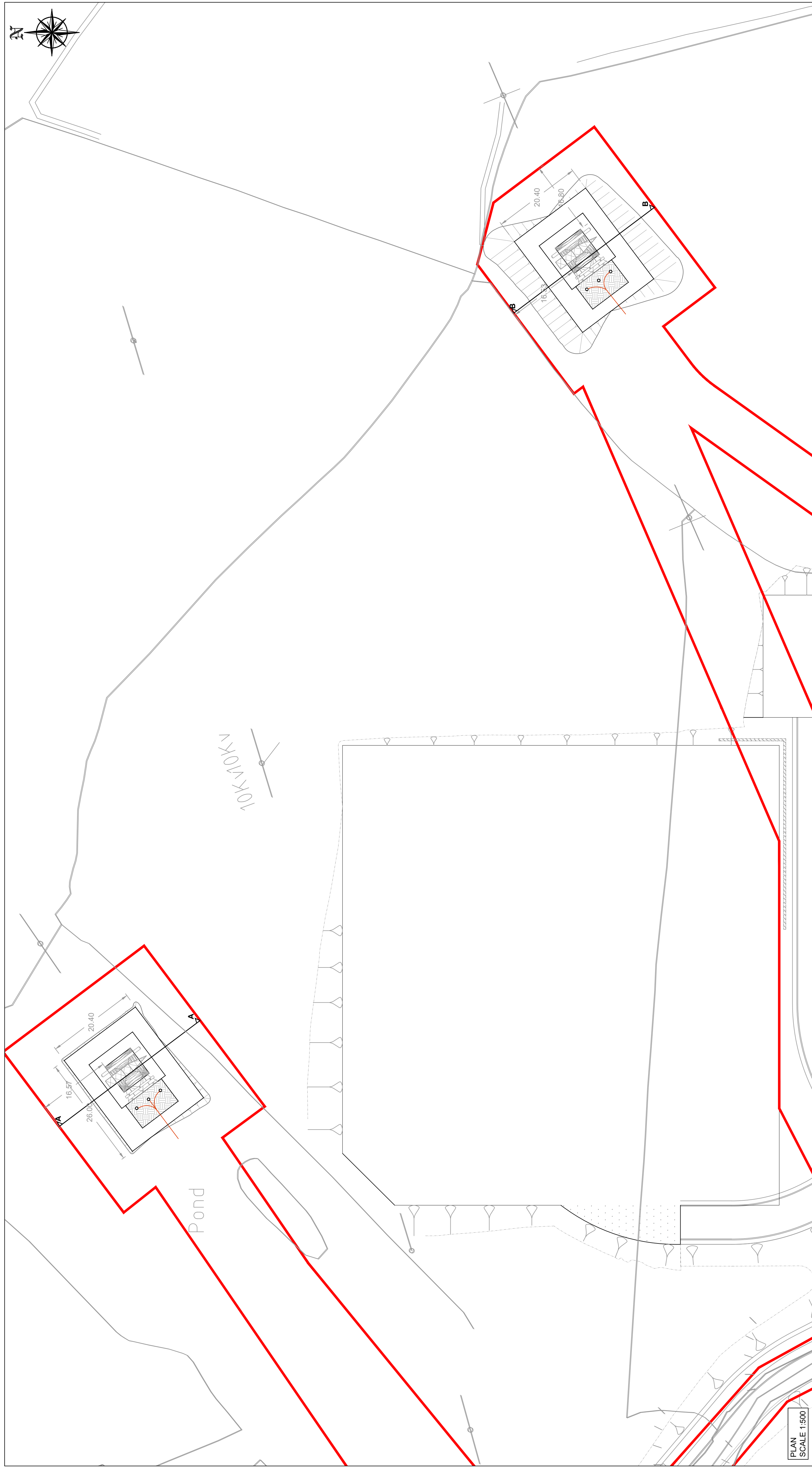
HDR IPRF Project Number: 10299317			
Client File Name:			
Drawn: RT	Checked: RT	Date: 13.05.2021	Scale: A1
Drawn Number: 10299317-SC-63-01	Checked Number:	Date:	Scale: NTS
			Revision: 1



