

ENGINEERING

**THE NATIONAL GRID ELECTRICITY TRANSMISSION PLC (SCOTLAND TO
ENGLAND GREEN LINK 1) COMPULSORY PURCHASE ORDER 2023**

STATEMENT OF EVIDENCE

**David Omer BEng CEng MICE
Lead EPC Project Manager
National Grid Electricity Transmission plc**

1. QUALIFICATIONS AND EXPERIENCE

- 1.1 My name is David Omer, and I am a Lead EPC Project Manager with National Grid Electricity Transmission Plc (NGET). I am a Chartered Engineer, Member of the Institution of Civil Engineers with a degree in Civil Engineering with Management from the University of Sunderland.
- 1.2 In my role with NGET I am responsible for the project management engineering, procurement and construction from development until commissioning of all works on the Scotland to England Green Link 1 within England that is not covered in proof of evidence by Faisal Karim and Graham Law. These works include;
- 1.2.1 New Hawthorn Pit gas insulated switchgear (GIS) 400kV Substation including access road
 - 1.2.2 Removal of two pylons and relocation of a third pylon.
 - 1.2.3 Installation of HVAC cables between new Hawthorn Pit GIS 400kV Substation and the existing Hawthorn Pit air insulated switchgear (AIS) 275kV Substation.
 - 1.2.4 Works at 'remote ends' of the OHL routes at other substations which are not included in the Order.
 - 1.2.5 All temporary works, including substation compounds, to deliver to above works.
- 1.3 I have over thirty years' experience in the Energy Sector specifically High Voltage Transmission. I have worked for NGET for eleven years as an EPC Project Manager delivering capital investment projects within substations. I have delivered similar projects at Bicker Fen Substation where NGET connected two Customers from HVDC Converter Stations. I worked for Areva/Alstom Transmission and Distribution for nine years. I was site manager on a new GIS Substation at West Weybridge and Civil Engineer of a new GIS Substation at Hackney. I worked for Pirelli Construction (now Prysmian) for eight years as a Project Engineer. I was responsible for all Civil Works on the 3-mile cable section of the 2nd North Yorkshire Link.
- 1.4 I have worked on the Scotland to England Green Link 1 Project for 18 months. My role to date has been to work with the Principal Designer (WSP) to produce a functional substation design compliant with NGET specifications and health and safety legislation, write the project Scope for issuing to Tenderers, lead technical evaluation of tender submissions, liaise with Stakeholders internal and external, directly or indirectly with the assistance of Hugh Smith and Elliot Chandler.

2. INTRODUCTION AND SCOPE OF EVIDENCE

- 2.1 The purpose of my evidence is to explain the engineering design and construction methodology of the Scotland to England Green Link 1 (the **Project**), specifically the onshore substation and overhead lines near the existing electricity substation at Hawthorn Pit. My evidence does not address the wider need for the Project (addressed by Mr Law at section 4, Mr Smith at section 3 in respect of planning and Mr Chandler at section 4 in respect of the need for the Order land of their respective evidence). My evidence does not extend to the engineering design and construction methodology for the section of the Project from landfall to the converter station (which is the responsibility of Mr Karim and is dealt with in his

evidence, nor does it extend to the section of the Project comprising the converter station (which is the responsibility of Mr Law and is dealt with in his evidence, save where there is overlap with the cable infrastructure).

2.2 My statement of evidence is structured as follows:

2.2.1 Section 3 provides an overview of the Project.

2.2.2 Section 4 describes the works and rights required for the Project (namely the substation, HVAC Cables and overhead lines).

2.2.3 Section 5 comments on objections made to the Order.

2.2.4 Section 6 contains my conclusions.

3. OVERVIEW OF THE PROJECT

3.1 For a full description of the Project and the English Onshore Scheme I refer to the evidence of Mr Graham Law and the Statement of Case.

3.2 My evidence relates to the following elements of the Project.

3.3 **English Onshore Scheme:** Approximately 10 km of underground HVDC cable from the mean low water mark at Seaham, to a converter station at Hawthorn Pit in County Durham. The converter station will be connected to a new 400 kilovolt (kV) substation by approximately 1 km of underground of High Voltage Alternating Current (HVAC) cable. The new 400 kV GIS substation will connect the project to the existing 275 / 400 kV AIS Hawthorn Pit substation and the existing electricity transmission system.

3.4 The Project also includes works to existing overhead line electricity infrastructure and the installation of new overhead line electricity infrastructure, comprising the re-alignment of existing overhead lines at Hawthorn Pit, the relocation of a pylon, the removal of two pylons and the removal of existing overhead lines.

3.5 The English Onshore Scheme components of the infrastructure required to deliver the Project which I address will comprise the following:

3.5.1 **Substation:** A new 400 kV GIS substation to the south of the existing Hawthorn Pit substation (the **Substation**);

3.5.2 **HVAC Cables:** approximately 600m of nine underground HVAC cables connecting the new Substation to the existing electricity substation at Hawthorn Pit (the **HVAC Cables**);

3.5.3 **Temporary Compounds:** construction of associated temporary construction compounds, temporary work areas, and temporary vehicle access arrangements (the **Temporary Compounds**);

3.5.4 **New Overhead Lines:** the installation of new overhead electricity lines and one new pylon to connect to the new substation at Hawthorn Pit (the **New Overhead Line Works**); and

3.5.5 **Removal of Overhead Lines:** the removal of existing overhead electricity lines, including three pylons, which currently connect to the existing electricity substation at Hawthorn Pit (the **Overhead Line Removal Works**).

4. PHYSICAL COMPONENTS AND WORKS REQUIRED TO CONSTRUCT THE SUBSTATION, HVAC CABLES AND OHL INFRASTRUCTURE

- 4.1 Section 3 above sets out the key components comprising the English Onshore Scheme of the Project. This section of my statement of evidence provides further detail on the Substation, HVAC Cables, the New Overhead Line Works and the Overhead Line Removal Works, including:
- 4.1.1 The infrastructure that will be constructed and installed;
 - 4.1.2 The construction works and methodologies that are required for this infrastructure; and
 - 4.1.3 The spatial extent of the land and new rights that are needed to facilitate the construction, operation and maintenance of the infrastructure comprised in the Project by reference to the Order Maps (**CD D.2**).
- 4.2 NGET developed a design for the Project for the purposes of seeking planning permission and promoting the Order (**CD D.1**). This was informed by a wide range of surveys and assessments, including ecological surveys, geophysical surveys, ground investigations (e.g., boreholes), soil surveys, and land drainage assessments. Planning permission was granted in July 2023 (**CD C.4**).
- 4.3 The Substation is a gas insulated substation, as opposed to the more common air insulated substation. The footprint of a gas insulated substation is smaller than the footprint of an air insulated substation and so the design reduces the land requirement for this element of the Project.
- 4.4 The final design of the Substation is not yet known. The Principal Contractor and Principal Designer will be responsible for developing the detailed design, including matters such as route alignment and micro-siting for the overhead lines, and requirements of the reserved matters detailed within the planning permission. The procurement process which will lead to the appointment of the Principal Contractor and Principal Designer is ongoing. It is currently anticipated that contracts will be awarded in January 2024.

Construction Phase

New 400kV Substation to the south of the existing Hawthorn Pit substation (Plot 6-25 on Order Maps)

Physical Components

- 4.5 A new 400 kV Substation is required in proximity to the existing substation at Hawthorn Pit to allow connection of the HVAC cables from the Converter Station into the electricity transmission system. The Substation is likely to have a footprint of up to 2 ha and will be no greater in height than the existing infrastructure at the existing substation at Hawthorn Pit, the tallest of which are approximately 18 m high. The Substation is consented pursuant to the Outline Planning Permission. The Outline Planning Permission (through planning condition 22) imposes a height limitation of 14m (save for lightning protection measures).