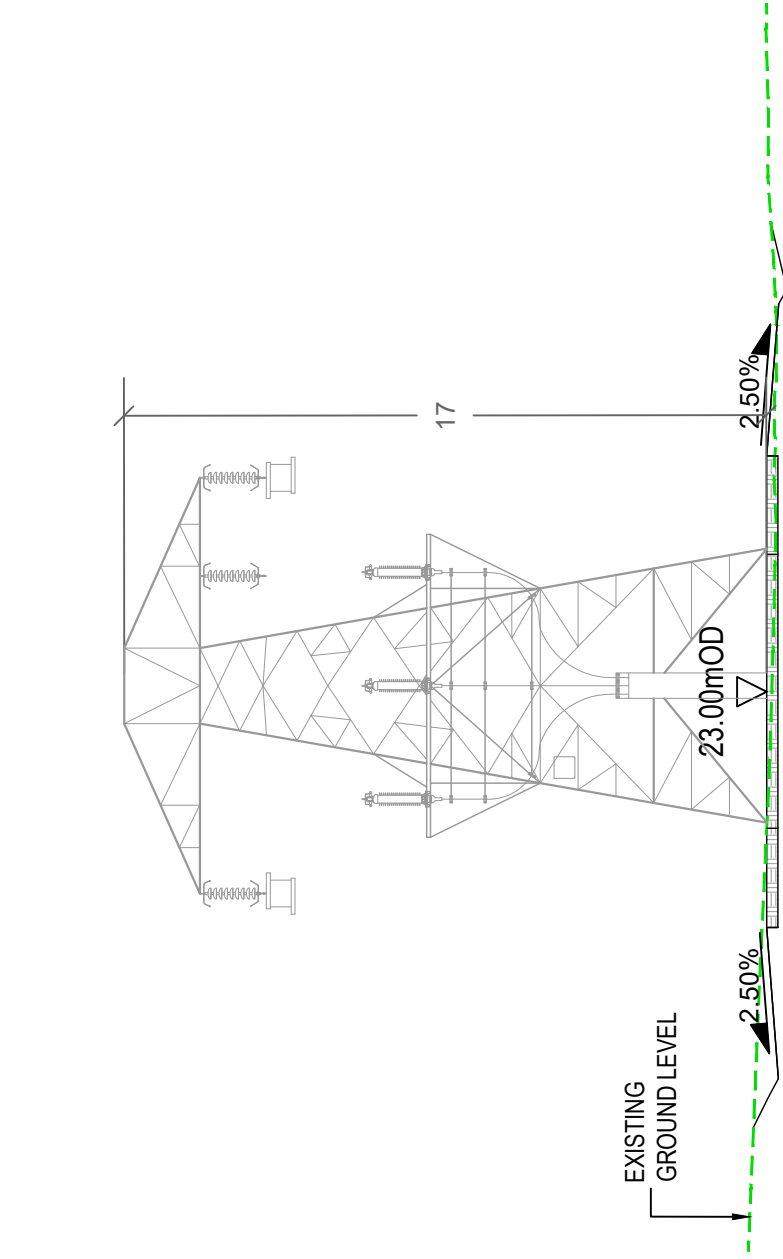
1200mm wide x 1200mm deep clear concrete cable trenches

4No x 250dia Rigiducts or similar installed to Eirgrid GIS substation, final positions and arrangements to be agreed with Eirgrid.

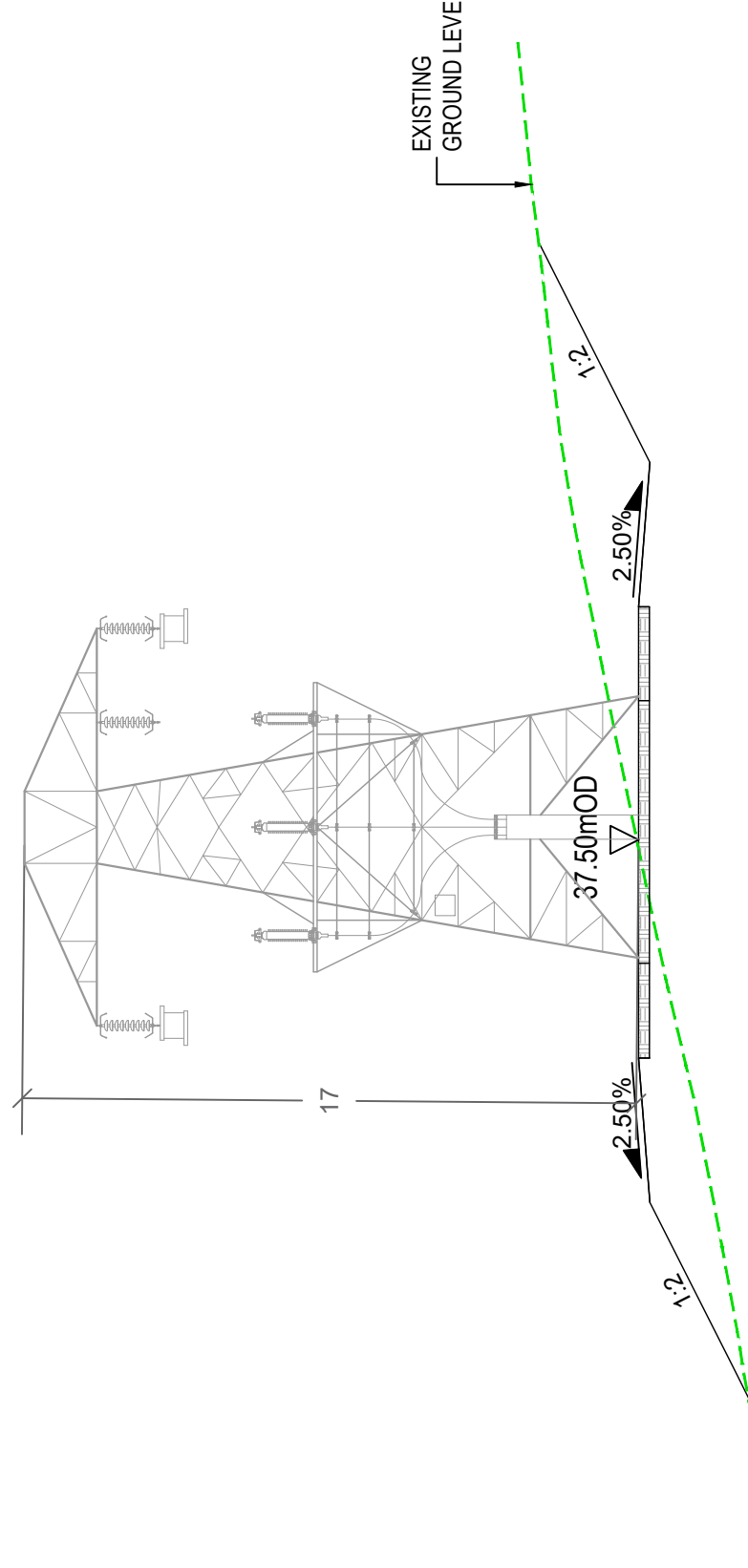
4No x 250dia Rigiducts or similar installed to Eirgrid GIS substation, final positions and arrangements to be agreed with Eirgrid.



PLAN
SCALE 1:500



SECTION A-A
Scale 1:200



SECTION B-B
Scale 1:200

Rev	Description	PS	RG	Drawn	Checked	Date
P01	FOR PLANNING					03/06/22



Clifton Scannell Emerson
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Client: ART DATA CENTRES
Project: ART DATA CENTRES ENNIS
CAMPUS - 110KV GIS SUBSTATION
PROPOSED DROP DOWN
MASTS SECTIONS
Dwg Title: PS PS JUN 2022
Drawn By: PS PS JUN 2022
Project Code: PS PS JUN 2022
Project Code Originator Type Role Dwg No.
20_110A - CSE - GEN - XX - DR - C - 2915

S2 PLANNING AS INDICATED
Status Code Subcategory Description Scale @ A1
P01 PLANNING 20_110A
Revision Project Status CSEA Job No.

Appendix C

Eirgrid drawing No;

MMD-373966-E-SK-00-XX-0021 Rev P2

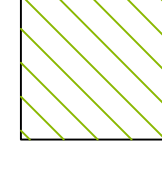
Drawing Title:

Transmission Line and Solar Farm Guidance Clearances
Guideline 110kV Setback Distances
Section Drawing - Elevation

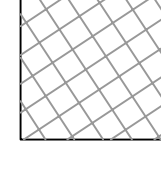
Notes

- All dimensions in millimetres.
- Overhead line clearances derived from EirGrid functional specification for overhead lines LDS-EFS-00-001-R0.
- Exclusion zone clearances derived from ESBN Code of Practice for Avoiding Danger from Overhead Electricity Lines (Document No. DOC-2309(CBBA)).
- Conductor swing path based on midspan wind blow at minimum ground clearance.
- This drawing does not specify clearances at structures. Refer to drawing MMD-373966-E-SK-00-XX-0011 for clearances at structures.
- There is a statutory obligation for the developer to notify ESB prior to the erection of any structure within a 46 metre corridor of an overhead line. This notification shall be made in writing at least two months prior to commencement of construction works.