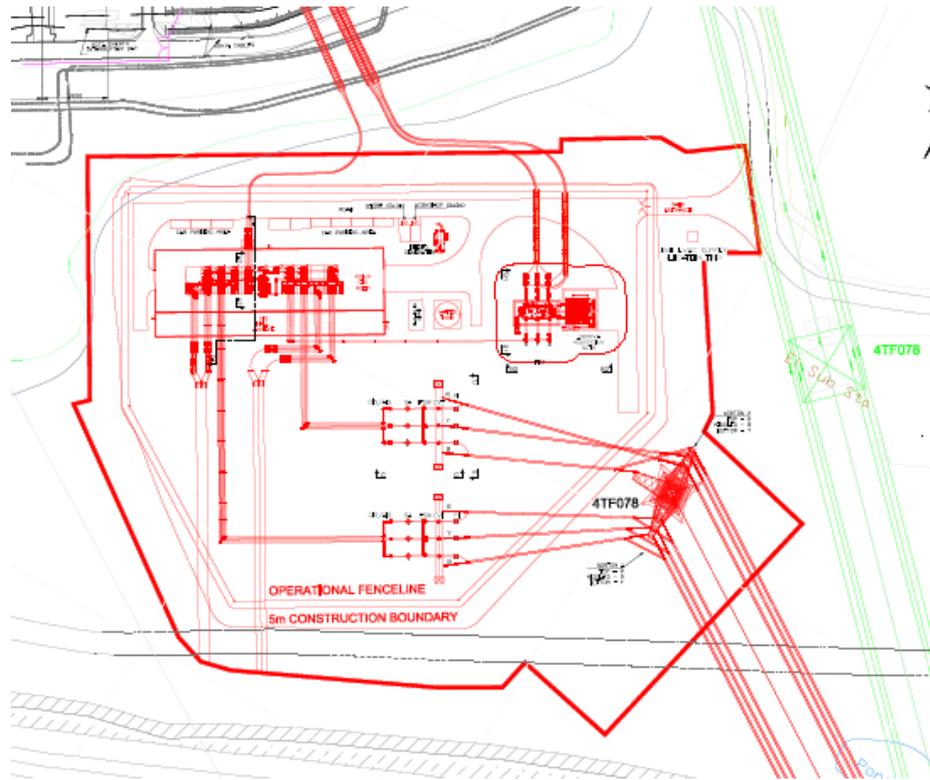


Figure 1: Indicative layout of the Substation submitted with the planning application

- 4.6 The Substation site is located approximately 50m south-east of the existing substation at Hawthorn Pit. The footprint of the Substation is approximately 2ha and is located on an area of informal open access land. The site of the Substation is gently sloping, with a 4m change in elevation from the north-west to south-east.
- 4.7 Due to the topography, natural features and the site being an old colliery with made ground a GIS Substation was chosen, despite the greater technical complexity and operation over the traditional AIS designs due to its smaller footprint to maintaining close proximity to the existing Hawthorn Pit substation, OHL and access roads.
- 4.8 The Substation will provide termination for the HVAC Cables connecting the Converter Station. The Substation site will be a flat surface of grey gravels (“substation chippings”) with a level no higher than 122.845m AOD, along with internal roads, car parking and footpaths. The Substation site will be enclosed within a 2.4 m galvanised palisade security fence, with a 3.4 m high electric fence inside it.

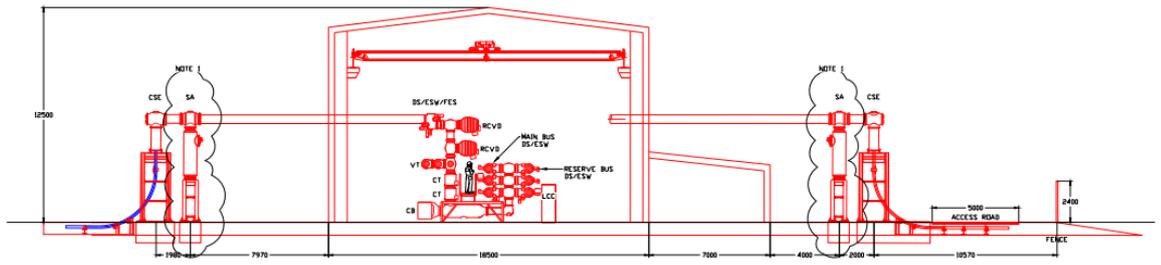


Figure 3: Illustrative cross section of GIS substation, GIB to cable sealing ends.

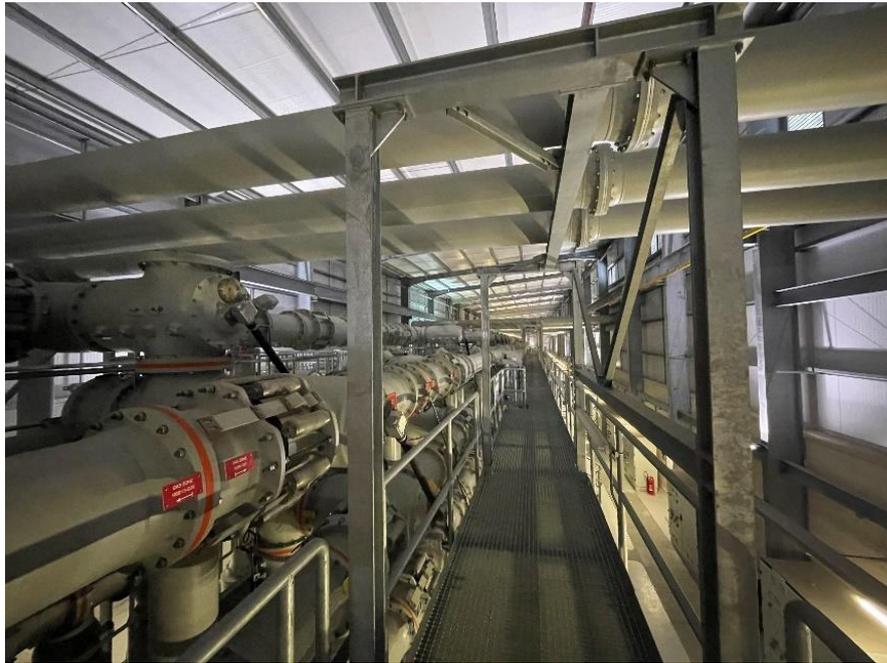


Photo 2. Illustrative view of the Substation GIS Hall taken at Connah's Quay.

- 4.10 The Substation site will contain a 1100 MVA 400/275/13kV super grid transformer comprising the main tank and cooler bank. The main tank will be within a noise enclosure and the cooler bank consists of a set of larger outdoor fans.
- 4.11 Areas of the Substation site will comprise gas insulated busbars (GIB) and traditional air insulated switchgear (AIS) equipment including gantries that connect to the new overhead line (OHL) pylon to the south-east.



Photo 3. Illustrative view of the Substation showing GIB & AIS equipment connecting to a Gantry and OHL.

- 4.12 The Substation will also contain small buildings including:
- 4.12.1 Static 120,000 l cylindrical above ground water tank for fire-fighting purposes;
 - 4.12.2 Diesel generator for back-up power supply;
 - 4.12.3 Workshop (7m x 3m container); and
 - 4.12.4 Stores (7m x 3m container).
- 4.13 The connection between the new Substation and the existing substation at Hawthorn Pit will be via HVAC Cables.
- 4.14 The Substation drainage system will be a SuDS system comprising swales and attenuation by underground cellular storage adjacent to the Substation. The attenuated water would then be routed via an underground pipe to the south and discharged into an existing water course by means of flow control devices, sampling chambers and a headwall, subject to detailed design.
- 4.15 Access to the Substation is proposed via approximately 25m of new road from the existing substation access road, connecting to the north-east corner of the new Substation via a 6m wide security gate.
- 4.16 Below ground earthing forming an ‘earth mat’.