Key to symbols



Clear area for placement of Solar panels



3 metre height restriction on Solar panels

Reference drawings

Guideline 110kV setback distances plan view: MMD-373966-E-SK-00-XX-0011

P2	21/12/2018	JD	Notes Updated	CF	BM
P1	17/11/2017	SHY	Issued for Comment	DMC	DMC
Rev	Date	Drawn	Description	Ch'kd	App'd

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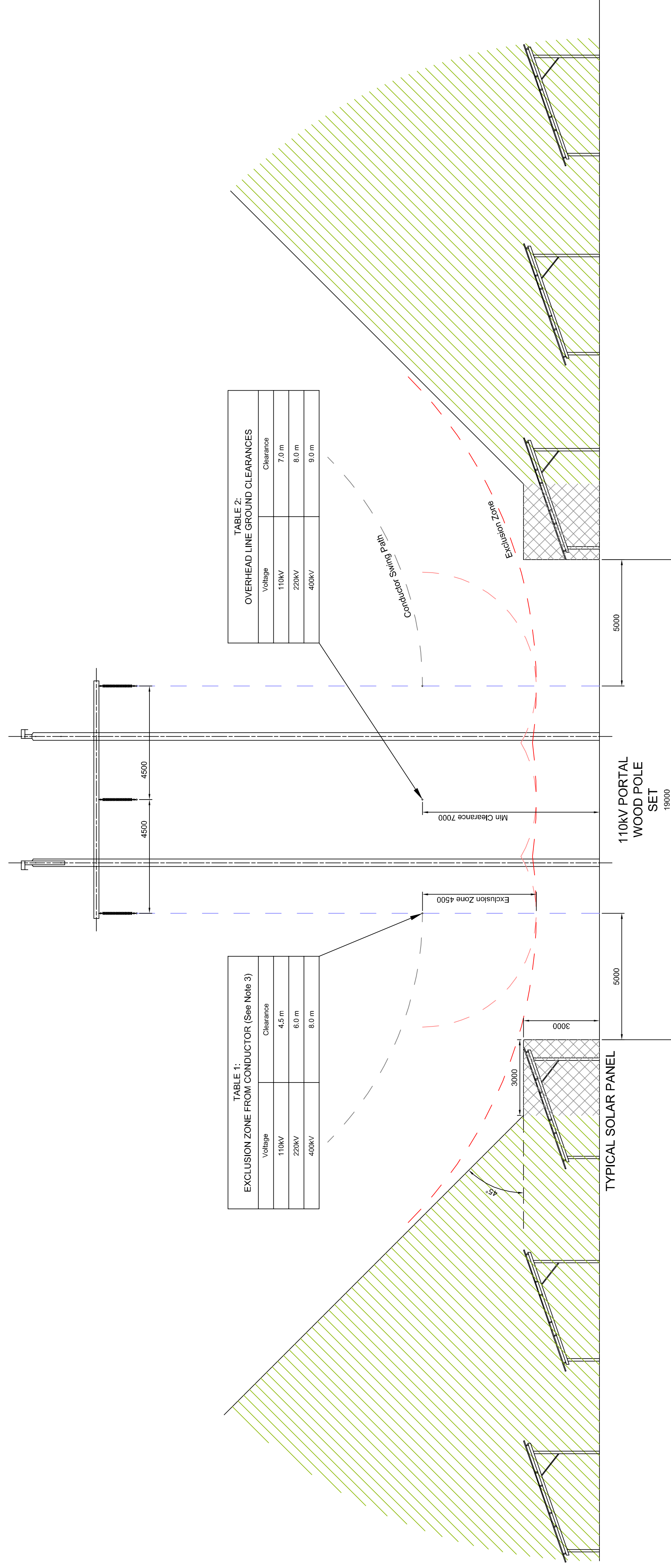
Client



Title
**Transmission Line and Solar Farm
 Guideline Clearances
 Guideline 110kV Setback Distances
 Section Drawing - Elevation**