Works required / construction methodology

- 4.17 The sequence of works and construction methodology for the Substation is expected to be as follows:
- (a) Following appointment of a Principal Designer and Principal Contractor, further ecological, geotechnical, and location of utilities surveys may be required. This will provide the Principal Designer and Principal Contractor information required for outline designs. These designs will then be submitted to support the planning application on reserved matters to Durham County Council for their approval.
 - (b) Regular vegetation clearance will be undertaken.

- (c) Work on the Substation will commence following approval of reserved matters pursuant to the Outline Planning Permission by Durham County Council and once the haul road from Jade Business Park and Substation Compound have been established.
- (d) Earthworks will be the first activity to commence including the formation of permanent and temporary landscaping bunds.
- (e) The construction activities at the Substation will be a continuous operation from when earthworks commence until all Converter Station and Substation works are completed and transferred to NGET Asset Operations.
- (f) The Substation will become operational in phases whilst Substation and Converter Station construction activities are ongoing.

Land and rights needed

- 4.18 As the Substation comprises integral above ground infrastructure, freehold acquisition is sought over Plot 6-25. To ensure that the rights acquired pursuant to the Order are proportionate, the Order includes the following rights: Access Rights in respect of the new permanent access road; Drainage Rights in respect of the land required as part of the drainage system; and Landscaping Rights in respect of the landscaping required.
- 4.19 Unhindered access is required to Plots 6-18 – 6-33, 6-36 – 6-41 throughout the duration of the Substation construction to enable all works required inside and outside of the Substation including for installation of drainage, third party utilities, landscaping.

Substation Compound

- 4.20 The temporary construction compound required for the construction of the Substation will be situated on Plot 6-36 with access required from Plot 6-48 and 7-20.



Figure 4. Indicative layout of Substation and Substation Compound

Works required / construction methodology

- 4.21 The Substation compound and access will be the first activities required to be undertaken by the Substation Principal Contractor from May 2024.

- 4.22 There will be a permanent security presence at the compound throughout the duration of the works.
- 4.23 A hardstanding area or ground stabilisation will be used over the area to provide a surface suitable for continued heavy construction vehicle traffic and reinstated. A fence will be erected around the Substation Compound to prevent the public encroaching into the work areas.
- 4.24 The Substation compound will be used for:
- (a) offices, meeting rooms, mess facilities, changing rooms, small material and equipment stores, workshops, WC/ Washing facilities, gatehouse
 - (b) car parking as there is no offsite parking within a reasonable distance to the work area and no public transport.
 - (c) main offloading and storage area for plant, equipment and machinery.

4.25 *Land and rights needed*

4.26 24hr access required to plot 6-36 whilst Substation Compound is in place. Construction Compound Rights will be acquired over Plot 6-36, and Temporary Access Rights over Plots 6-48 and 7-20.

4.27 We are not proposing to close any public rights of way, however, the Principal Contractor will be putting in measures to segregated and control the interface between the haul road access 6-48 and National Cycleway 1/ Bridleway between Plots 6-36 and 6-48 to ensure the safety of the Public crossing the haul road.

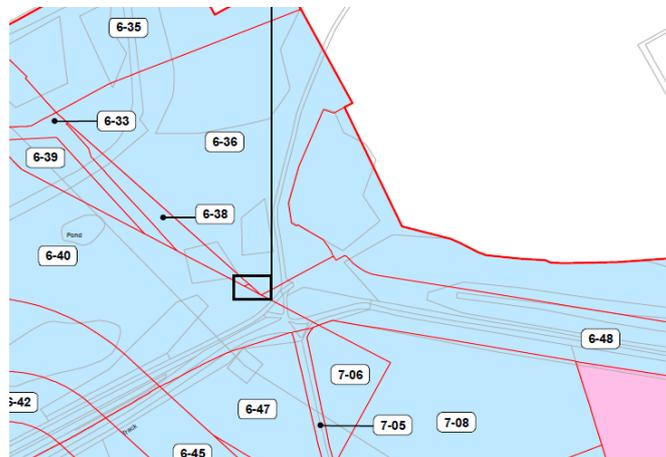


Figure 5: Extract from CPO plan page 7 showing pathway interfaces adjacent to plots 6-36 & 6-48.

Nine underground HVAC cables approximately 600m in length between the Substation and the existing electricity substation at Hawthorn Pit (Plots 6-21 and 6-26)

4.28 HVAC cables will be installed between the Substation and the existing electricity Substation at Hawthorn Pit are Plots 6-21 and 6-26.

Physical Components

4.29 There will be one 400kV circuit consisting of one cable per phase, with a total 3 of cables. This circuit will leave the Substation and head north turning left into the existing substation.

- 4.30 There will be one 275kV circuit consisting of two cables per phase, with a total 6 cables. This circuit will leave the Substation and head north through NGET owned land then head north of the existing substation and turn west then will enter the northwest corner of the existing substation.
- 4.31 There will also be the installation of control, fibre optic and earthing cables between the Substation and the existing Hawthorn Pit substation.

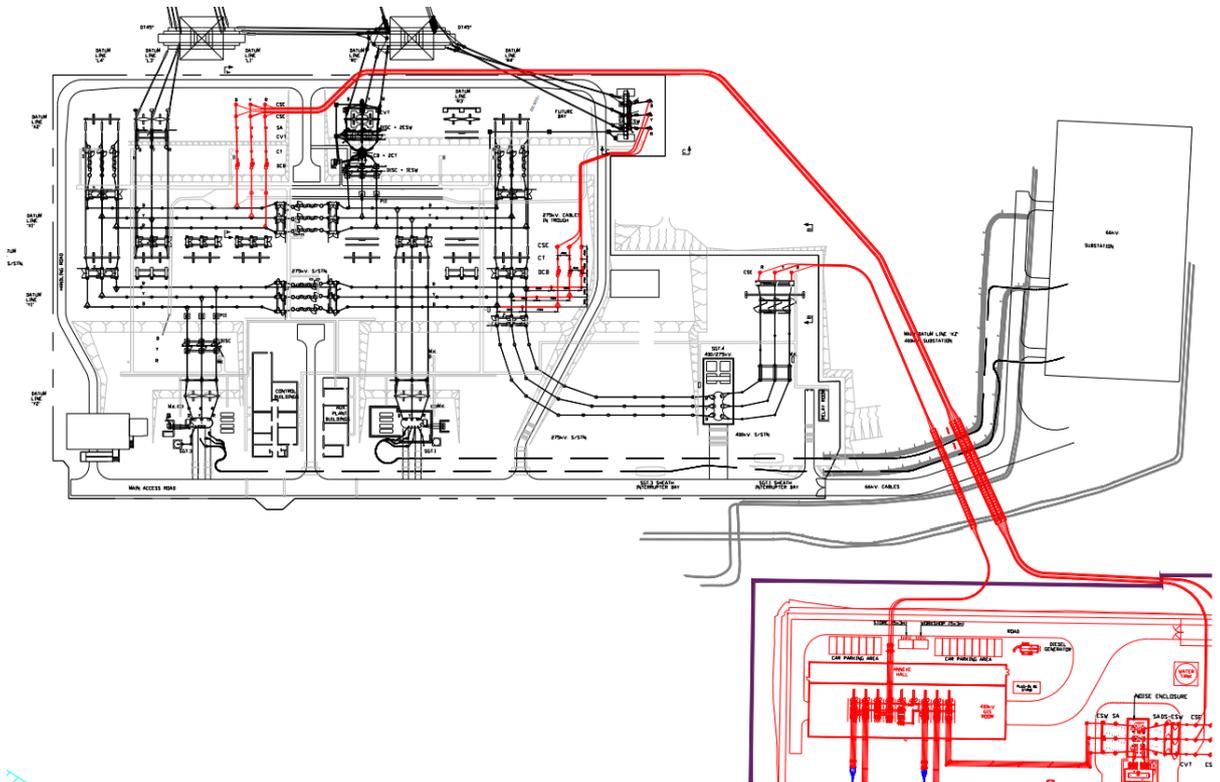


Figure 6: Route of HVAC cables between the Substation and existing Hawthorn Pit Substation

Works required / construction methodology

- 4.32 The depth of the 400kV & 275kV cables and precise route are unable to be determined until detailed design due to unknown bending radius of cable and depth of below ground services. The topography and above ground services will also affect the final methodology.
- 4.33 The detailed design will determine if the cables crossing the access road into the existing substation will be in surface troughs or in ducts that will be installed by directional drilling. This will affect the route and depth of cables in plots 6-21 and 6-26.

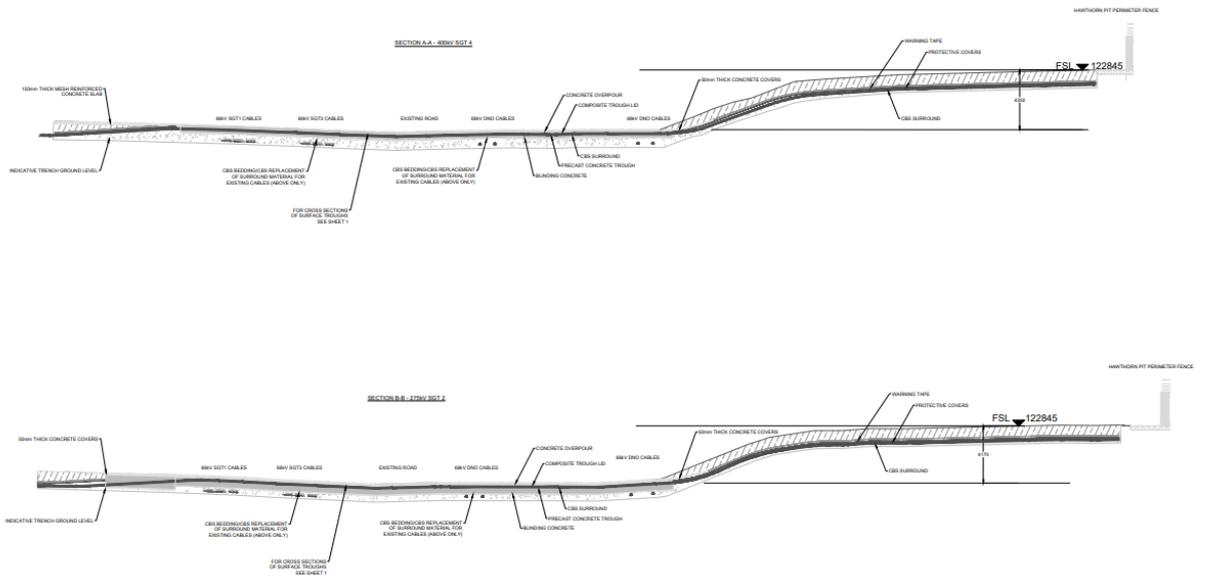


Figure 7: Cross section of HVAC cables from Substation across existing substation access road.

4.34 *Land and rights needed*

4.35 Easements for the HVAC cables between the Substation and the existing electricity Substation at Hawthorn Pit will be required. The Order includes the acquisition of Electricity Infrastructure Construction Rights for the construction period and HVAC Rights for ongoing operation and maintenance.

Installation of new overhead electricity lines and one new pylon (Plots 6-27, 6-40, 6-47, 7-05 and 7-06)

Physical Components

- 4.36 One new traditional steel lattice framed Pylon is to be built to the southwest of the Substation. Each corner of the tower will have concrete foundations. Earthing of the new Pylon is to the Substation's earth mat.
- 4.37 The Project also requires the installation of approximately 304m of new OHL. The OHL will operate at 400kV.
- 4.38 The location of the pylon is to maintain safe construction without affecting the operation of the existing assets and to allow the ease of transfer of the OHL.

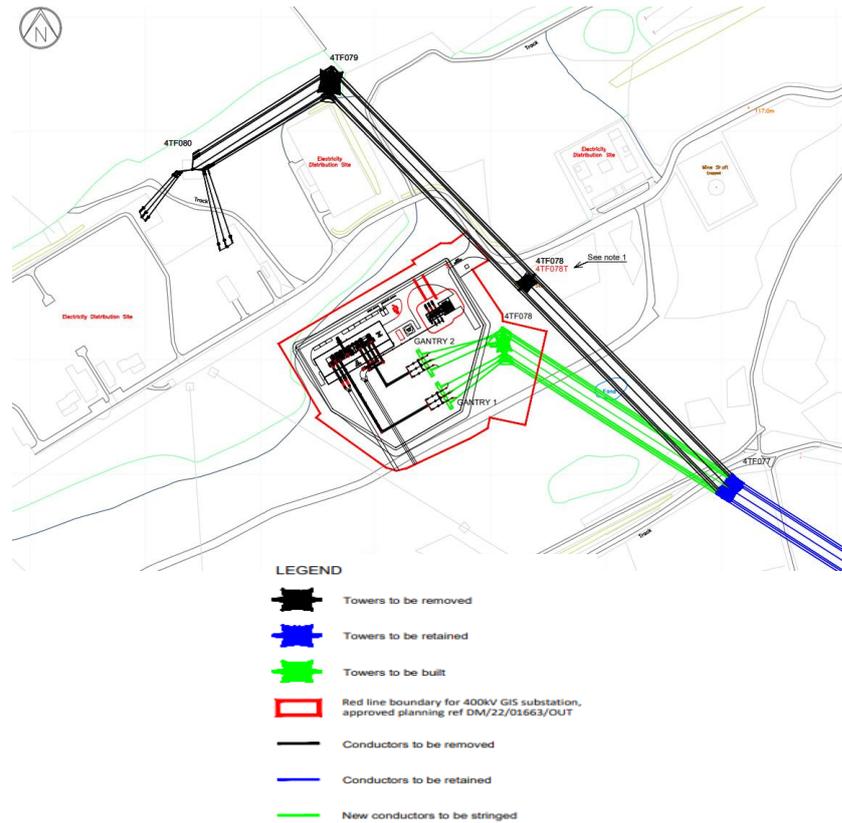


Figure 8 :Layout showing OHL and Pylons to be installed and removed

Works required / construction methodology

- 4.39 The detailed design will determine the final size of the pylon and the crossarms. The method of construction will be determined by the Principal Contractor, however,
- (a) A temporary compound will be located in Plots 6-47 and 7-06 to located either cable drums for OHL conductors or pulling winch to install the new OHL
 - (b) Installation of trackway may be required between the existing Pylon (4TF077) and new pylon up to the Substation gantry.
- 4.40 The OHL conductor on the Western side will be installed first.
- 4.41 Until all OHL conductors have been installed and operational the Converter Station is unable to operate at transfer its full capacity of 2GW.
- 4.42 Scaffolding may be required to maintain access for pedestrians and construction vehicles whilst the new OHL cables and installed.

Rights needed

- 4.43 Access to the area of the tower is required throughout the project for ease of construction for the new Hawthorn Pit and an attenuation tank adjacent to the new tower.
- 4.44 Easements for the OHL will be required. The Order includes the acquisition of Overhead Line Rights for the construction and maintenance of the OHL and Construction Compound Rights for construction and ongoing operation and maintenance.

Removal of existing overhead lines (including three pylons) (Plots 6-14, 6-15, 6-16, 6-17, 6-31, 6-32, 6-33, 6-37, 6-38 and 6-39)

Physical Components

- 4.45 There is an existing OHL route between Hawthorn Pit to Norton which is designated as 4TF.
- 4.46 Three pylons which form part of the existing OHL route (4TF078, 4TF079 & 4TF080) are to be removed as part of the Project.
- 4.47 This will include the removal of approximately 717m of OHL between pylon 4TF077 to the existing Hawthorn Pit substation.



Photo 4: The three towers highlighted and the OHL cables between them are to be removed.

- 4.48 The concrete foundations will be removed up to a max 1m below ground level.

Works required / construction methodology

- 4.49 The method of removal of the pylons and OHL is not yet known and will be determined by the Principal Contractor and Principal Designer during detailed design.
- 4.50 Scaffolding may be required in locations to lower the OHL cables onto.

Rights needed

- 4.51 Access will be needed throughout the project for maintenance prior to the removal of the towers and secure are to prevent non-essential personnel in the area.
- 4.52 A separate contract is in place for On Tower Ltd to remove their telecommunication assets from pylons 4TF078 and 4TF079 and at ground level adjacent to the pylons by January 2024.

- 4.53 Access is required for the removal of the OHL between towers 4TF077 and the existing OHL line substation.
- 4.54 The first OHL line to be removed will be between on the 400kV line on the western side of 4TF080 and the gantry within the existing Hawthorn Pit substation and the between 4TF077 and 4TF078.
- 4.55 It is still to be determined if all OHL on the Western side of the pylons can be removed until detailed designs are undertaken to determine the structural stability if they were removed.
- 4.56 The removal of the eastern 275kV OHL between towers 4TF077 and the gantry at the existing Hawthorn Pit substation will be conducted sequentially between towers.
- 4.57 During the removal of OHL a safety zone will be in force so that no unauthorised or non-essential personnel are allowed into the area.
- 4.58 NGET has been liaising with Harmony Energy (who are developing a new scheme in the vicinity of the Project) to establish the location of their assets and access of the Battery Energy Storage System (BESS) and its interface with the removal of the OHL. I am aware that contact was made with Harmony Energy in June 2022 in order to discuss their emerging proposals and discussions are ongoing.
- 4.59 NGET and the Principal Contractor will liaise with various Stakeholders, internally and externally about maintaining access or operation of assets when the OHL cables are removed.

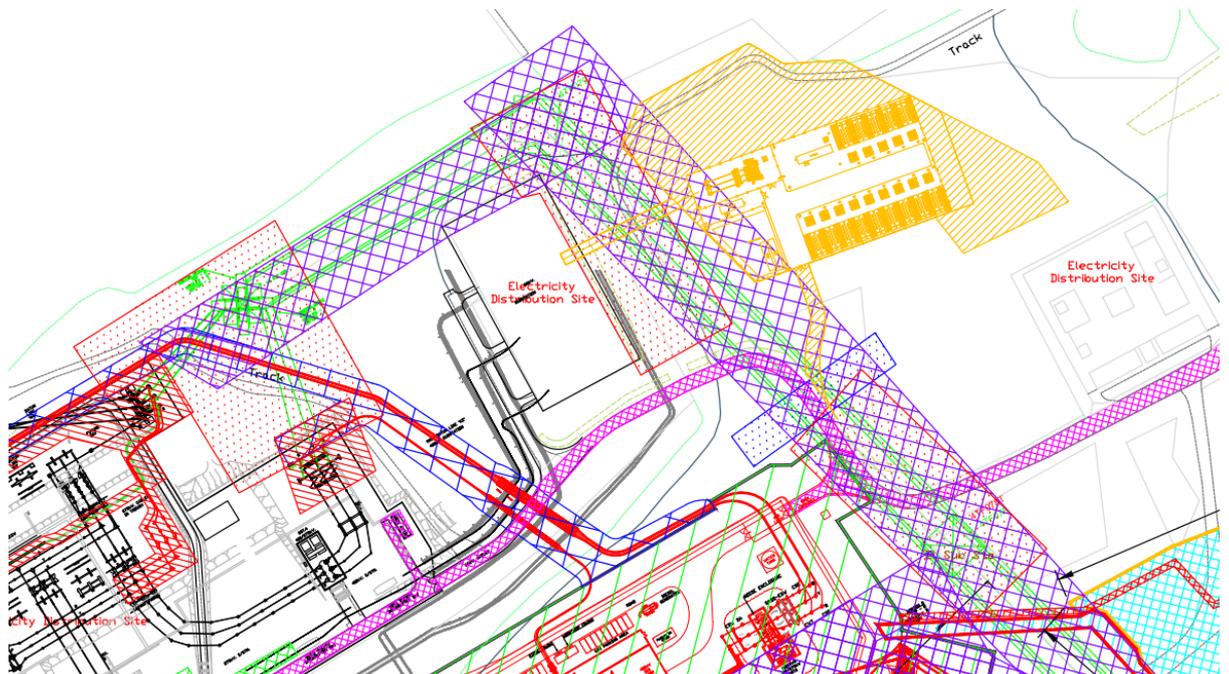


Figure 9: OHL and pylons to be removed and CDM areas required for safe removal of assets. Yellow area is Harmony Energy BESS

- 4.60 NGET may request that operational assets at Harmony Energy be turned off and made safe to allow removal of OHL cables and any temporary works needed to be put in place to ensure safe removal.
- 4.61 An operational safety zone will be needed around the pylons which are being removed.

- 4.62 On completion of the removal of OHL and pylons the constraints on the electricity substation and BESS will have been removed.

Operational Phase

Substation buildings and outdoor electrical equipment (together with formation of internal roads and erection of security fencing and provision of landscaping)

Physical Components

- 4.63 From 2026 the Substation will become operational. 24hr access will be required for any maintenance, switching operations, emergency repairs to ensure network resilience is maintained. Unobstructed Vehicle access will be needed to allow cars, van, HGVs, Cranes and Abnormal Load Haulage.
- 4.64 Access up to 5m around the perimeter of the substation will be required to inspect and maintain the repair the fence line.

Overhead Lines

- 4.65 Access will be required to undertake maintenance to the pylon, including painting, replacement of fittings and equipment on the tower to support the OHL.
- 4.66 Access to the OHL will be required to undertake maintenance and replacement at the end of the asset life.

5. OBJECTIONS MADE TO THE ORDER

- 5.1 NGET's Statement of Case and the evidence of Mr Chandler outlines the 17 relevant objections remaining at the time of writing, NGET's response to them and the status of negotiations.
- 5.2 No objections have been submitted in relation to the acquisition of the Substation, and no objections relate to the construction and operation of the Substation.
- 5.3 No objections have been submitted in relation to the acquisition of rights in respect of the Substation compound.
- 5.4 No objections have been submitted in relation to the acquisition of rights in respect of the new overhead line works.
- 5.5 No objections have been submitted in relation to the acquisition of rights in respect of the HVAC cables between the Substation and the existing substation.
- 5.6 An objection has been received in relation to the OHL removal works. This is addressed in sections 4.52 to 4.63 above and in the proof of Mr Smith at sections 7.38 and 7.39.

6. SUMMARY AND CONCLUSION

- 6.1 In my statement of evidence I have described the physical components of the Project, namely the substation and the overhead line works, together with the works that are required to construct and/or install those physical components, with reference to the illustrative drawings and photographs embedded within/appended to it. I have also described the rights that are needed to enable those works to be undertaken safely.

6.2 I consider that the engineering design and construction methodology of the above elements of the Project is appropriate, feasible, and compliant with the relevant standards, codes, and guidance.

6.3 No more land than is necessary for the purposes of the safe construction, operation and maintenance of the Project has been included in the Order (**CD D.1 and CD D.2**).

7. DECLARATION

7.1 I confirm that the opinions expressed in this proof of evidence are my true and professional opinions.

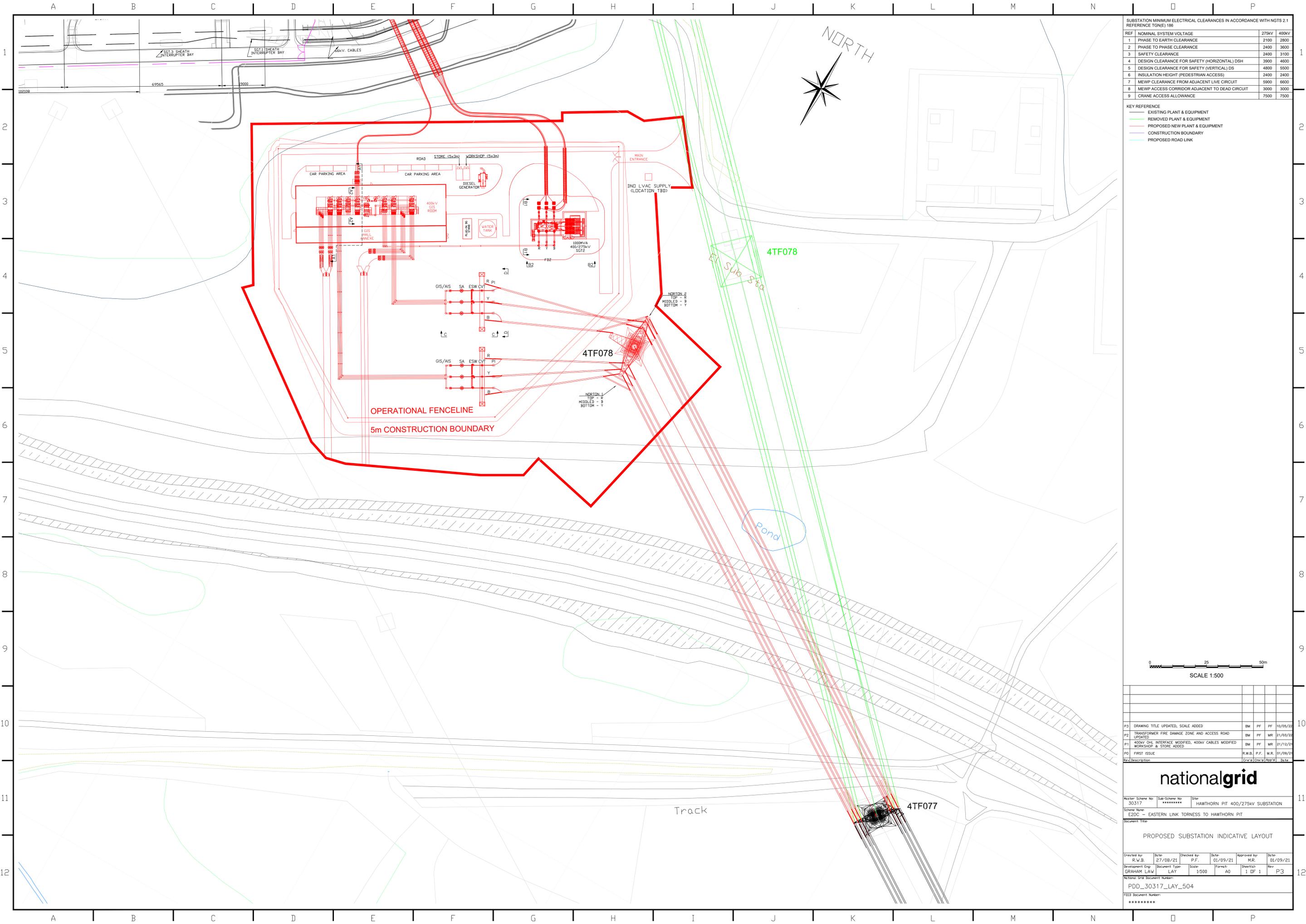
David Omer

5 September 2023

Appendices

- a. PDD_30317_LAY_504_P3 Substation Layout drawing submitted with planning application to Durham County Council. Referred to in Figure 1.
- b. PDD_30317_CIV_500_02_P3 Earthworks drawing of substation. Referred to in Figure 2.
- c. PDD_30317_LAY_505_P4 Substation cross section drawing referred to in Figure 3.
- d. PDD_30317_LAY_513_P5 CDM drawing referred to in Figure 4 to show Substation Compound illustrative layout and size and referred to in Figure 9 to show location of Harmony Energy BESS in relation on OHL removal between towers 4TF078 & 4TF079.
- e. PDD_30317_LAY_521_P2 HVAC route drawing between the Substation and the existing Hawthorn Pit substation access road referred to in figure 7.
- f. PDD_30317_OHL_507 P1. OHL drawing submitted with Section 37 application showing Towers to be built, Towers to be removed and Towers to be retained referred to in figure 8.

APPENDIX A

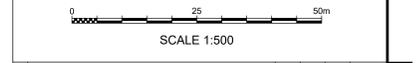


SUBSTATION MINIMUM ELECTRICAL CLEARANCES IN ACCORDANCE WITH NGTS 2.1 REFERENCE TG(IE) 186

REF	NOMINAL SYSTEM VOLTAGE	275kV	400kV
1	PHASE TO EARTH CLEARANCE	2100	2800
2	PHASE TO PHASE CLEARANCE	2400	3600
3	SAFETY CLEARANCE	2400	3100
4	DESIGN CLEARANCE FOR SAFETY (HORIZONTAL) DSH	3900	4600
5	DESIGN CLEARANCE FOR SAFETY (VERTICAL) DS	4800	5500
6	INSULATION HEIGHT (PEDESTRIAN ACCESS)	2400	2400
7	MEWP CLEARANCE FROM ADJACENT LIVE CIRCUIT	5900	6600
8	MEWP ACCESS CORRIDOR ADJACENT TO DEAD CIRCUIT	3000	3000
9	CRANE ACCESS ALLOWANCE	7500	7500

KEY REFERENCE

—	EXISTING PLANT & EQUIPMENT
—	REMOVED PLANT & EQUIPMENT
—	PROPOSED NEW PLANT & EQUIPMENT
—	CONSTRUCTION BOUNDARY
—	PROPOSED ROAD LINK



Rev	Description	Rev	Description	Rev	Description
P3	DRAWING TITLE UPDATED, SCALE ADDED	BM	PF	PF	10/09/22
P2	TRANSFORMER FIRE DAMAGE ZONE AND ACCESS ROAD UPDATED	BM	PF	MR	21/03/22
P1	400V OHL INTERFACE MODIFIED, 400V CABLES MODIFIED WORKSHOP & STORE ADDED	BM	PF	MR	21/12/21
PD	FIRST ISSUE	R.W.B.	P.F.	M.R.	01/09/21

nationalgrid

Master Scheme No: 30317 | Sub-Scheme No: ***** | Site: HAWTHORN PIT 400/275kV SUBSTATION

Scheme Name: E2DC - EASTERN LINK TORNESS TO HAWTHORN PIT

Document Title: PROPOSED SUBSTATION INDICATIVE LAYOUT

Created by	Date	Checked by	Date	Approved by	Date
R.W.B.	27/08/21	P.F.	01/09/21	M.R.	01/09/21

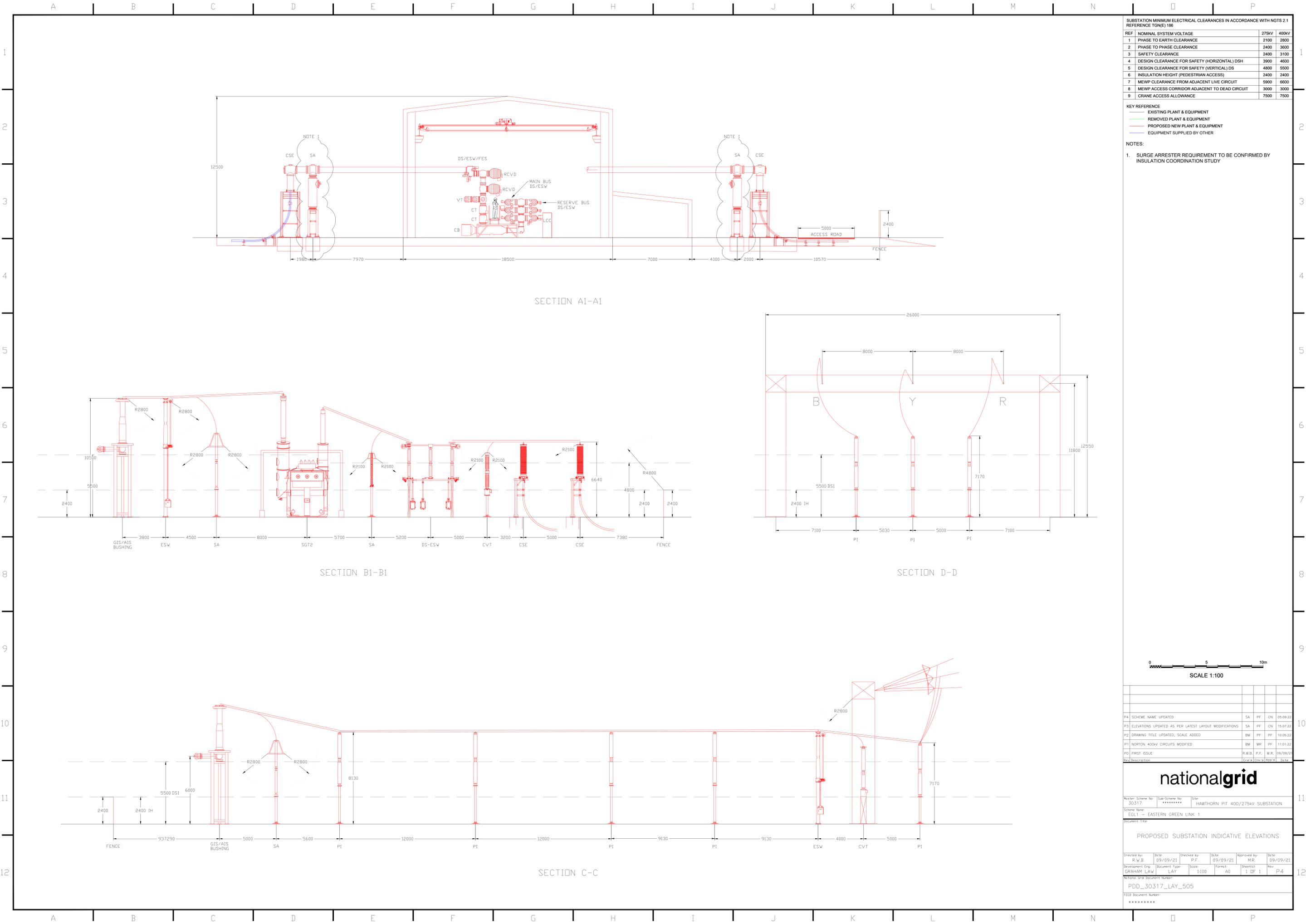
Development Group: GRAHAM LAW | Document Type: LAY | Scale: 1:500 | Format: A0 | Sheets: 1 OF 1 | Rev: P3

National Grid Document Number: PDD_30317_LAY_504

TEEP Document Number: *****

APPENDIX B

APPENDIX C



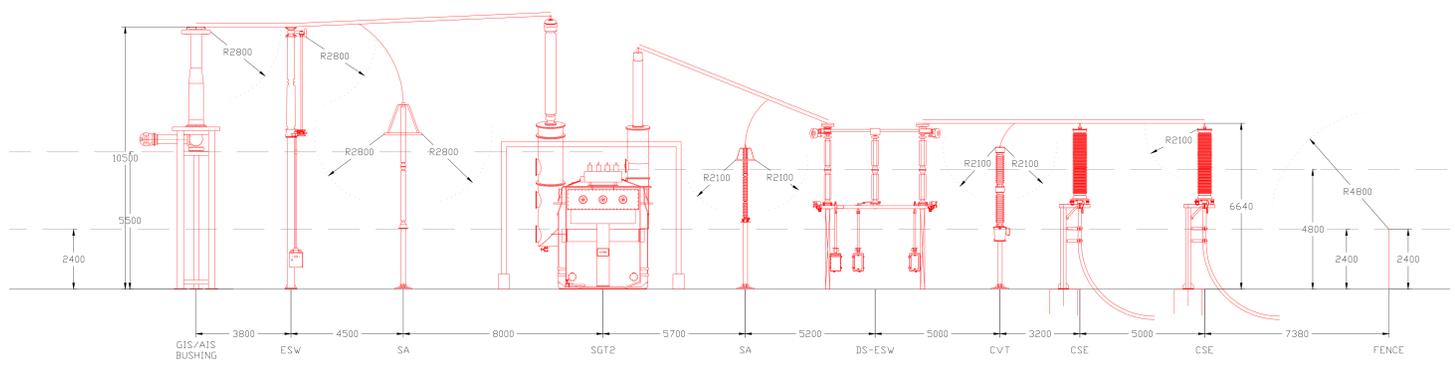
SUBSTATION MINIMUM ELECTRICAL CLEARANCES IN ACCORDANCE WITH NGTS 2.1 REFERENCE TGN(E) 186

REF	NOMINAL SYSTEM VOLTAGE	275kV	400kV
1	PHASE TO EARTH CLEARANCE	2100	2800
2	PHASE TO PHASE CLEARANCE	2400	3600
3	SAFETY CLEARANCE	2400	3100
4	DESIGN CLEARANCE FOR SAFETY (HORIZONTAL) DSH	3900	4600
5	DESIGN CLEARANCE FOR SAFETY (VERTICAL) DS	4800	5500
6	INSULATION HEIGHT (PEDESTRIAN ACCESS)	2400	2400
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8	MEWP ACCESS CORRIDOR ADJACENT TO DEAD CIRCUIT	3000	3000
9	CRANE ACCESS ALLOWANCE	7500	7500

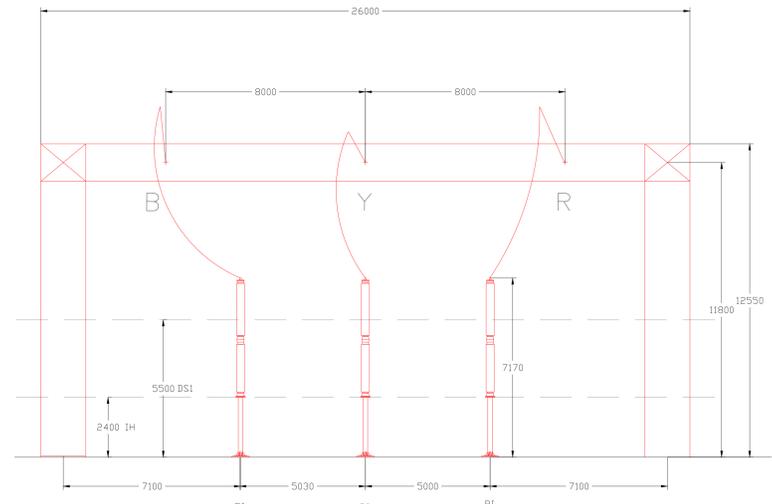
KEY REFERENCE
 — EXISTING PLANT & EQUIPMENT
 — REMOVED PLANT & EQUIPMENT
 — PROPOSED NEW PLANT & EQUIPMENT
 — EQUIPMENT SUPPLIED BY OTHER

NOTES:
 1. SURGE ARRESTER REQUIREMENT TO BE CONFIRMED BY INSULATION COORDINATION STUDY

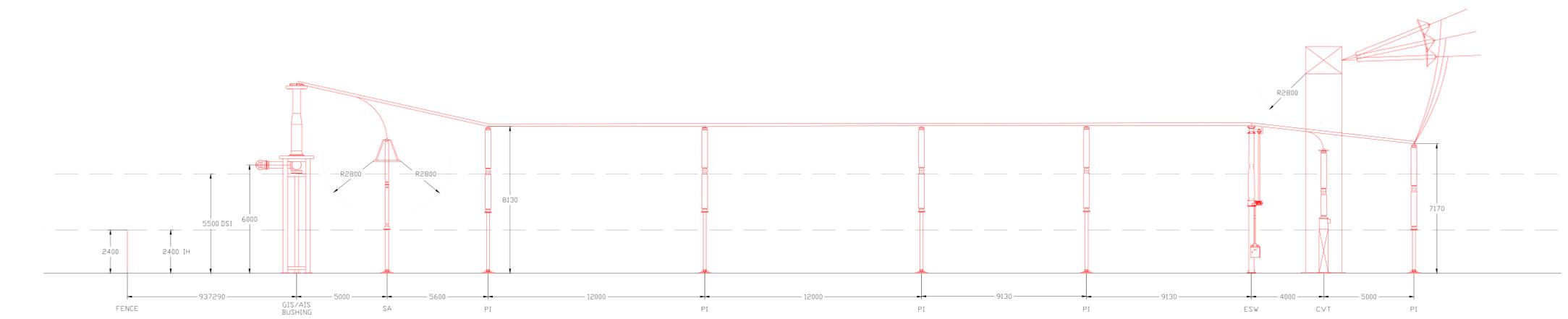
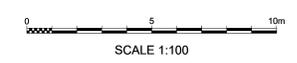
SECTION A1-A1



SECTION B1-B1



SECTION D-D



SECTION C-C

Rev	Description	By	Date
P4	SCHEME NAME UPDATED	SA	05.09.22
P3	ELEVATIONS UPDATED AS PER LATEST LAYOUT MODIFICATIONS	SA	15.07.22
P2	DRAWING TITLE UPDATED, SCALE ADDED	BM	10.05.22
P1	NORTON 400kV CIRCUITS MODIFIED	BM	11.01.22
PD	FIRST ISSUE	R.W.B.	09/09/21

nationalgrid

Master Scheme No: 30317 | Sub-Scheme No: ***** | Site: HAWTHORN PIT 400/275kV SUBSTATION
 Scheme Name: EGL1 - EASTERN GREEN LINK 1

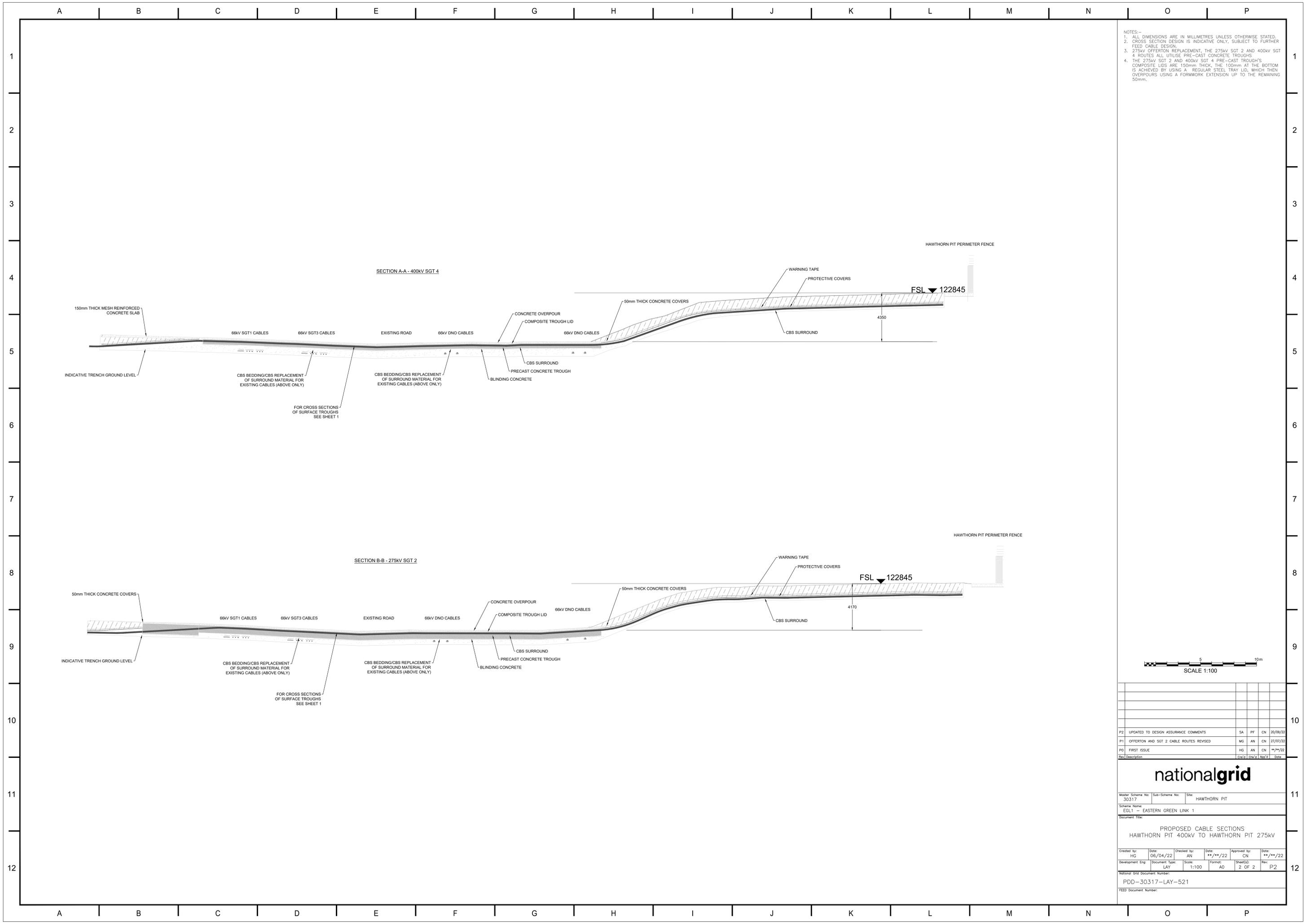
Document Title: PROPOSED SUBSTATION INDICATIVE ELEVATIONS

Created by	Date	Checked by	Date	Approved by	Date
R.W.B.	09/09/21	P.F.	09/09/21	M.R.	09/09/21

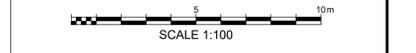
National Grid Document Number: PDD_30317_LAY_505
 FEED Document Number: *****

APPENDIX D

APPENDIX E



- NOTES:-
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
 2. CROSS SECTION DESIGN IS INDICATIVE ONLY, SUBJECT TO FURTHER FEED CABLE DESIGN.
 3. 275kV OFFERTON REPLACEMENT, THE 275kV SGT 2 AND 400kV SGT 4 ROUTES ALL UTILISE PRE-CAST CONCRETE TROUGH'S.
 4. THE 275kV SGT 2 AND 400kV SGT 4 PRE-CAST TROUGH'S COMPOSITE LIDS ARE 150mm THICK, THE 100mm AT THE BOTTOM IS ACHIEVED BY USING A REGULAR STEEL TRAY LID, WHICH THEN OVERPOURS USING A FORMWORK EXTENSION UP TO THE REMAINING 50mm.



Rev	Description	Cre'd	Chk'd	App'd	Date
P2	UPDATED TO DESIGN ASSURANCE COMMENTS	SA	PF	EN	20/09/22
P1	OFFERTON AND SGT 2 CABLE ROUTES REVISED	MG	AN	EN	27/07/22
P0	FIRST ISSUE	HG	AN	EN	**/**/22

nationalgrid

Master Scheme No: 30317 | Sub-Scheme No: | Site: HAWTHORN PIT

Scheme Name: EQL1 - EASTERN GREEN LINK 1

Document Title: PROPOSED CABLE SECTIONS
HAWTHORN PIT 400kV TO HAWTHORN PIT 275kV

Created by: HG	Date: 06/04/22	Checked by: AN	Date: **/**/22	Approved by: CN	Date: **/**/22
Development Eng: LAY	Document Type: LAY	Scale: 1:100	Format: A0	Sheet(s): 2 OF 2	Rev: P2

National Grid Document Number:
PDD-30317-LAY-521

FEED Document Number:

APPENDIX F