Designed	E. Halpenny	Eng check	D. McCormack
Drawn	S. Healy	Coordination	G. McCarthy
Dwg check	D. McCormack	Approved	D. McCormack
Scale at A1	Status	Rev	Security
1:100	PRE	P2	STD

Drawing Number
MMD-373966-E-SK-00-XX-0021



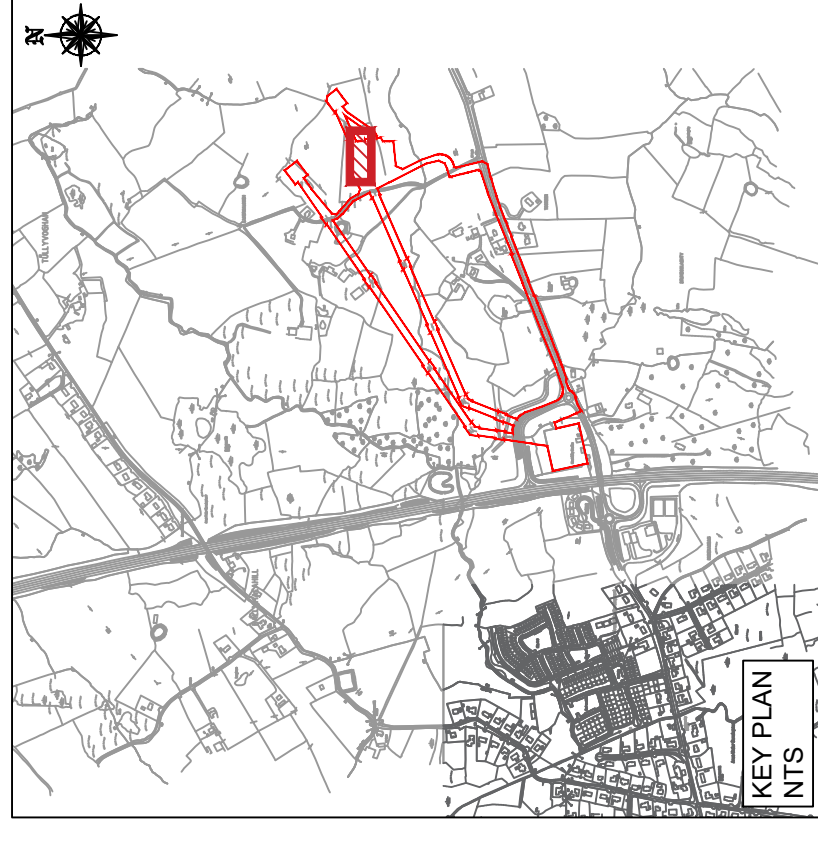
1:100
 0 2m 5m 10m

Section A-A
 REPRESENTS THE MIDSPAN OF THE LINE TO BE READ IN CONJUNCTION WITH PLAN DRAWING
 MMD-373966-E-SK-00-XX-0011

Appendix D

CSEA drawing No; 20_110A - CSE - ZZ - XX - DR - C - 2901 Rev P01
Drawing Title: Art Data Centre Campus – 110kV GIS Substation
Cross Section on Existing 110kV Overhead Lines

ART DATA CENTRES



LEGEND:

- SITE BOUNDARY
- EXISTING HV OVER HEAD LINE
- CLEARANCE ZONE FROM EX. OH LINE
- PROPOSED BUILDING DEVELOPMENT
- DEVELOPMENT TO ONLY COMMENCE ONCE EXISTING OH LINES HAVE BEEN REMOVED
- PROPOSED NATIVE WOODLAND PLANTING TO BE RESTRICTED TO 3m HIGH (MATURED)

Rev	Description	PS	RG	Date
P01	FOR PLANNING			03/06/22

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Client: ART DATA CENTRES
 Project: ART DATA CENTRES ENNIS CAMPUS - 110KV GIS SUBSTATION EXISTING OVERHEAD LINES -
 Dwg. Title: - SHEET 01 OF 02
 Drawn By: PS Checked By: RG Date: JUN 2022
 Project Code: Originator: Phase: Level: Type: Role: Dwg. No.:
 20_110A - CSE - GEN - XX - DR - C - 2901

S2 PLANNING AS INDICATED Scale @ A1
 P01 PLANNING 20_110A
 Revision: Project Status: CSEA Job No.:

