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National Grid North Wessex Downs VIP

Document Title: Construction Method and Site Management Statement (CMSMS)

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This document has been submitted to fulfil the requirements of the following planning condition(s):

Local Planning Authority (LPA)	Planning Permission Reference	Condition Number	Requirement
Wiltshire County Council	PL/2023/01643	8	Construction Method and Site Management Statement (CMSMS)

Planning condition(s) full requirement:

Wiltshire County Council (Condition No. 8)	Location within Document / Reference Document
"No development shall commence on site (including any works of demolition), until a Construction METHOD and Site MANGEMENT Statement, which shall include the following: has been submitted to, and approved in writing by, the Local Planning Authority. The approved Statement shall be adhered to throughout the construction period. The development shall not be carried out otherwise than in accordance with the approved construction method statement without the prior written permission of the Local Planning Authority."	
1. Traffic Management Plan including the wider routing/network plans, location of directional signage etc	Traffic Management Plan (5417-PTDC-CABXX-XX-RP-PDM-000076)
2. Number (daily/weekly) and size of delivery vehicles and hours of deliveries and site operation.	Refer to Section 5.1 within Traffic Management Plan for Site Operating Hours, delivery hours and number and size of delivery vehicles
3. Number of staff vehicle movements and a site plan showing staff parking location within the site compound	Refer to Section 5.2 within Traffic Management Plan for Staff vehicle movements and parking arrangements. Refer to Appendix A in this document for plan showing parking within compounds
4. Details of temporary/permanent Traffic Regulation Orders	Refer to Section 4.1 within Traffic Management Plan
5. Phases plan including a week/month by month breakdown of operations including vehicle movements (in particular HGV movements)	Refer to Section 5.6 within Traffic Management Plan

Wiltshire County Council (Condition No. 8)	Location within Document / Reference Document
"No development shall commence on site (including any works of demolition), until a Construction METHOD and Site MANGEMENT Statement, which shall include the following: has been submitted to, and approved in writing by, the Local Planning Authority. The approved Statement shall be adhered to throughout the construction period. The development shall not be carried out otherwise than in accordance with the approved construction method statement without the prior written permission of the Local Planning Authority."	
6. Drawing showing loading and unloading of plant and materials;	Refer to Appendix A for location of loading and unloading / storage of plant and materials at all three construction compounds.
7. Drawing showing the location of storage of plant and materials used in constructing the development;	Refer to Appendix A for location of storage and laydown areas for plant and materials to be used in construction (all three construction compounds)
8. Drawing showing the location of wheel washing facilities;	Refer to Appendix A for wheel washing facilities at Primary Construction Compound. Possibility of including wheel washing facilities at secondary compounds.
9. Details of how measures to control the emission of dust and dirt during construction;	Refer to Sections 4.3, 4.4.2.1 and 4.12 within the Construction Environmental Management Plan (CEMP).
10. Details of measures for the protection of the natural environment.	Refer to Sections 4 & 5 within Construction Environmental Management Plan (CEMP)

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List of Abbreviations

WCC	Wiltshire County Council
NGET	National Grid Electricity Transmission Ltd.
CCoP	Construction of Code Practice
CEMP	Construction Environmental Management Plan
CCD Camera	Charge Coupled Device Camera
CBS	Cement-Bound Sand
AONB	Area of Outstanding Natural Beauty
AC	Alternating current
kV	Kilovolt
NWD	North Wessex Downs
TCC	Temporary Construction Compound
HDD	Horizontal Directional Drilling
PVM	Plant Vehicle Marshal
AWNES	Authorisation to Work Near Existing Services
HGV	Heavy Goods Vehicle
PRoW	Public Right of Way
SWMP	Site Waste Management Plan
ALO	Agricultural Liaison Officer
OHL	Overhead Lines
UGC	Underground Cables
SWA	Swept Path Analysis
TMP	Traffic Management Plan
ODTR	Optical Time Domain Reflectometer
CDM	Construction, Design and Management
CMSMS	Construction Method and Site Management Statement (This Document)
HAVS	Hand Arm Vibration Syndrome
RAMS	Risk Assessment Method Statements
SSoW	Safe System of Working
COSHH	Control of Substances Hazardous to Health
PPE	Personal Protective Equipment
RPE	Respiratory Protective Equipment
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations
LDB	Local Drainage Board
LA	Local Authority
EA	Environment Agency
PID	Perimeter Intrusion Detection
SPZ	Source Protection Zone
SHES	Safety Health Environment Sustainability
DTS	Distributed Thermal Sensing
GPR Survey	Ground Penetrating Radar Survey
CSEC	Cable Sealing End Compound
ITP	Inspection & Test Plan
GIR	Ground Interpretation Report

WW	Wessex Water
NRSWA	New Roads and Street Works Act

1. Introduction

1.1.1 This document comprises the Construction Method and Site Management Statement (CMSMS) as part of the North Wessex Downs Visual Improvement Provision Project as required by Wiltshire County Council (WCC).

1.1.2 The Local Authority has requested Planning Conditions for a CMSMS. Please refer to Pages 2 and 3 for further details of Condition No. 8.

1.1.3 This document will be submitted for approval to WCC as the relevant local planning authorities for the discharge of the required planning conditions.

1.1.4 Processes and procedures outlined in this document shall be adhered to throughout the life of the project.

1.1.5 This document sets out the proposals for each construction section and describes how the works will be undertaken in order to promote best practicable means and modern methods of construction.

1.1.6 The CMSMS covers all aspects of works including, but not limited to, the enabling works, main construction works, and reinstatement of the site at the completion of the project.

2. Overview of the Project

2.1.1 The North Wessex Downs (NWD) Visual Improvement Provision (VIP) Project is a proposed 4.5km long, 400kV Overhead Line (OHL) to Underground Cable (UGC) replacement project, as part of National Grid's existing Bramley to Melksham YYM OHL route.

2.1.2 The project will involve the construction of two new Cable Sealing End Compounds at either end of the proposed cable route and the installation of underground cables connecting these.

2.1.3 The project shall also undertake to dismantle and remove thirteen redundant OHL towers (YYM34 to YYM46) to improve the visual appeal of the area in question, which is located near the town of Devizes within the North Wessex Downs AONB.

2.1.4 The site is bounded to the East by the Kennet and Avon Canal and to the West by the hamlet of Rowdefield. The proposed 400kV Cable route crosses under the existing A361 and Horton Road to the east. Part of the route on the western part of

the cable route runs in parallel to Conscience Lane and crosses a number of farm tracks and minor roads to the west, including Folly Road.

2.1.5 The proposed cable route is shown in Figure 1 below:

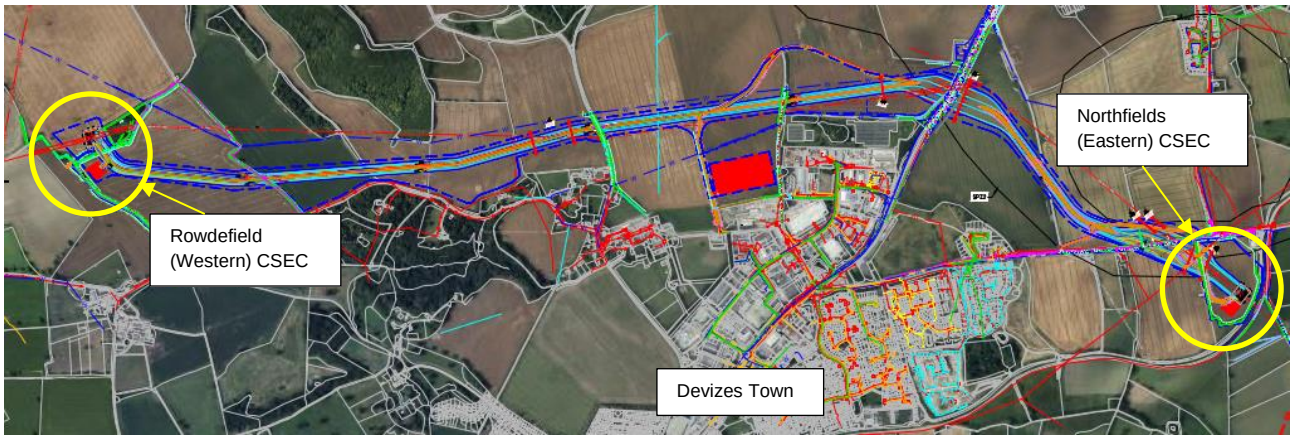

Figure 1: Overall layout of the NWD VIP Cable Route

2.1.6 It will be made up of the following components:

Cable Sealing End Compounds (CSEC)

2.1.7 Two new High Voltage Cable Sealing End Compounds (CSEC) shall be constructed at either end of the new cable route. The purpose of these CSECs is to provide a location for the new cables to be terminated and provide a location for the newly installed cables to interface with the remainder of the Bramley to Melksham YYM OHL route. Please refer to Figure 1 below for location details.

2.1.8 The construction of the new CSECs is covered under this Town and Country Planning application, reference number PL/2023/01643.

2.1.9 The table below shows the sequence of construction for the two new Cable Sealing End Compounds:

Table 1: Planned Construction Schedule for the new CSECs for the NWD VIP Project

Location	Chainage	Anticipated Start	Anticipated Completion
Northfields (Eastern) CSEC	0m	Sep 2024	Jul 2025
Rowdefield (Western) CSEC	4600m	Sep 2024	Jun 2025

Overhead Lines

2.1.10 A key part of the project is to improve the visual appeal of the area, in the vicinity of the Devizes Millennium White Horse monument. As such the existing OHL and towers

between YYM34 and YYM46 shall be dismantled and removed once the underground cable section has been installed.

2.1.11 Part of the works shall also include the construction of four temporary towers at the location of the two new CSECs. These shall also be removed upon completion of the underground cable installation.

2.1.12 Finally, the remaining towers which form part of the scope of works of this project (i.e., YYM33 and YYM47) shall have their foundations and structures strengthened.

2.1.13 The table below shows the planned sequence and duration of construction of the OHL element of the project:

Table 2: Proposed Construction Schedule of the OHL Works for the NWD VIP Project

Location	Scope of Works	Anticipated Start	Anticipated Completion
Tower YYM34A / YYM46A	Temporary Diversions	Feb 24	Jun 24
Tower YYM34B / YYM46B	Temporary Diversions	Mar 24	Sep 24
Towers YYM33 & YYM47	Foundation and Tower Strengthening	Sep 24	Nov 24
Tower YYM30 to YYM34 & Tower YYM46 to YYM50	Fibre Optic Works	Jun 25	Aug 25
Towers YYM34 to YYM46	Tower de-stringing and dismantling	Oct 25	Dec 25

Underground cables

2.1.14 The two new CSECs shall be connected by two circuits of new UGC. Typically, the cables are approximately 120mm in diameter and will have a nominal operating voltage of 400kV. There shall be two circuits formed of three phases, with two new 400kV cables per phase.

2.1.15 All the cable installation elements shall be carried out under Permitted Development orders.

3. Main Cable Routing & Sections

3.1.1 To assist with managing the works efficiently Balfour Beatty have divided the new cable route into six sections. During the pre-construction and main construction phases, the works in the six sections is planned to be completed in a sequential

method along the cable route starting in Section 1. However, this will be dependent on landowner licences and option agreements being in place for each phase.

3.1.2 The six sections are as follows:

Table 3: Sections of the new NWD VIP cable Route and their proposed construction dates.

Section	Location	Chainage	Proposed Construction Durations
1	Northfields (Eastern) CSEC to Joint Bay 1/2	0m – 900m	Feb 24 to Jul 25
2	Joint Bay 1/2 to Joint Bay 2/3	900m – 1950m	Feb 24 to Jul 25
3	Joint Bay 2/3 to Joint Bay 3/4	1950m – 2700m	Feb 24 to Jul 25
4	Joint Bay 3/4 to Joint Bay 4/5	2700m – 3350m	Feb 24 to Jul 25
5	Joint Bay 4/5 to Joint Bay 5/6	3350m – 4000m	Feb 24 to Jul 25
6	Joint Bay 5/6 to Rowdefield (Western) CSEC	4000m – 4600m	Feb 24 to Jul 25

*Please Note: Final Reinstatement and Landscaping are not shown in the above table. Please refer to the High-Level Works Summary in Figure 19 for further details.

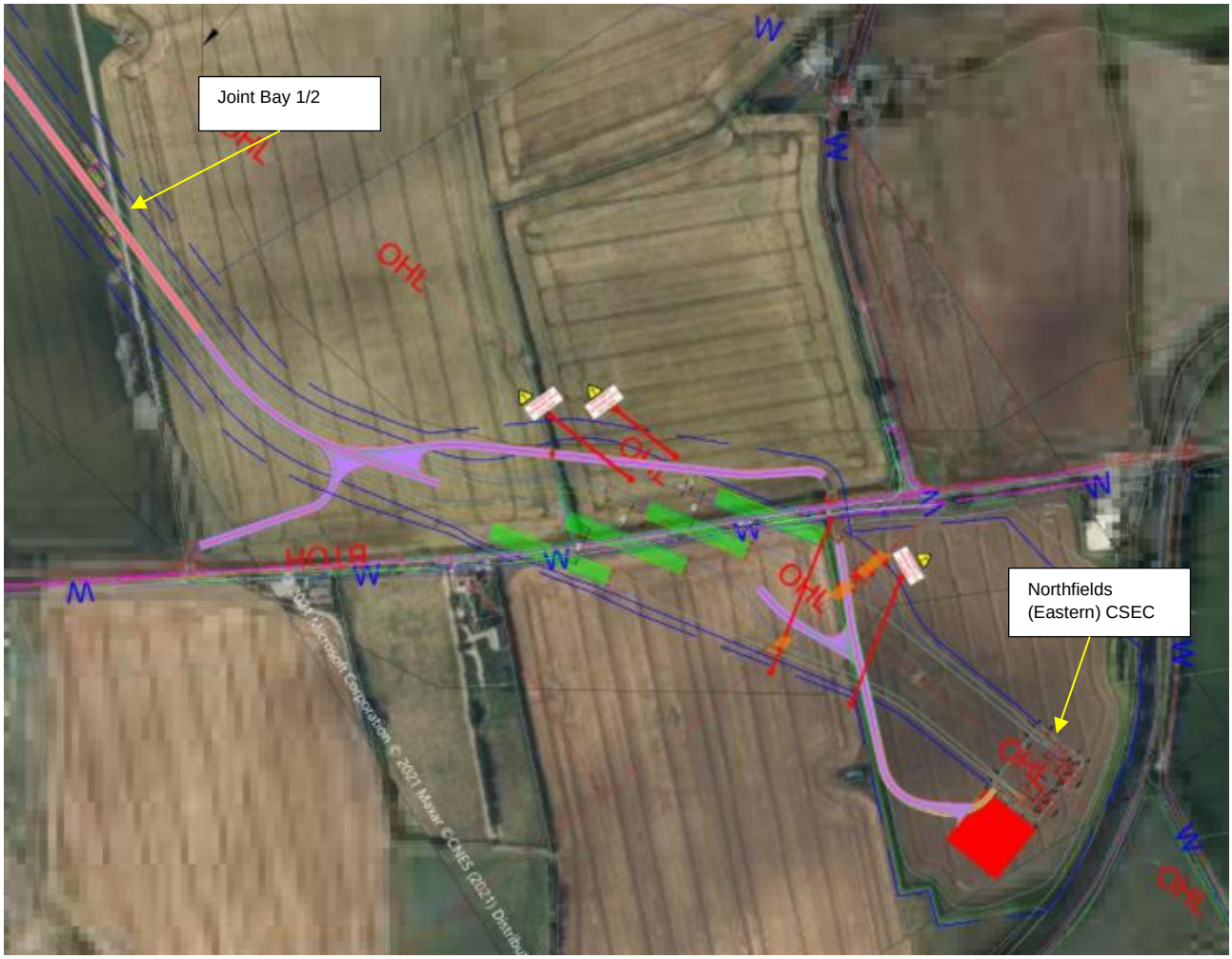

Figure 2: Section 1: Northfields (Eastern) CSEC to Joint Bay 1/2



Figure 3: Section 2: Joint Bay 1/2 to Joint Bay 2/3



Figure 4: Section 3: Joint Bay 2/3 to Joint Bay 3/4



Figure 5: Section 4: Joint Bay 3/4 to Joint Bay 4/5

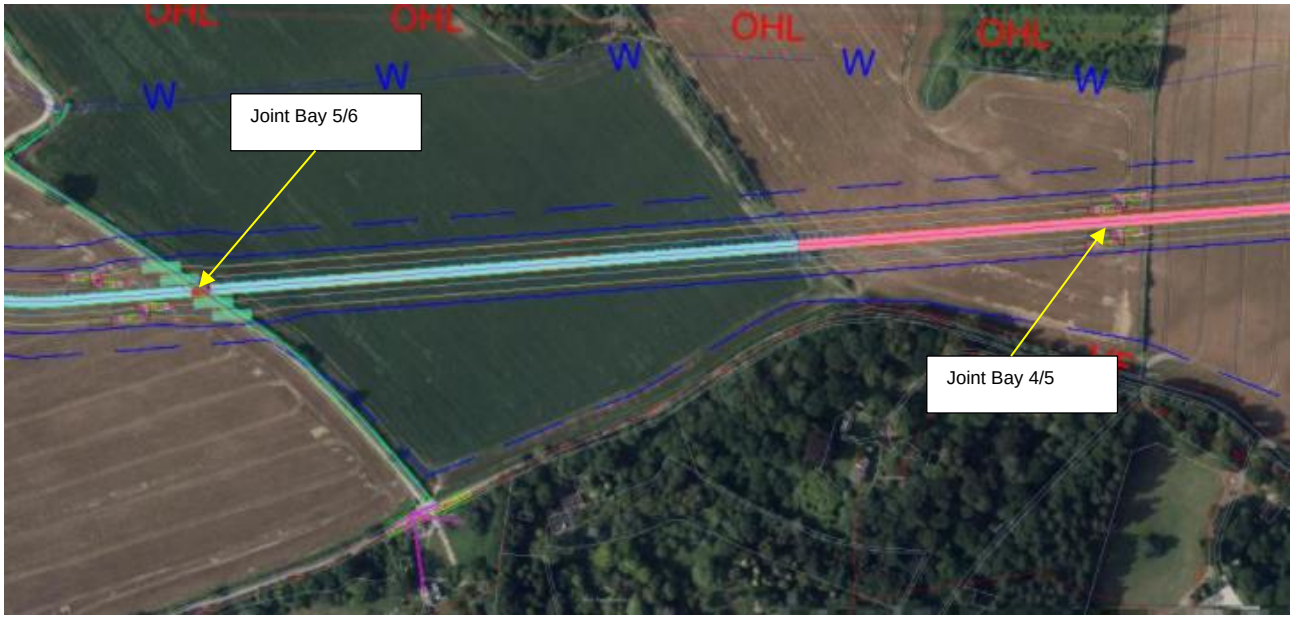

Figure 6: Section 5: Joint Bay 4/5 to Joint Bay 5/6

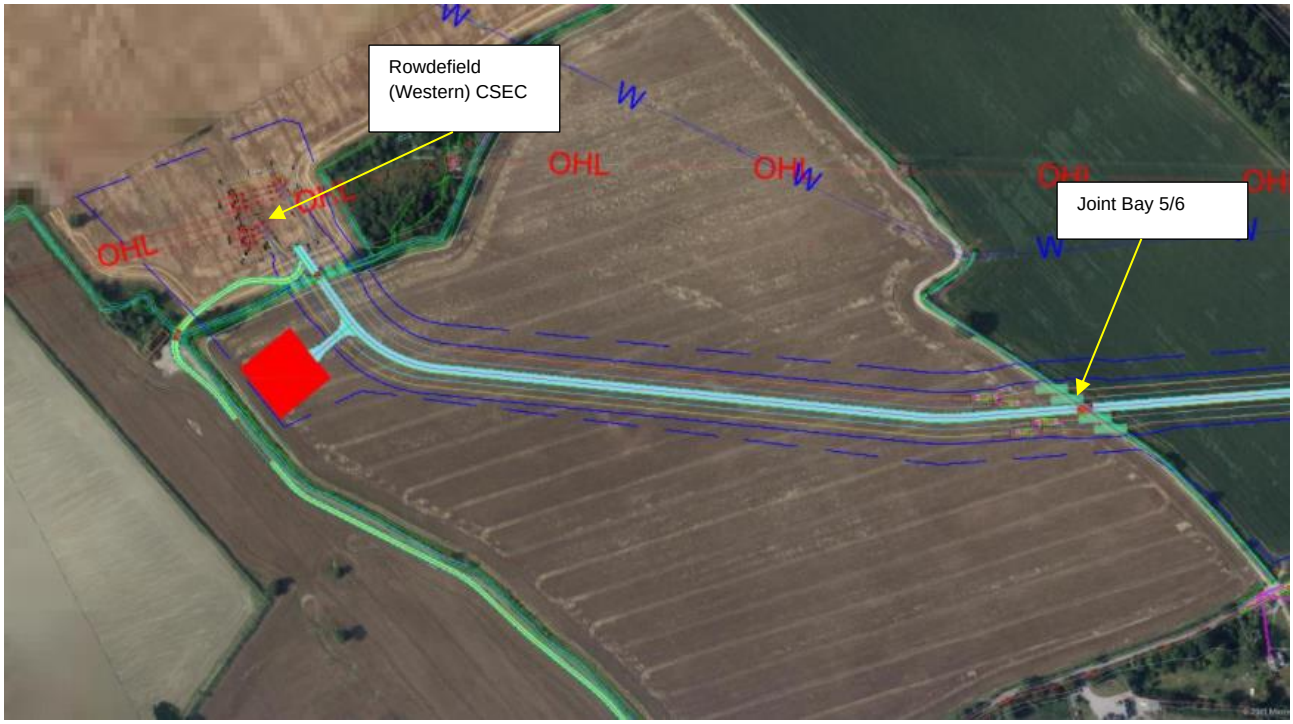

Figure 7: Section 6: Joint Bay 5/6 to Rowdefield (Western) CSEC

4. Construction, Design & Management (CDM) Obligations

4.1.1 As part of the contract arrangements, Balfour Beatty shall act as the Principal Contractor and Principal Designer for the North Wessex Downs VIP Project under the CDM Regulations (2015).

4.1.2 Part of these CDM obligations is the requirement to manage any interfaces with other organisations involved in the project, including the Employer, vendors; Local stakeholders, the Contractor's Sub-contractors as well as those operational interfaces which arise among the Contractor's internal divisions.

4.1.3 The key interfaces for the project have been identified and are detailed in the Third-Party Interface Plan. A few key interfaces are listed below:

- Employer: National Grid Electricity Transmission
- Cable Supply, Jointing and Terminating Works: Taihan Electric Wire Co. Ltd.
- Local Planning Authority: Wiltshire County Council
- Civil Design Sub-Contractor: Mott McDonald Ltd.

5. Pre-Construction Activities

5.1.1 As part of the initial consultation and development of the project, a significant number of surveys and design work has already taken place. The output of these works has formed part of the supporting documentation submitted to WCC as part of the Town and Country Planning Application (Ref. No. PL/2023/01643).

5.1.2 However, there remain some key activities to be undertaken prior to the main construction works commencing.

5.1.3 During these pre-construction activities all relevant consents and approvals from the relevant Local Planning Authorities, Regulatory Bodies and Stakeholders will be obtained prior to the enabling and main construction works commencing in each section. The per-construction phase works will involve some survey and investigation work including the following elements:

- Ecology surveys & mitigation works.
- Archaeological trenching, strip & mapping (to be carried out by NGET).
- Hedgerow Removal (via agreement with and taking the ecological calendar into consideration).
- Land drainage pre & post-construction designs.
- Dewatering designs.
- HDD designs.
- Ground Investigation works involving trial holes, window sample bore holes & soil sampling where required.
- Temporary works designs.
- All permanent works designs.
- Key Procurement activities (including long lead time items)
- Liaison with key stakeholders

5.1.4 Pre-construction works shall commence immediately upon contract award (expected 24th October 2023).

5.1.5 Site specific precondition surveys will be completed for each entry point complete with photographic evidence. This will also form part of the record keeping and reinstatement confirmation.

5.1.6 NGET are due to undertake archaeological works which will involve trial trenching, strip and mapping in a logical sequence along the cable route. The results of these surveys shall be shared with Balfour Beatty Power T&D, the County Archaeologist and the Historic England as required to inform the construction strategy and for record keeping purposes.

5.1.7 Dependent on the archaeology present the trial trenches maybe opened up further into a strip and mapping area, however the extent of this area will be agreed between NGET's archaeologist and the County Archaeologist.

5.1.8 Trial trenching forms part of a phased approach in areas where there is limited archaeological information. Trenching could identify archaeological assets which require extended Strip, Map and Sampling or could result in limited archaeological finds which would allow construction works to proceed with limited or no further archaeological support. Trenches are expected to be 50m in length and 2m in width

and 50m in length and 3m in width for the joint bay trenches, extending to a depth determined by the archaeologists on site however will be subject to negotiations with the Local Authority's Archaeologist. Topsoil is stripped from the trench, before removal of layers under archaeological supervision. Works may be stopped at various points to record finds or features of significance before being fully reinstated. Please see Figures 5 and 6 as useful examples.

5.1.9 However, it is noted that due to the lack of intrusive archaeological investigation on the project to date, further 'strip, map and sample' sites may be required depending upon the results of the trial trenching.

5.1.10 These Strip, Map and Sample sites are areas larger areas that are opened up for assets to be recorded prior to construction works taking place. The extent of these areas will be discussed with the Local Authority Archaeologist and will be documented in the project WSI by NGET's archaeological contractor.

5.1.11 For the purpose of the programme, the trial trenching and 'strip, map and sample' activities will run ahead of the other pre-construction activities.



Figure 8 Sample Photograph of Trial Trenching Activity on the Hinkley Cabling Scheme.



Figure 9: Example of Pre-Construction of an open area excavation

5.1.12 The main construction works in each section will commence with the construction of compounds; these compounds will be used for welfare and the storage of material. They will also assist with considerably reducing construction traffic movement on the local highways by using haul roads. These haul roads will be constructed along the cable corridor to the adjoining Temporary Construction Compounds (TCC's).

5.1.13 The haul roads have already been designed with the relevant traffic movements, sizes and frequencies considered. They will be constructed at strategic locations to allow HDD works, cable drum movements and cable installation works to take place. In order to ensure that access to the cable corridor is available at all times within the six sections the construction works will be further sectioned from TCC to TCC with the haul road installed as required between each TCC.

5.1.14 The TCC's and bellmouths will form the only access points on to the cable route during construction,

5.1.15 Figure 7 below shows the layout of the TCC's in relation to the route:



Figure 10: Location of Temporary Construction Compounds along NWD cable route

6. Enabling Works

6.1.1 During early enabling works and prior to the main the site welfare being established temporary welfare will be mobilised to a safe location within the easement area. This will be a self-contained tow-along groundhog style welfare unit as shown below in Figure 8 below.



Figure 11: Temporary Accommodation to be used in the mobilisation / enabling works phase

Site Compound Establishment

6.1.2 Temporary Construction Compounds (TCC's) will have two classifications; ***Primary*** (main compound for primary works and offices – to be located to the rear of the existing Wiltshire Concrete Compound), and ***Secondary*** (satellite, smaller more specific compounds related to the direct construction works – located in the vicinity of the two new CSECs at either end of the cable route), Figure 12 below shows the locations of the TCC's. Appendix A shows the typical compound layouts by type (Pages 83, 84 and 85).

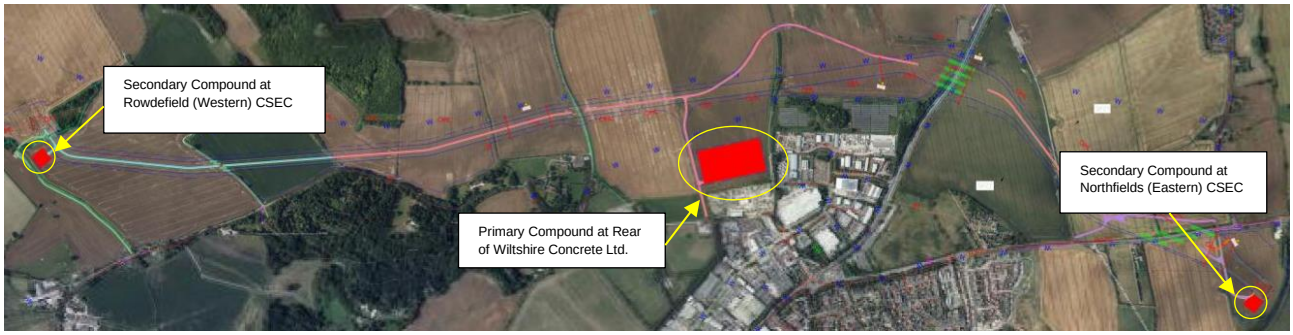

Figure 12: Location of Primary and Secondary Construction Compounds along the NWD Cable Route

6.1.3 Any existing services in the highway verge and/or within the TCC area will be identified and protected using approved methods from prior liaison with the relevant service provider(s).

6.1.4 The Primary Construction Compound shall contain all stie offices, staff parking arrangements, the majority of the plant and material storage facilities and staff welfare.

6.1.5 The two secondary compounds, located near the new Eastern and Western CSECs shall be used as temporary laydown and storage areas, with limited welfare facilities to be used by operatives working on the OHL Diversions and CSEC installation activities.

6.1.6 All TCC's that require bell mouth accesses from the highway will be installed.

6.1.7 TCC's will then be constructed from the bell mouths with pre-construction drainage for the compound areas installed at the same time. During the construction of the TCC's the area will be fenced off using Heras style fencing. Hoarding or Heras fencing will used on the main Primary CDM compound, as well as segregating the works area this will help provide extra security measures and also reduce the visual impact on the surrounding area. An example of such fencing is shown below:



Figure 13: Example of Heras Fencing used for CDM Compound

6.1.8 Before any excavation works commence, the relevant inductions, permits and RAMS will be issued to the relevant operatives. The fully briefed workforce will then attend site to take delivery of all the required plant and materials. All plant will be delivered to the site using a low loader and offloaded at a safe location utilising the bell mouths. Stone will be delivered to site in 20t rigid 8-axle wagons and tipped into a stockpile in a safe designated location. Other materials such as geotextile and geogrids will be

delivered by lorry and offloaded by site plant or Moffat Mountie/tail lift as required. Materials will then be transported around the site using dumper trucks.

6.1.9 The design for the compound areas has already been undertaken and an extract of this is shown below:

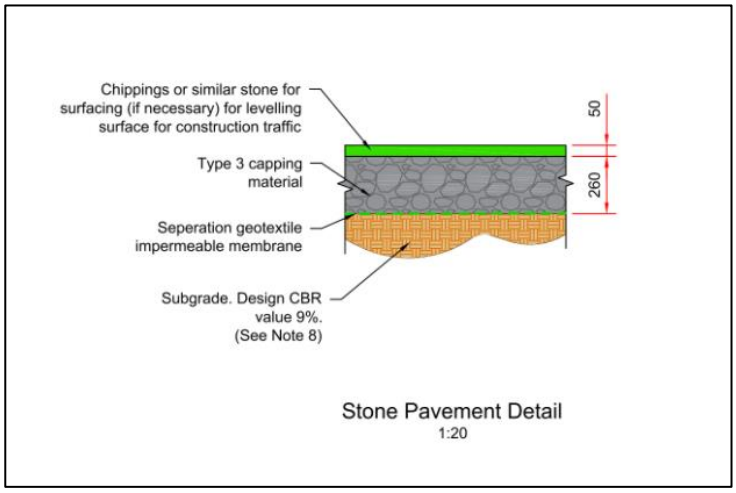

Figure 14: Typical Compound hardstanding construction detail

6.1.10 Stone will be distributed to the required thickness using dumper truck offloads and excavator movements. Geotextile will be placed directly on top of the subsoil and the Geogrid will be installed at the relevant layer to ensure correct hard standing construction and strength to match the design. As the compound area is installed the stone will be compacted with suitably sized rollers in layers. It is envisaged that the Primary Compound which is to be used by both the Employer, Balfour Beatty and associated works contractors will have a finished tarmac running surface installed, along with a barrier entry system, with entry to be controlled by use of the MSite security system.

6.1.11 Once the compound area is installed to the correct design, the cabins and office buildings will be delivered. Any further equipment or materials required for the haul road and other ongoing construction works will also be delivered.

6.1.12 This will be done in a logical sequence depending on the ongoing works and progression of other site activities. These activities will be required to allow the smooth advancement of the installation of the boundary fencing and pre-construction drainage along the cable corridor to take place and subsequently to enable the main construction programme to progress once begun.

6.1.13 In some instances, tasks identified as pre-construction enabling works can and may extend into the main construction phase.

Haul Road Installation

6.1.14 Due to the high quality of the agricultural land that the cable route crosses, and to protect as much as possible the integrity of the soil structure, a temporary haul road will be installed along the cable route for the duration of the construction period. This will also ensure that works can generally continue throughout the year in a safe and

controlled manner, regardless of weather conditions. The haul road has been designed and shall follow the route indicated below:

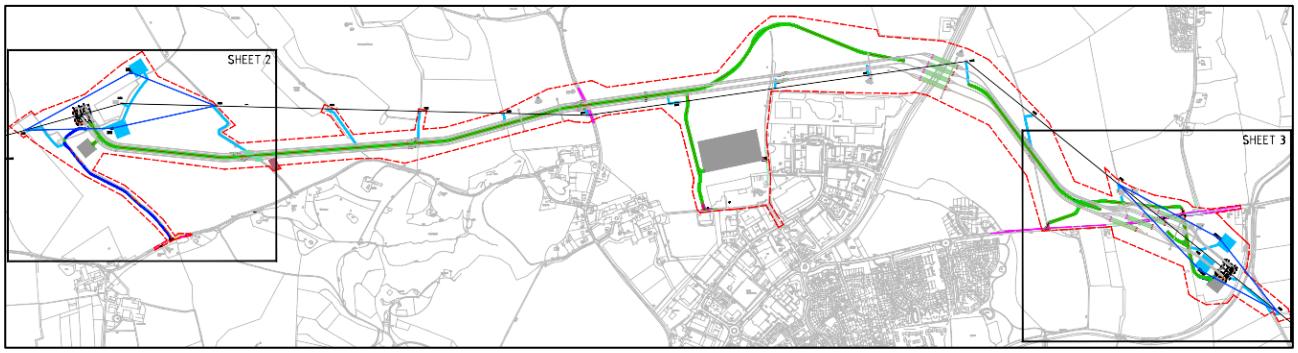

Figure 15: Overall NWD cable route map with extent of haul road highlighted

6.1.15 Final haul road designs will be confirmed by the California Bearing Readings (CBR's) results for each specific location and the requirements for the cable drum transportation vehicle. An indicative design of the haul road is shown below:

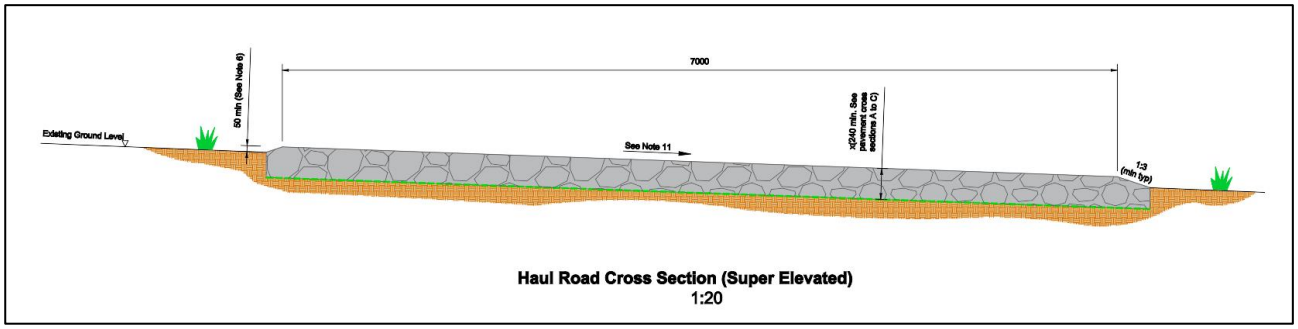

Figure 16: Indicative design for temporary haul road on sloping ground

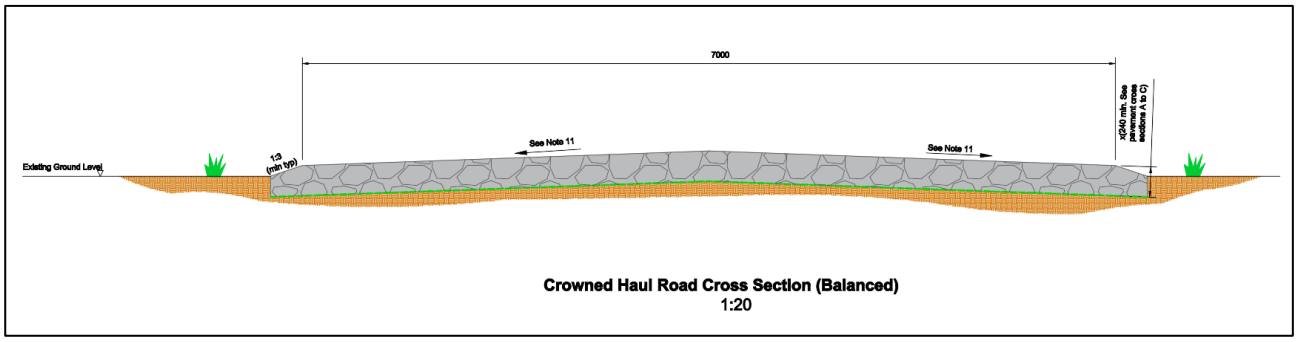

Figure 17: Indicative design for temporary haul road on even ground

6.1.16 Cable drum movements within the site boundaries shall be carried out using Balfour Beatty's own proprietary Cable Drum handler / transportation vehicle. The haul roads to be utilised by the cable drum transportation vehicle shall be designed in line with the typical cable drum transportation trailer shown below in Figure 18 below and will

also take into consideration the cable drum weight. Swept-path analysis to identify sufficient turning and manoeuvring areas to this haul road design will also be required at joint bay locations where cable pulling activities are to take place to allow access and egress for the cable drum transportation vehicle.

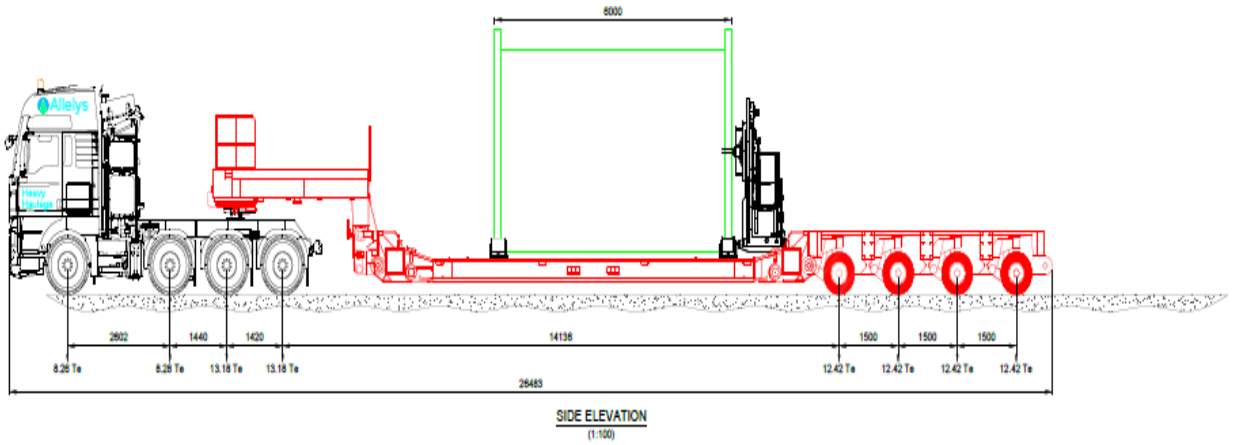

Figure 18: Typical Cable Drum handler arrangement to be used within site boundaries.

6.1.17 Transportation of the cable drum to the joint bay locations is the critical design consideration for the haul road. This will be dependent on the direction of the cable pull.

6.1.18 The construction of the haul road is scheduled to commence as soon as possible at the start of the construction period (From March 2024 onwards).

6.1.19 Any additional plant for compound installation will be delivered to site using a low loader and offloaded at the Primary Construction Compound.

6.1.20 Topsoil will be stripped from the working width and stockpiled above the pre-construction land drain. This stockpile, which will be located at the extents of the stripped area within the easement, will be consistently dimensioned and trimmed along its length to allow drainage and avoid erosion. The stockpiled topsoil will be well managed as to not adversely affect its condition upon replacement as detailed in the Soil Resources Survey and Management Plan (Document Number: 5417-MMD-CIVGT-XX-RP-CEW-10005), which has previously been submitted as part of this planning application.

6.1.21 Once stripped, the CBR value of the subsoil will be assessed, and the depth of the road determined based on the design parameters. Once confirmed, the haul road will be installed to the relevant temporary works design previously shown in Figures 16 and 17.

6.1.22 Stone will be delivered to the main compound locations or direct to the working area over constructed haul road accesses in 20-tonne rigid 8-axle wagons (or similar) and tipped into a stockpile in a safe designated location (either for storage or immediate

use). If necessary, the materials will be transported around the site using dumper trucks.

6.1.23 Other materials such as geotextile and geogrids will be delivered by lorry and off loaded by site plant or tail lift as required to the relevant compound storage areas.

6.1.24 Geotextile separation membrane will be placed on the sub soil surface. Stone to the required grade will be distributed using dumper truck offloads and graded to the required thickness. Geogrid will be installed at the relevant layer to ensure correct haul road construction and strength to match the design.

6.1.25 As the haul road is installed the stone will be compacted with suitably sized rollers in layers.

6.1.26 During the construction period provision will be made to monitor and maintain the road as required.

Installation of Culverts for Haul Roads

6.1.27 Where required all ditches and drains crossed by the haul road will have culverts installed, shown in Figure 16. These temporary crossings, comprising of pipes, granular fill, and baulk timber edge protection, will enable construction traffic to access each field and cross tracks and road crossings which have drains and LDB's running adjacent to them.

6.1.28 All ditches or drains which have either standing or flowing water will be dammed and over pumped in accordance with LDB guidelines and in agreement with the landowners. The Agricultural Liaison Officer (ALO) and Consent Manager will establish relationships with the LDBs, and the landowners affected during the pre-construction phase to agree the correct methodology and appropriate engineering designs required for these culverts.

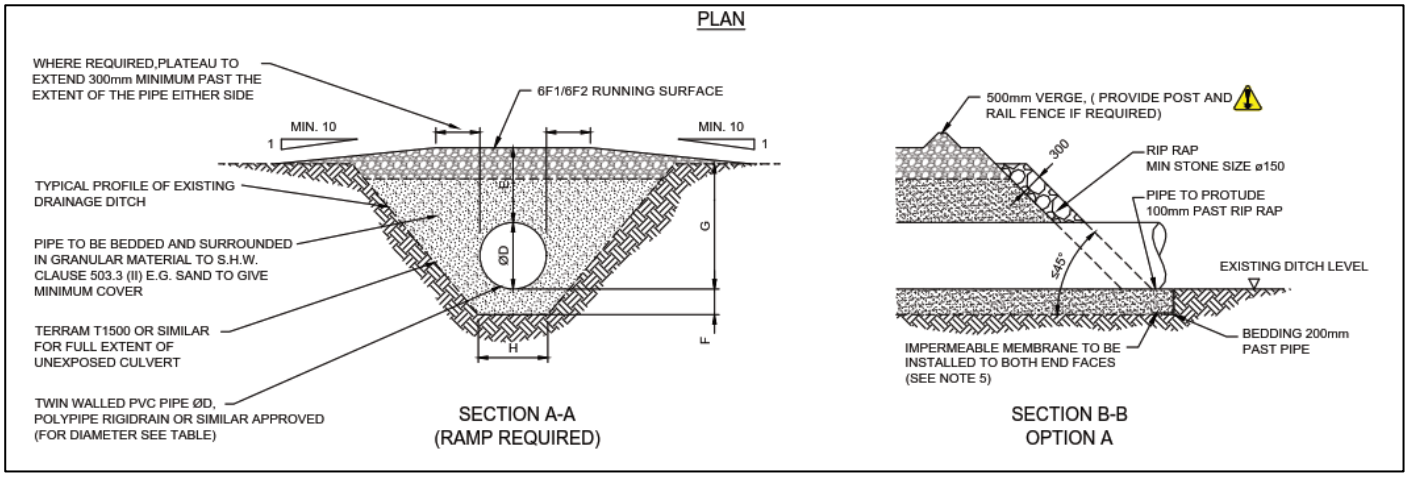

Figure 19: Typical Culvert Construction

6.1.29 This work will be carried out using 360-tracked excavators and forward tipping dumpers. The exact methodology for the ditch works will be determined following site surveys and detailed design, but will involve the following typical operations:

- Clear vegetation and install Geotextile (terram).
- Install pipe – as per diameters on culvert installation design drawing.
- Import and place fill to the required specification.
- Install baulk timber edge protection.

6.1.30 Some culvert installation works may need to take place before the main construction period in order to develop site access and to facilitate pre-construction demarcation fencing and drainage works. These will be limited to only those required to reduce the scale of the pre-construction activities. These works will continue into the main construction phase in conjunction with the haul road construction.

6.1.31 The culvert size, design and installation will depend on the individual drain size and flow, and any LDB requirements to be considered. These requirements will be designed in the pre-construction phase in liaison with landowners, tenants and any affected LDB's. Figure 17 below shows a typical example of a culvert crossing, previously installed by Balfour Beatty on a previous project which we will look to install on North Wessex Downs.



Figure 20: Example of a culvert crossing previously constructed by Balfour Beatty

6.1.32 One innovative solution that Balfour Beatty propose to use on this project is the AquaDam which replaces the requirement for sandbags during the dam and overpump process. The AquaDam is a low-cost reusable item, is easily transported and reduces the need for excessive manual handling. It is pumped full of water from

the watercourse until a sufficient dam is formed and then sealed. Water within the channel is overpumped around the excavation in order to maintain a flow within the channel and create a dry working area. On completion of the works, the dam can be gradually emptied back into the channel. This reduces the need for large items of plant and the subsequent people and plant interface that is normally required to position one tonne sandbags. It also reduces the manual handling of sandbags, the physical impact on the bankside, cost, and likelihood of pollution (see Figure 18 below).



Figure 21: Example of AquaDam system in use on another Balfour Beatty project

Highways Access Works

6.1.33 As part of the planning application, a "Construction Access Strategy Stage 2 Works" document has been prepared (Please refer to Document Number 5417-MMD-CIVXX-XX-DR-CGN-10077).

6.1.34 Additionally, Balfour Beatty have prepared a Traffic Management Plan (Document Number 5417-PTDC-CABXX-XX-RP-PDM-000076) which has previously been submitted as part of the Town and Country Planning Application. This document contains details of all permanent and temporary access point installations and the necessary Traffic management (if required) that shall be put in place prior to Access Installation works commencing.

6.1.35 The two documents referred to above account for all access, both permanent and temporary (e.g., Bellmouths) to be installed to carry out all the works, including but not limited to the OHL diversions, CSEC installation, 400kV Cable installation,

Jointing and Terminating and the necessary High Voltage Testing required at the end of the project.

6.1.36 The sequence of access installation is as follows:

Table 4: Sequence of Installation

Bellmouth (BM) Reference	Type (Permanent / Temporary)	Road Name	Installation Date
BM01	Temporary – Crossing Only	Folly Road	10 Apr 24
BM02	Temporary – Crossing Only	Folly Road	16 Mar 24
BM03	NOT REQUIRED		
BM04	Temporary Access to Primary Construction Compound	Hopton Road	17 Jan 24
BM05	NOT USED		
BM06	Temporary – Crossing Only	Horton Road	06 Mar 24
BM07	Temporary access to Northfields (Eastern) CSEC and OHL Diversion Works	Horton Road	18 Mar 24
BM08	Temporary – Crossing Only	Horton Road	11 Apr 24
BM09	Permanent access to Rowdefield (Western) CSEC	Conscience Lane	02 Mar 26
BM10	Permanent access to Northfields (Eastern) CSEC	Horton Road	24 Mar 26

6.1.37 Before the works commence, all access agreements shall be in place in accordance with National Grid and the relevant Highways Authority (WCC) requirements.

6.1.38 A pre-condition survey and assessment of the highway and access points shall also be undertaken to ensure all temporary access shall be returned to the original condition.

6.1.39 Once approved and ready for installation the traffic management will be set out by NRSWA-trained and personnel.

6.1.40 During the pre-construction period a detailed overhead line (OHL) survey will be completed to identify lines which may pose an issue for access and to also ensure that all OHL have been identified on the crossing schedule.

6.1.41 In line with HSE GS6 guidance goalpost system will be installed prior to entry onto the land where required, these will be installed to protect against impact with any overhead lines within the accesses and compound areas (Figure 22 below for illustration purposes). This is expected to be required at the new Northfields (Eastern)

CSEC off Horton Road to cover Bellmouths 6, 7 and 10 and the Folly Road crossings covered by Bellmouths 1 and 2.



Figure 22: GS6 Overhead Protection System

Working Easement Demarcation Fence Installation Works

6.1.42 Before any works commence along the working width, the easement will be pegged out and demarcation fencing will be erected along the edge of the easement.

6.1.43 In arable land this will consist of post and wire fencing made up of 2 No. 2.5mm LT mild steel galvanised wire fixed to softwood round posts 1.65x50-75mm diameter, driven at 4metre centres. Grazing land and locations where pastoral stock will be present during the works will have Stock Proof Fencing installed consisting of L8/80/15 wire mesh fixed to softwood posts 1.65x50-75mm diameter driven at 4 metre centres and secured at boundaries and road crossings by gating as required.

6.1.44 Due to the field configuration, or where required by the landowners, culverts at main accesses points between fields will have been installed to allow the fencing works to progress ahead of the pre-construction works. At track crossing points suitable access gating will be installed where necessary to allow access across the easement. The fencing will be typically completed by gangs using tractors and trailers or tracked excavator mounted post drivers to install the fencing (as shown in Figure 13 below), and who can move easily about the route depending on the requirements of the main programme of pre-construction works.

6.1.45 Until the permanent welfare units have been installed all welfare facilities will comprise tow-along ground-hog style units localised to the gangs' work areas.



Figure 23: Easement Fence installation in progress

Arboricultural Management Works

6.1.46 Prior to any pre-construction works commencing along the working width and at compound locations, all arboriculture works will be carried out These works will be discussed with the relevant Local Authority tree officers to establish whether the planned works are in areas with tree preservation orders. If protected trees are to be

impacted, alternatives will be discussed with the Local Authority or consent will be applied for to remove.

6.1.47 The Project Ecologist will carry out the following pre-start surveys:

- Bat roost potential surveys (Old barn identified in the vicinity of Tower YYM33 and YYM34). Any potential tree felling with bat roost potential requires the appropriate licence applied for and granted before works commence.
- Barn Owl (as above)
- Bird Nesting surveys along entire cable route, and further tree inspections where trees are thought to have a high potential in addition to nesting bird surveys. If arboriculture works are to take place during nesting season, these locations will be identified during the project design stage and prevention measures will be implemented. These could include removal of trees and hedgerows out of nesting season in advance of works, physical deterrents e.g., netting installed on hedges and keeping long grassed areas strimmed. Any hedgerows that require temporary or permanent removal will be identified prior to works and discussed with the Local Authority. Should the hedgerows be classed as important, then Hedgerow Removal Consents will be applied for.
- Water Voles (Water Vole Displacement Licence required to install temporary culvert at Tower YYM34 and trenching works at the new Rowdefield (Western) CSEC.
- Otter and Badger (to ensure works are at least 20m away from Setts and Holts)
- Dormice Footprint survey in the vicinity of Tower YYM41

6.1.48 All works to trees and hedgerows will be carried out in a sympathetic manner and will only be completely removed if necessary. Those due for removal will be clearly marked by the Ecological Clerk of Works prior to works to ensure only the correct areas are cleared. If required and in the event of encountering nesting birds during works, we will work with Natural England and our Project ECoW to ensure disturbance is kept to a minimum if not totally avoided.

6.1.49 Tree protection measures will be put in place where required along the cable corridor. The actual measures to be employed will be developed during the detailed design and pre-construction phase, however the default position, as set out by BS5837:2012 (Ref:1-1), is that retained trees would be protected from construction operations with the erection of robust protective fencing positioned on the outer edge of the root protection area or crown spread (whichever is greatest). All site operations would be restricted to the area outside of tree protection fencing and this area would form a Construction Exclusion Zone (CEZ) unless agreed otherwise.

6.1.50 The area inside the fence and any additional tree protection measures would be sacrosanct and would not be removed or altered without the prior approval of the LPA

Tree Officer. Any damage to tree protection measures would also be reported immediately.

6.1.51 Fencing design, which will be developed during the detailed design stage in order to provide a robust barrier to contain all construction works, plant and materials, would comply with the default specification set out in Figure 9 below.

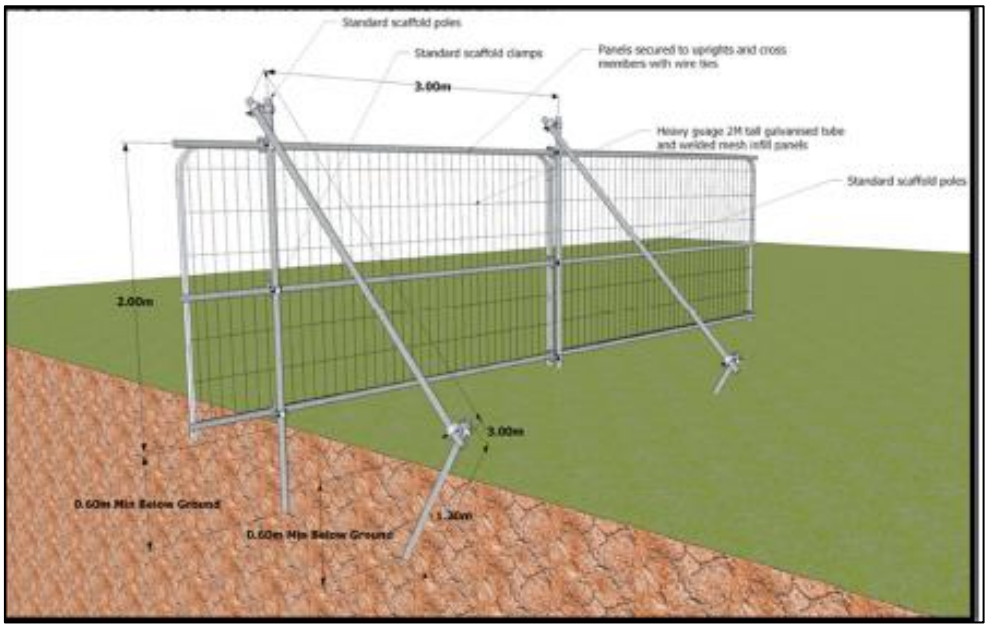

Figure 24: Default Specification for outline tree protection fencing.

6.1.52 Remediation works will take place once civil works are complete in line with the Construction Environmental Management Plan (CEMP) submitted as part of the planning process. All works will endeavour to take place during the optimal planting season (e.g., October – March) to facilitate the speed of reinstatement. Where hedgerows have been temporarily located, they will be reinstated to their original locations and where required, new hedgerows will be planted to the specification agreed with the Local Authority. Any trees identified for replacement will be planted a minimum of 10m away from the DC cable trench to ensure future root growth does not affect the system.

Soil Management

6.1.53 Soil management method statements shall be produced in line with the project Soil Resource Survey and Management Plan (SRSMP) Document Number: 5417-MMD-CIVGT-XX-RP-CEW-10005). The following methodology will be incorporated, in accordance with the CEMP, when removing vegetation, topsoil and subsoil within the project area:

- Vegetation will be cut down to close turf, considering ecological and bird nesting season (March to August inclusive).

- The cut vegetation will be removed to take account of nesting bird issues relevant to the site.
- Topsoil and subsoil will be stockpiled separately.
- Topsoil will be stripped using a flat topsoil blade on excavators and placed in bunds adjacent to the works along the swathe of the works area.
- If material cannot be stockpiled locally, it will be transported in dump trucks to previously demarcated allocated plots to be stored separately from any other material, without compaction.
- The topsoil will be stockpiled; generally, the maximum height for stockpiles is to be limited to 3m to avoid compaction from the weight. However, if the soil to be stockpiled is dry (below the plastic limit) formation of higher stockpiles may be permissible, if required, as the soil is likely to remain dry in the core of the stockpile for the entire storage period. However, the appropriateness of higher stockpiles will need to be established on a location-by-location basis.
- Where practicable the excavator will work, from previously stripped and exposed subsoil materials.
- Excavators will work to strip the soil layers and transfer them in dump trucks to the previously demarcated allocated plots.
- Sub soil allocated plots will be clearly signed and demarcated to prevent any mixing between different layers of topsoil and subsoil and will be back bladed to aid water runoff.
- The subsoil materials will generally be stored to a maximum height of 5m to avoid compaction from the weight. However, if the soil to be stockpiled is dry (below the plastic limit) formation of higher stockpiles may be permissible, if required, as the soil is likely to remain dry in the core of the stockpile for the entire storage period. However, the appropriateness of higher stockpiles will need to be established on a location-by-location basis.
- Soils from different fields and different hedgerows will be kept separate to avoid contamination.
- Topsoil and subsoil movements will not be undertaken when the conditions are too wet, this will be decided by the Project Engineer and the Environmental Advisor / ECoW.
- A site-specific record plan will clearly identify where soils are excavated from, storage location and dates when soils restoration takes place.
- Soils will be clearly identified and labelled based on the classifications unique to each field and reinstated within the same location.
- Soil stored for long durations, such as at the construction compounds, will be seeded as per pre-construction condition in agreement with the relevant landowner.
- Following the removal of the topsoil an access route will be formed on the subsoil using best practice methodology.
- The design of the road will be determined subject to the site conditions and ground conditions.

6.1.54 Further detail can be found in the Soil Resource Survey and Management Plan (SRSMP) Document Number: 5417-MMD-CIVGT-XX-RP-CEW-10005) which was previously submitted as part of the Planning Application process.

Pre- and Post-Construction Drainage

6.1.55 Balfour Beatty have engaged Mott McDonald Ltd., who have produced a land drainage design. This has been submitted as part of the planning application in the form of: The Drainage Strategy (Doc. No.: 5417-MMD-CIVDG-XX-RP-CGN-10055), and Drainage layout plans for the Northfields (Eastern) CSEC (Doc. No.: 5417-MMD-CIVDG-XX-DR-CGN-10057, Sheet 9) and Rowdefield (Western) CSEC (Doc. No.: 5147-MMD-CIVDG-XX-DR-CGN-10057, Sheet 01).

6.1.56 The report details proposed pre and post construction drainage along the cable corridor. Further design work from a land drainage design team during the pre-construction period will be required to finalise the designs for construction.

6.1.57 During the pre-construction phase the Drainage Contractor (DC), Balfour Beatty and the employer's lands team will establish an agreement with landowners regarding the extent of the current drainage, the design of the pre-construction drainage and what will be installed for the post-construction drainage. Once an agreement has been reached between the landowner, the pre-construction drainage will be installed in line with the approved design.

6.1.58 The pre-construction drainage will be installed using a tracked chain trencher (similar to that shown in Figure 25 below) to lay the drainage pipe to an accurate line and level controlled by GPS. Tracked gravel trailers will be used to feed drainage gravel to the correct specification into the trencher's hopper.

6.1.59 The lateral drains will either be connected into existing mains where applicable, or laid to an adjacent drain, where an outfall will be installed with a prefabricated headwall built into the bank.

6.1.60 A tractor mounted angled blade will follow the drainage machine to backfill the trench and level any remaining spoil.

6.1.61 Temporary and permanent attenuation ponds shall be installed at the required locations (viz., Primary Construction Compound, Rowdefield (Western) CSEC and Northfields (Eastern) CSEC).

6.1.62 Post-Construction drainage shall be installed upon completion of the project and removal of the haul roads, using similar methods as described above. These shall be installed in line with the approved designs, and with agreement from the various key

stakeholders, including the Canals and Rivers Trust, especially around discharging into the Kennet and Avon canal from the new Northfields (Eastern) CSEC.



Figure 25: Tracked chain trencher.

Public Right of Way (PRoW) Management

6.1.63 There are a number of Public Rights of Way (PRoW) to be either permanently or temporarily diverted to allow for the safe execution of the works. During the Stage 1 works, BB have produced a Public Rights of Way Access Plan (Document Number: 5417-MMD-CIVXX-XX-DR-CGN-10089) previously submitted as part of the Town and Country Planning application. A schedule of PRoW Diversions is provided below:

Table 5: Public Rights of Way Diversions

PRoW Reference	Location	Diversion Type	Public Interfacing
ROWD32	Tower YYM33 / Rowdefield (Western) CSEC	Permanent	None: to be diverted around working easement
DEVI63	Between Joint Bay 1/2 and Joint Bay 2/3	Temporary	Pedestrian Temporary Traffic Signals
DEVI36	Between Joint Bay 2/3 and Joint Bay 3/4	Temporary	Temporary Pedestrian Traffic Signals
DEVI56 / Circular Walking Route	Between Joint Bay 3/4 and Joint Bay 4/5 and in vicinity of Primary Construction Compound	Temporary	Temporary Pedestrian Traffic Signals and manned crossing point where required
BCAN6 & BCAN8	East of A361	Temporary	Temporary Diversion when carrying out scaffolding and HDD works

BCAN34 / Kennet and Avon Canal Towpath	Kennet and Avon Canal Towpath	Temporary	Temporary closure during scaffolding works

6.1.64 Prow Diversions are listed within the PRoW Access Plan and shall be carried out in line with the Haul Road installation to ensure that the PRoWs can remain accessible or usable by members of the public for the duration of the project.

6.1.65 The working swathe will initially be fenced off and gates will be installed where the swathe intersects a PRoW. During construction of the haul road and cable trench, the PRoW will be diverted around the live construction area as shown in Figure 26.

6.1.66 If the ground condition of the diverted PRoW route is considered to be poor, then a layer of type 1 aggregate will be placed down ensure it is safe for pedestrian access. There will be adequate segregation between the diverted PRoW and the live construction area (e.g., barriers).

6.1.67 All points where PRoW cross any part of the Scheme will have appropriate signage to advise the public of dates and hours of working. This signage may be located at the beginning and end of PRoW to ensure suitable notice. Standard signage will be developed and will be used along the length of the Scheme. Signage will be installed within the working swathe to notify construction traffic and personnel that there is a PRoW crossing through the site.

6.1.68 Further mitigation may include Joint inspection during setup of PRoW diversions with a PRoW Officer from Lincolnshire County Council, to ensure the diversion is fit for purpose.

6.1.69 Members of the public shall be kept separate from the construction site by ensuring that the diverted PRoWs cross the cable working easement in a controlled manner. Using a combination of Heras fencing, Temporary Traffic Signals and, where required, manned crossing points shall be used to ensure no interaction between any construction traffic and pedestrians / members of the public during the works.

6.1.70 All PRoW Diversions shall be carried out following consultation with the Local Authority. Where permanent diversions are required (i.e., ROWD32), a Section 257

Notice shall be applied for and in place before the permanent diversion works can commence.

6.1.71 Balfour Beatty shall ensure that any diversions are well maintained throughout the duration of the project to ensure safety of any members of the public who wish to use these.

6.1.72 An example of the PRoW diversion is shown below:

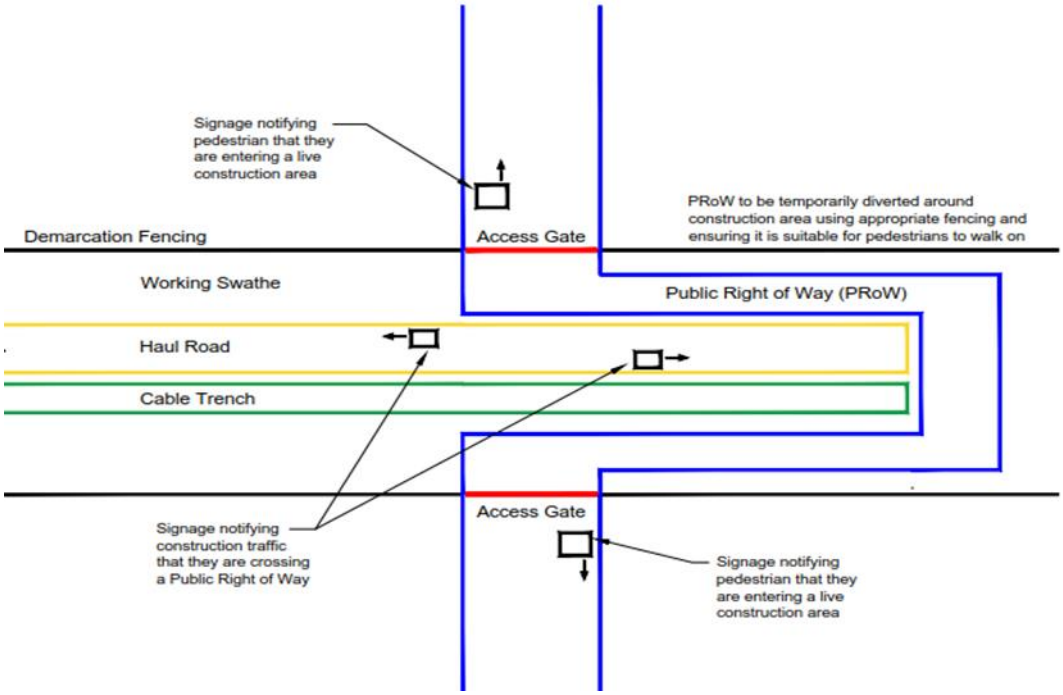

Figure 26: Example of Public Right of Way Diversion

7. Main Construction Works

7.1.1 Balfour Beatty's main construction methodology breaks down in detail our baseline methodology for how works will be carried out for the following aspects of the works:

- Overhead Lines (OHL), including temporary diversions, foundation works, tower strengthening and dismantling of redundant towers.
- Construction of the two new Cable Sealing End Compounds (CSEC) at the Rowdefield (Western) and Northfields (Eastern) sites
- Horizontal Directional Drilling (HDD)
- HV Cable Trenching and Duct Installation
- HV Cable Jointing and Terminating
- HV Testing ad Commissioning.

7.1.2 A high-level summary of the schedule of the works is shown below:

High Level Site Works Summary		956.0d	10-Jan-24	22-Aug-26
Tree Clearance	SUM1000	41.0d	10-Jan-24	19-Feb-24
Fencing Installation	SUM1020	36.0d	06-Feb-24	12-Mar-24
Main Compound Set Up	SUM1010	79.0d	17-Jan-24	04-Apr-24
4x OHL Foundation Works	SUM1030	58.0d	15-Feb-24	12-Apr-24
Access Installation	SUM1040	76.0d	06-Mar-24	20-May-24
4x Tower Assemble & Erect	SUM1050	44.0d	17-Apr-24	30-May-24
Outage 1 - North - Cct1 - Diversion	SUM1060	33.0d	13-May-24	14-Jun-24
Outage 2 - South - Cct2 - Diversion	SUM1090	33.0d	05-Aug-24	06-Sep-24
HDD Works	SUM1070	135.0d	20-May-24	01-Oct-24
Duct Installation	SUM1080	142.0d	04-Jun-24	23-Oct-24
CSE Works	SUM1110	202.0d	11-Sep-24	31-Mar-25
Cable Installation	SUM1100	254.0d	02-Sep-24	13-May-25
Jointing	SUM1120	204.0d	06-Dec-24	27-Jun-25
Terminations	SUM1130	108.0d	18-Mar-25	03-Jul-25
Commissioning / Testiing	SUM1140	31.0d	23-Jun-25	23-Jul-25
Outage 3 - North - Cct1 - Final Arrangement Outage	SUM1160	40.0d	04-Aug-25	12-Sep-25
Partial Reinstatement (A365 to Eastern Compound)	SUM1150	56.0d	24-Jul-25	17-Sep-25
Outage 4 - South - Cct1 - Final Arrangement Outage	SUM1170	40.0d	15-Sep-25	24-Oct-25
Trackway Removal	SUM1190	24.0d	19-Nov-25	12-Dec-25
Tower Dismantling	SUM1180	58.0d	23-Oct-25	19-Dec-25
Final Reinstatement	SUM1200	174.0d	02-Mar-26	22-Aug-26

Figure 27: North Wessex Downs high-level site works summary from the construction schedule.

Pre-Outage Works: OHL and CSEC Foundations

7.1.3 The first activity to be carried out in order to complete the OHL temporary diversion works shall be to install access to Towers YYM34 and YYM46. This shall be done using Bellmouth 09 and Bellmouth 07 to access Tower YYM34 and Tower YYM46,

respectively. The access shall be trackway panels laid on to the ground similar to Figure XX below:



Figure 28: Example of Trackway Access to an OHL Tower

7.1.4 Upon completion of the construction of the access track to tower YYM34 and YYM46, our civils team will commence installation of the required sealing end compound foundations and tower foundations both in the East and Western compounds. This activity will be carried out by our in-house civil operatives and in accordance with our procedure OPS-WI-5627-OHL (Foundation Installation - Pad and Column) together with our standard processes and procedures to maintain site safety.

7.1.5 Measures will be put in place during our enabling works period to prevent any infringements of clearance of the existing OHL by the foundation team.

7.1.6 For all our foundation works, a temporary works design will be completed in conjunction with the soil investigation report issued during the initial planning phase (Stage 1) of the work. This will detail the specific type of sheet piles to be used and

the size, type, and locations of the hydraulic support frames. An example of sheet piled excavation for foundation installation is shown below:

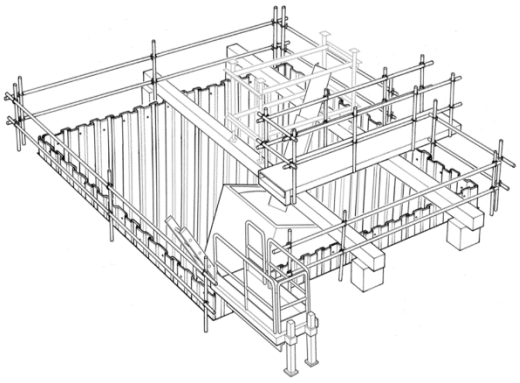

Figure 29: Example of sheet piled excavation for foundation installation.

Pre-Outage Works: Temporary Tower Assembly

7.1.7 In accordance with our programmed works, a 360 Roto telehandler will be used to carry out most of the assembly & erection of the temporary towers YYM34A, YYM34, YYM46A and YYM46B. These will be built off-line pre outage and topped off using a crane. Tower YYM46A will be assembled on the floor and erected with a crane in outage 2. This will be done in accordance with OPS-WI-563-OHL (Tower erection with a crane).

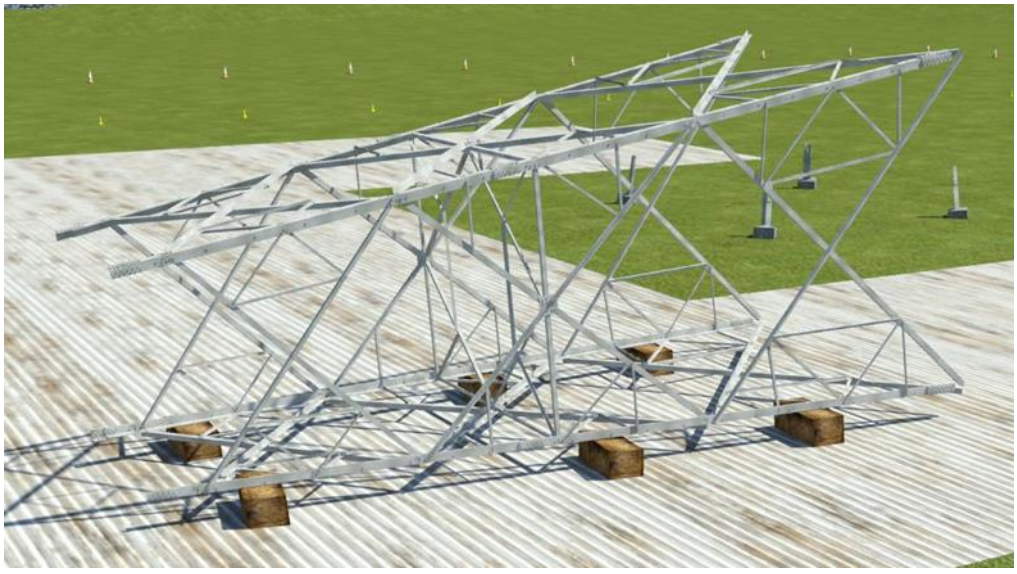

Figure 30: Tower Steelwork assembled on timber stools.

7.1.8 A detailed lifting plan shall be developed that takes into account the equipment to be used, the rigidity of the panels to be lifted (if single panels are to be installed), the

weight of the heaviest lift, and the stability of the structure during erection. Consideration shall also be given to ensure that each section of the tower to be lifted can be actually bolted together safely at height.

7.1.9 Ground assembly will be carried out pre-outage, with full erection of YYM46A taking place during the Outage 2 when the conductors are transferred off YYM46 and moved across to YYM46T during outage 1 to make space for the new tower YYM46A to be erected. This approach takes into account the 28 days' curing periods for all concrete foundations.

Outage 1 & 2 Works: Temporary Diversions

7.1.10 Temporary Towers YYM34A, YYM34B and YYM46A and YYM46B would have been assembled and erected prior to this outage. Upon receipt of the appropriate permits, towers will be demarcated and earthed, with flag brackets and flags being installed as per the earthing schedule. All works will be in accordance with OPS-WI-5642-OHL (Earthing)

7.1.11 Taking Tower YYM46 as an example, utilising a tractor winch, the tension on the top phase will be let off and at the same time in span 4YYM46 to 4YYM47 a winch will be sited at the new tower YYM46T pulling the conductors over to YYM46T to be landed at top crossarm within a running block. At towers YYM43 the tractor winch will pull the conductors up to sag, and the shortage in conductor will be made up by installing F-links or piecing in additional conductor as dictated by engineering design dept. The top phase will be clipped in and re-spacered and a new jumper made completing the phase. The above will be repeated for the middles and bottom phases. Earths will then be removed and circuit 1 will be returned to service allowing outage on circuit 2

to follow. A similar process shall be followed at all the other temporary towers to allow transferring of the conductor on to the temporary towers.

7.1.12 The spans of the OHL crossing the Kennet and Avon Canal and Horton Road shall require scaffolding & netting. This requirement shall be discussed and agreed with all stakeholders prior to installing. An example of such scaffolding is shown below:



Figure 31: Scaffold and netting to be used when transferring conductor on to temporary towers.

Post HV Cable Connection: Redundant OHL Tower and Conductor Removal

7.1.13 Once the new HV Cables have been installed and tested, the section of OHL between Towers YYM33 and YYM47 is now redundant and shall be removed.

7.1.14 Detailed RAMS will be produced for the lowering of the now redundant conductors. In addition, our design department will carry out all the necessary design checks to see if backstays are required on any towers where the loadings may be excessive.

All lifting and lowering operations during this phase will be in accordance with OPS-WI5609-OHL.

7.1.15 All conductor lowering activities will be carried out in this sequence, Bottoms, middles and tops.

7.1.16 When lowering conductors, scaffold similar to that shown in Figure 31 shall be used to protect the Kennet and Avon Canal, Pig Road, A361 and Horton Road.

7.1.17 The following strategy is to be used to remove redundant towers and Conductor:

Table 6: Redundant OHL Tower removal strategy

Tower Number/Access Point	Method	Crossings	Comments
YYM34 -YYM39	Lower & cut	Tracks and Hedges	Manage with Standby man.
YYM43-YYM46	Lower & cut	Horton & Canal Xing	Scaffold & Netting
YYM39-YYM43	Lower & cut	2 x Road A361/Folley Rd	Scaffold & Net & TM

7.1.18 Following the removal of all the conductors, we intend to employ the following methods to dismantle the towers at site:

7.1.19 We will fell the towers at locations that allow us to, due to their elevation and safety considerations.

7.1.20 Where it is considered unsafe to fell the towers, we will employ a crane to dismantle the tower Regardless of the method, all dismantling works will be done in accordance with procedures OPS- WI-5676-OHL.

7.1.21 The towers on the route will be dismantled as follows.

Table 7: Redundant Tower removal strategy

Tower	Dismantling Method
YYM46T	Crane
YYM46	Crane
YYM35 to YYM46	FELL
YYM37	This Tower is within SSSI and will be felled appropriately

7.1.22 When felling a tower, the appropriate working area will be established and demarcated to ensure that there are no risks to livestock, overhead or underground services or members of the public using pathways or roads.

7.1.23 The following sequence of works is to be followed when felling:

- The rakers at the bottom of all four legs are cut.
- Legs W and Z are cut on the outside face, leaving the section of leg facing the tractor uncut and to be used as hinge.
- Leg X is cut on one face in the direction shown. A packer/washer is placed in the cut, to prevent the tower dropping onto the blade when the leg is completely cut through and also to create a visual indicator that the leg has been completely cut.
- Leg Y is cut in the same way as Leg X and a washer is placed in the cut.
- After cutting legs X and Y, the supervisor shall ensure all operatives are clear of the structure and the area in which the tower will fall. He then signals to commence winching operations whilst monitoring from a distance that all legs become free and clear as the weight is taken. Figure XX below illustrates the above sequence:

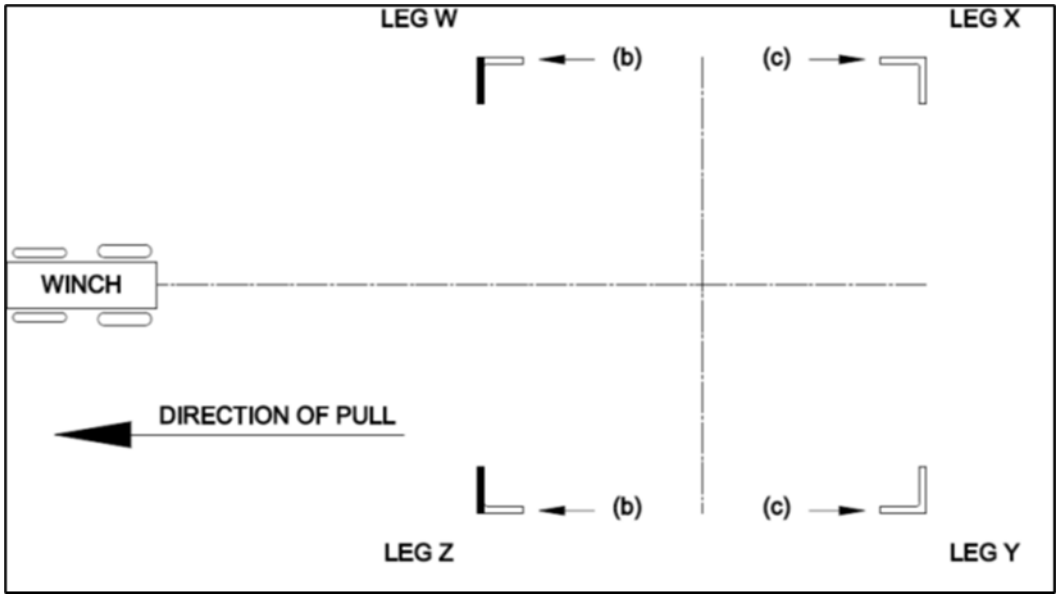

Figure 32: Tower Felling sequence

7.1.24 Where a crane is to be used for dismantling a tower, a site visit shall be arranged, prior to commencement. The site visit, which will be attended by the Crane

Representative, Crane Appointed Person, Access Supervisor, and the Senior Site Supervisor, will be used to identify the following:

- A safe access route to the tower
- Crane size
- Crane positions
- Ground conditions and requirements for temporary works (e.g., Crane Pad)
- Other services
- Lifts to be carried out
- Lifting Plan to be agreed

7.1.25 Following the site visit, all necessary arrangements will be made for the crane pad and the delivery of the crane to site.

7.1.26 Once redundant towers have been dismantled and removed from site, their redundant foundations shall be excavated and removed to between 0.5m and 1.5m below ground level.

7.1.27 Depending upon ground conditions, the area around the cap can be hand dug or machine dug to the correct depth. Service drawings are to be checked to identify underground services and a CAT & Genny scan carried out (to enable an AWNES to be issued). A concrete breaker will be needed to break off the cap and foundation down to 1.4 metres. It is imperative that the excavation has sufficient room to operate the breaker.

7.1.28 A site-specific method statement shall be written to cover the method of removing the diggings and how the hole shall be protected with consideration given to the most efficient and effective method of removing the steel stub. The method statement shall take into account any relevant Engineering Data and use of any specialist machines or equipment.

Construction of new Cable Sealing End Compounds

7.1.29 Once the two temporary OHL towers are installed and the OHLs temporarily diverted, there will be enough space at both the new Rowdefield and Northfields compounds to start constructing the new Cable Sealing End Compounds in line with the approved designs.

7.1.30 Foundations for the new CSECs will have already been installed alongside the temporary OHL tower foundations. Once this is complete, the remainder of the compounds shall be constructed.

7.1.31 As previously mentioned, the first item of work will be to install the pre-construction drainage and attenuation ponds at both the East and West CSECs. This will be done using 360 tracked excavators up to 30 tonnes. All excavated spoil shall be transported to the designated storage locations using dumper trucks or similar vehicles. Balfour Beatty shall undertake a full survey of the excavation area for any underground / buried services and issue an AWNES document before any excavation works commence.

7.1.32 Once attenuation ponds and drainage has been installed, the civil cut and fill works will take place to achieve the correct levels at each compound. Where required,

imported material shall be transported to the site location using the previously installed haul roads. Imported fill shall be spread to the correct levels using the excavator buckets.

7.1.33 Once the correct site levels have been achieved, the various substation equipment, such as sealing end structures, post insulators, gantries, and busbars shall be installed. At this stage, substation earthing may also be installed

7.1.34 High-level equipment such as busbars and post insulators shall be installed using Mobile Elevated Work Platforms (MEWP) to allow safe access and working at height.

7.1.35 The new cable sealing end gantries shall be installed using cranes. To do this, a survey of the area shall be undertaken to ensure the right crane pad is available and in place for the works. A thorough lift plan shall be prepared and checked by Balfour Beatty's Appointed Person (AP) and a specialist set of RAMS shall be prepared for these works to take place.

7.1.36 Once the various equipment has been installed, the substation fencing may be installed. There will be some minor civil works relating to excavating the ground to install a fence beam which will take place alongside this activity.

7.1.37 Fencing for the substation shall be made up of palisade type fencing, with panels of 2.4m height. The fence shall have its own, separate earth mat, this shall be installed alongside the civil works for the fence beam construction.

7.1.38 Once cable jointing and terminating works are complete the new CSECs will be considered operational. At this stage the only works left to do at the CSECs will be the landscaping and other finishing and reinstatement. These works shall also be undertaken using tracked excavators and other heavy equipment. The final arrangement of the attenuation ponds shall be installed prior to completion of the new CSECs and for the Northfields (Eastern) compound, the drainage into the Kennet and Avon canal shall be installed following agreement with the Canal and River Trust.

HDD Mobilisation

7.1.39 For the HDD installations, the equipment will be transported along the haul road accessed from the nearest TCC. For the smaller crossings, the rigs will sit to one side of the haul road with the drilling equipment adjacent and will be supplied from the haul road. The hard standing areas for the smaller HDD's will predominantly be trackway matting. Allowances will be made for additional hard standings for the larger HDD crossings which require the heavier rigs, e.g., the river Witham crossing.

7.1.40 It is proposed that the HDD rigs utilised on the project will all be self-contained tracked machines and readily able to access the drilling location. Any ancillary equipment would be loaded at the haul road end point and transported together with the rig. For the larger of the HDDs the rig will arrive in a number of sections, each by low loader, and a dedicated HDD working, and compound area would be installed as part of the

haul road and easement construction at the drill location. Please see Figure 33 below for a typical HDD working and compound area.

HDD Installation, Assets Crossing by HDD

7.1.41 As part of our Principal Designer duties Balfour Beatty will work with the relevant HDD subcontractor during the pre-construction period to ensure that detailed design of each asset crossing are in place for the construction phase for the project. This will consist of the Solar Farm Crossing, A361 crossing and Horton Road Crossing.

7.1.42 The HDD subcontractor will be responsible for carrying out the relevant surveys, bore holes and producing designs for approval as part of their scope of works under their contract with Balfour Beatty. This will include any revision to designs in order to gain consent and approval from the relevant Consent Granting Bodies (CGB's), e.g., WCC Highways, Local Drainage Board, Canals & Rivers Trust, Environment Agency and Local Authorities. Work will only commence once consents from each relevant asset owner has been formally granted. Some of these approvals may extend into the construction phase of the project e.g., Canal and River Trust.

7.1.43 The depth of the trenchless HDD's will be dependent on the asset to be crossed. In the case of the LDB drains the asset owner has advised that the installations must be 2.5m from the hard bed of the drain which will typically see the crossing installed at depths of approximately 5m. Specific designs will be completed for each HDD location for acceptance from the asset owner prior to works commence at that location.

7.1.44 Where HDD's cross third-party utility apparatus, detailed design of each asset crossing will be undertaken, and the utility asset owner will be consulted to ensure that the designs meet with their clearance specification and that the methodology of the works is formally approved by them. Where permissible trial holes will be taken to physically expose and identify the depth of the utility asset prior to any drilling activities. Where trial holes cannot be taken GPR surveys will be carried out to identify the depth of the utility asset.

7.1.45 The crossing design will be supported with design calculations including (but not limited to); settlement calculation, topographical surveys, drill profile drawings, mud pressures, drilling torque, pull back calculations and steering co-ordinates, as well as identification of any services to be crossed or adjacent to the working area.

7.1.46 A full construction pack will be prepared for each crossing including inductions, permits, design, fluid calculations, pipe welding parameters, pull back calculations, method statement environmental management plan and emergency plans.

HDD Mobilisation

7.1.47 For the HDD installations, the equipment will be transported along the haul road accessed from the nearest TCC. For the smaller crossings, the rigs will sit to one side of the haul road with the drilling equipment adjacent and will be supplied from the haul road. The hard standing areas for the smaller HDD's will predominantly be trackway

matting. Allowances will be made for additional hard standings for the larger HDD crossings which require the heavier rigs, e.g., the A361 Crossing.

7.1.48 It is proposed that the HDD rigs utilised on the project will all be self-contained tracked machines and readily able to access the drilling location. Any ancillary equipment would be loaded at the haul road end point and transported together with the rig. For the larger of the HDDs the rig will arrive in a number of sections, each by low loader, and a dedicated HDD working, and compound area would be installed as part of the haul road and easement construction at the drill location. Please see Figure 33 below for a typical HDD working and compound area.

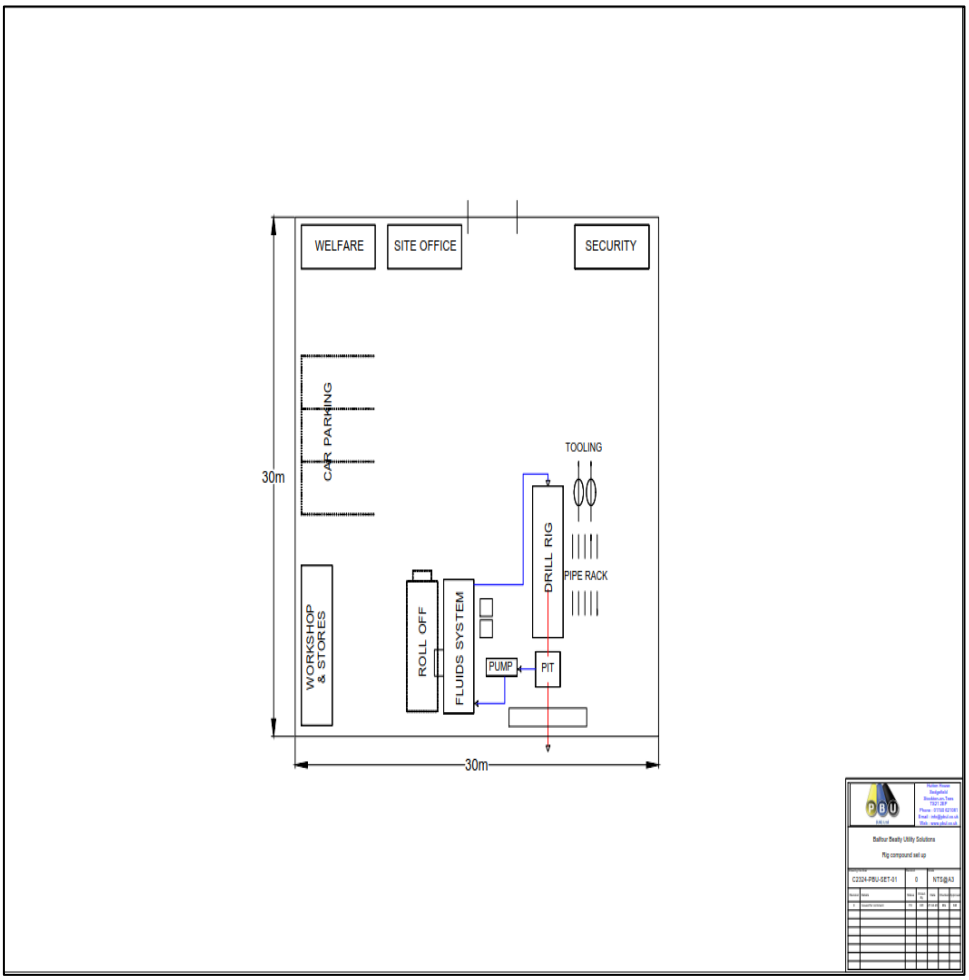

Figure 33: Typical HDD Working and compound area.

7.1.49 The PE pipe strings will be welded on site by a separate pipe welding crew using semi-automatic butt fusion welding, shown in Figure 34 below. The 6m PE pipe lengths will be strung out to the required length on the exit side of the HDD and positioned in the welding machine for jointing. On completion of each weld the pipe will be internally de-beaded to remove the excess weld material and provide a smooth path for the cable pull, each de-bead weld will be videoed and formally recorded in

the relevant Inspection & Test Plan (ITP). The welds will be continued until all of the required pipes are complete and ready for the pullback operation.



Figure 34: Butt fusion welding and completed pipe string

7.1.50 Water will be drawn from designated hydrants or drains and transported to site via tankers or bowsers. Where water extractions from drains is required, consent will be applied for in advance. The movement frequency of the tankers or bowsers is largely dependent on the formation and density of the ground conditions.

7.1.51 A launch pit for the entry of the drill string will be excavated and if required it will be battered to ensure the integrity of the excavation for the duration of the drilling. A similar pit at the exit point of the drill will be excavated to allow the drill head to emerge and heads to be swapped during various drilling and reaming passes. Once the pits are excavated the drill rig will be positioned with the correct tooling above the entry pit and the pilot bore can commence.

HDD Pilot Hole Drilling

7.1.52 One pilot hole will be drilled for each section of product pipe. Each pilot hole will be drilled typically with 2.38” drill pipes and 4” jetting assembly using standard walkover drilling techniques. For the larger drill crossings such as the A361 a GPS guiding system such as Wire Lines will be utilised.

7.1.53 Mud is pumped through the centre of the drill pipe to provide a hydraulic cutting action. The mud jets from the bit lubricate the hole and moving cuttings. During the pilot operation a down-hole pressure tool will be fitted in line of the drill string in order to continuously monitor the pressure down-hole reducing the risk of drilling fluid frackout. Should the down-hole pressure exceed the recommended calculation within the ground formations being drilled then the drill string will be retracted releasing the excessive pressure, and the pilot drill will recommence.

7.1.54 The position of the drill is monitored by directional guidance equipment positioned in the jetting assembly. The signal is then radiated to the control unit positioned at the surface. This data combined with accurate record keeping on site allow simple mathematical computations to be made and to record the progress and position of the pilot drill. The down-hole assembly has an angled steering shoe to give the drill a bias in one direction. By rotating the drill string, the tool face of the down-hole drilling

bit is rotated, altering the drilling bias and so altering the drilling direction. In this way the direction of the drill can be controlled. See Figure 35 below for an HDD rig.



Figure 35: Typical HDD Rig

7.1.55 A mud return line may be used to transfer drill mud and cuttings from the pipe side back to the rig side to be recycled before being re-used down hole. The mud return line will consist of two 4" pumps positioned in series with 4" hose and bower connections. The mud return line will then be connected to the mud lagoons using 100mm diameter rigid hose with Bauer type couplings to complete the recycling loop from exit to entry side. Where the mud returns lines crossroad ways, waterways etc. a tractor and tanker will be utilised to transfer mud and cuttings as site conditions dictate. This will not be required for the shorter ditch crossings.

HDD Reaming

7.1.56 After the main pilot hole has been completed it will be necessary to enlarge the pilot hole sufficiently to receive the product pipe. This is achieved by removing the pilot drill and by attaching a reaming tool to the drill string. The drill string and reamer are then rotated and drawn back towards the drilling rig, cutting the hole as it progresses. This process is repeated with larger diameter reamers until the required diameter is reached to allow safe passage of the product pipes. Drilling fluid is jetted through the reamer to lubricate during cutting and to enable the lining of the hole to remain stable. The hole is typically cut to a size 25% to 50% larger than the pipe(s) it has to carry. This is to facilitate the passage of soil cuttings as well as the pipe and allow for any clay expansion that may occur during the pulling process. The drilling fluid is a slurry or "mud" produced by mixing ground and refined bentonite or polymer to fresh water, which reduces drilling torque, imparts lubrication to the pipe and provides annular flushing of the freshly cut borehole soil debris and gives support to the bored hole.

HDD Duct Installation

7.1.57 The pipe pulling heads (Figure 25) are attached to the pipe string and are attached to the reamer via a swivel and universal joint. The pipe pullback operation will be coordinated by the Guidance Technician. Before pulling commences the Guidance Technician shall check that the area is clear and instruct the drill operator to commence the pull. Pullback will proceed and joints of drill line will be pulled and

removed at the rig. In the event of increased pullback pressure (which is continuously monitored) the process will be stopped, the pipe pulled out and further pre reaming will take place.

7.1.58 The ducts will be proved by blowing a suitable brush or pig through to prove their integrity. As required in the project Technical Specification duct videography will then be carried out following this and records kept which shall include the following:

1. Date of test.
2. Chainage(s).
3. Identification of the duct.
4. Confirmation that the duct is free from foreign matter and water.
5. Location of the test and pole the duct relates to.
6. Direction that the test is carried out in.

7.1.59 Cap ends will then be installed at either end of the duct to maintain cleanliness in preparation for the cable installation.



Figure 36: Pipe prepared with pulling heads

HDD Demobilisation

7.1.60 Upon completion of each of the HDD drilling activities, all equipment will be demobilised from the site and the waste drill fluids collected and where possible transported to the next HDD location for reuse, or off-site for disposal. The as-drilled

profile data and plan will be collected for the as built records, and any welding and videography records collated into the quality file.

Cable Trench Excavation, Duct & Engineered Backfill Installation & Trench Backfill

Duct Specification

7.1.61 The power cable and fibre optic duct specifications on the North Wessex Downs VIP project shall comply with ENATS 12-24 industry standard.

Cable Trench Excavation

7.1.62 The decision on which specific trench design (referenced in the Land Use section of this document) to be adopted for each location will be decided by the Temporary Works Design Engineer and will be dependent on the ground condition identified during the bore hole and trial hole works and whether dewatering is required. Should conditions change during the works taking place the works will stop until the Temporary Works Design Engineer has evaluated the conditions and provided a design solution for the condition encountered.

7.1.63 The excavation process will be carried out with 360 tracked excavator fitted with quick hitch attachment assembles as shown below in Figure 37; these assemblies eliminate the requirement for the Banksman to assist the machine operator with changing attachments reducing the Plant Movement interfaces.



Figure 37: Quick hitch attachment

7.1.64 The excavators will be accompanied at all times by a Plant Vehicle Marshall (PVM) who will monitor the operation and act as a Banksman and spotter for the excavator driver. These two parties will be in constant communication to ensure that the excavator is operating within the limits of the plant and people hierarchy. The

excavated subsoil will be located within the stripped easement at a suitable distance from the excavation to allow the subsequent elements of the trench installation to take place.

Crossing Assets by Open Cut Method

7.1.65 During the pre-construction period surveys and detailed design of each asset crossing will be undertaken to gain the relevant consents required to cross the asset. Where deep excavation is identified the Balfour Beatty Temporary Works Design Engineer shall produce specific designs for each location taking into consideration all relevant civil engineering issues such as ground conditions and surrounding structures.

7.1.66 Where the open cut trenches cross third-party utility apparatus (e.g., pipelines) again detailed design of each asset crossing will be undertaken and the utility asset owner consulted with to ensure that the designs meet with their clearance specification and to also ensure that the methodology of the works is formally approved by them. In line with the Balfour Beatty safe digging procedure and HSG47, a pre-defined exclusion zone will be implemented either side of the utility and hand excavation only shall take place within this exclusion zone. The distance of the exclusion zone from either side of the utility will be dependent on the type of utility. The exclusion zone distance will be identified on the Balfour Beatty Authorisation to Work Near Existing Services / Permit to Dig (AWNES).

7.1.67 Should poor ground condition be encountered whereby the open cut methodology is unachievable then the Temporary Works Design Engineer will consider alternative options such as shoring, trench boxes or coffer dams if necessary.

Duct & Engineered Backfill Installation

7.1.68 The power cable and fibre optic ducts will be installed in 6m sections. Each section of duct fits inside the corresponding section using a collar and spigot which are to be driven home to ensure tight fit. The ducts are to be installed taking into account the cable pulling direction.

7.1.69 The fibre optic ducts will be connected directly to the outside of the power cable ducts at 1m intervals. Consideration has been taken into account as to how the fibre optic duct will be maintained in position so as to avoid it slipping under the power duct and subsequently becoming crushed during the back-filling process.

CBS Installation

7.1.70 For the installation of cement-bound sand (CBS) cable bedding and surround, supply shall be via nearby Wiltshire Concrete Ltd. Who have confirmed their ability to supply site with the required CBS in the right quantities and to the correct specification.

7.1.71 CBS shall be delivered to site in 20 tonne wagons and tipped in specific laydown areas. These shall be bunded or sealed to ensure no cross contamination or impact on the natural environment.

7.1.72 A 75mm compacted layer of CBS will be installed into the bottom of the trench. The ducts will then be slung and mechanically lowered into the trench with the assistance

of a second tracked 360 excavators, before the top layer of CBS is installed the Banksman shall ensure that the DTS duct is in the correct position to avoid it from being crushed during the backfilling operation. The final compacted layer of CBS will then be installed and compacted to a depth of 75mm above the duct.

7.1.73 Again, in order to minimise as much as possible no man entry, during the compaction operations associated with the CBS installation, remote controlled Vib-plates will be utilised, see Figure 33 below.



Figure 38: Remote controlled vib-plate

Trench Backfilling

7.1.74 The Stokbord cable protection tiles will then be installed directly on top of the compacted CBS layer (Figure 36). This operation will be independent from the compaction and backfill operations and will run between these two operations at the required rate of progress.



Figure 39: Protection tile on a roll

7.1.75 A tracked excavator will then install 100mm of subsoil above the Stokbord tile where another 2.5mm thick warning tape will be installed above each duct. The tracked

excavator will then continue to grade the subsoil from the stockpile and move it in layers into the trench reinstating the ground level to the stripped, top of subsoil level.

7.1.76 Once again, an excavator operator and PVM will be working in conjunction with one another to maintain constant communication and to ensure that the excavator is operating within the limits of the plant and people hierarchy.

7.1.77 In order to minimise as much as possible no man entry during the subsoil compaction operations, a remotely operated compaction unit will be driven along the length of the trench to ensure compaction during the backfilling process, see Figure 37 below. The operator and compaction unit will work with the excavator at a reasonable distance to ensure correct plant people interface controls are maintained. Any excess sub soil will be graded out across the working width via agreement between the Employer, Balfour Beatty, and relevant landowner. The intention is to reuse and spread all excess soils across the working width/swathe. Where this is not possible material will be transported off site and will include obtaining all of the necessary certification and licensing requirements.



Figure 40: Typical remote controlled compaction unit and operator

Joint Bay Civils

7.1.78 As part of their Principal Contractor and Designer duties, during the pre-construction phase Balfour Beatty will develop Joint Bay designs for all types of ground condition anticipated for acceptance. The designs will have been completed in conjunction with Taihan and they will also consider the arrangements for earthing, snaking, joint box protection, link pillars, fibre pit location and engineered backfill.

7.1.79 Temporary works designs to allow for construction in all types of ground conditions will also have been produced and accepted. These designs will also identify the joint

bay locations which will require dewatering during the construction, jointing, and backfilling activities.

7.1.80 Prior to Taihan taking over acceptance of any joint bays constructed by Balfour Beatty a specific Joint Bay Handover standard form will be completed and countersigned by both parties.

7.1.81 In line with the civil scope of works Balfour Beatty will provide a hardstanding area for cable drum vehicle delivery manoeuvres and welfare facilities at the joint bay location. Figure 41 below shows an indicative layout area of a joint bay location.

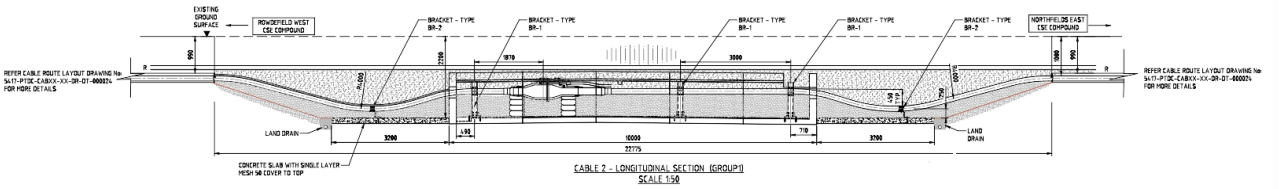

Figure 41: Indicative Joint Bay Layout

Jointing Works

7.1.82 The jointing methodology to be use on the project will be above ground jointing whereby the cables are lifted of the joint bay floor during the jointing process. A jointing tent shall be constructed using scaffold which shall be specifically designed for this solution. This scaffold jointing tent will contain lifting eyes and sufficient

apparatus to enable safe and controlled jointing at all times. An example of this is shown below:

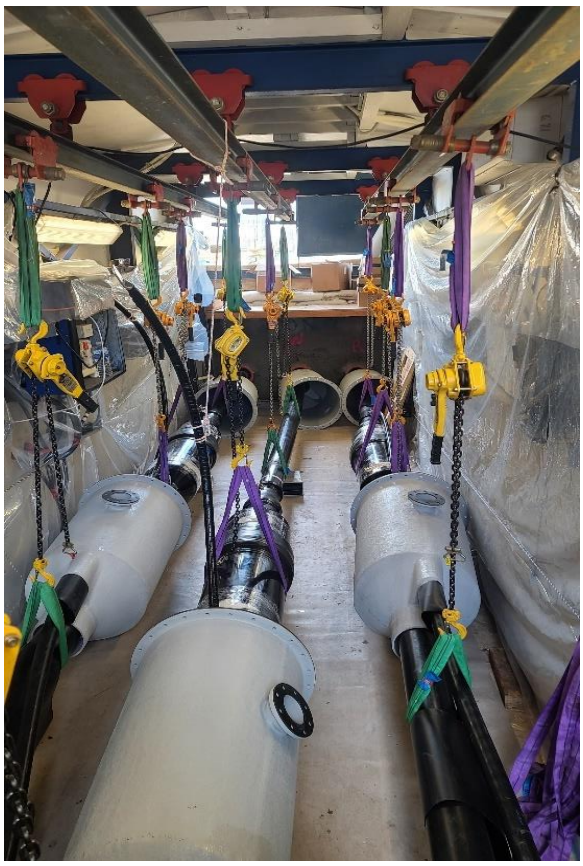

Figure 42: Example Jointing shelter on a 132kV cable project.

7.1.83 Benefits of this solution include:

- Reduced cost for dewatering and reduction in flood/water ingress.
- Increased cable length utilisation and reduced cable wastage.
- Enhanced quality levels and reduced failure rates for all jointing works undertaken.

7.1.84 Figure 43 below shows an example of a scaffolded joint bay with jointing works taking place.

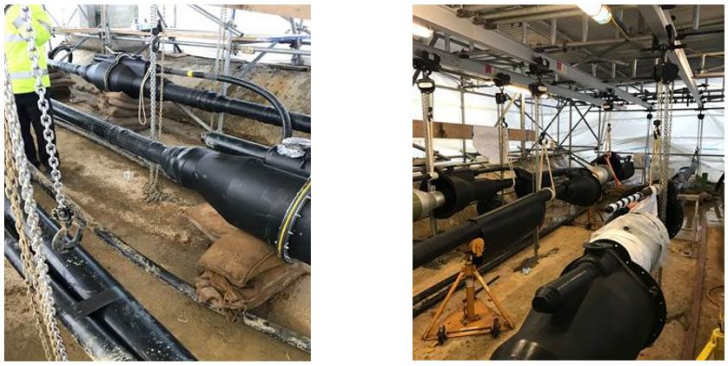

Figure 43: Jointing container positioned in jointing bay

7.1.85 The joint bays will be excavated using 360 tracked excavators, and dependent on the temporary works designs, shoring shall be installed along with a concrete base. An earth mat arrangement (designed in conjunction with Taihan) shall also be installed by Balfour Beatty.

7.1.86 To reduce the requirement of having operatives in the joint bay excavation during construction activities a bespoke concert installation bucket will be fitted to the 360 excavators to install the concrete for the base. These concrete installation buckets operate similar to a hopper and can install the concrete evenly eliminating time required for operatives to be in the excavation and reduce the plant and people interface. Figure 44 below shows the bucket in operation.



Figure 44: 360 Excavator concrete installation bucket

Preparation, Inspection, Testing and Certification of Ducts

7.1.87 Prior to cable installation the ducts will be tested to ensure they are clean and clear of any burrs which could damage the sheath of the Cable, representatives from both the employer and Taihan will be invited to witness these tests. The test will involve connecting in the HDD sections to the open trench ducted sections. A sealed section will then have a foam pig attached to the steel bond of an Auxiliary Winch blown through using a compressor. This Auxiliary Winch (shown below in Figure 45) does away with the need for polypropylene rope and capstan winches. To assist with the blowing of this steel bond Balfour Beatty has developed a specialised blowing gun tool shown below in Figure 46.



Figure 45: Auxiliary Winch



Figure 46: Specialised blowing gun

7.1.88 A larger winch bond will then be attached to the smaller Auxiliary Winch bond via a brush and solid mandrel assembly with a diameter of 10% less than the duct diameter and pulled back to ensure the cleanliness of the ducts. As required in the project Technical Specification Duct videography will then be carried out. In order to do this (unless the camera unit is independently mobile) it will be attached to the larger winch

bond and pulled through. Records of the videography will be kept which shall include the following:

- Date of test.
- Chainage(s).
- Identification of the duct.
- Confirmation that the duct is free from foreign matter and water.
- Location of the test and pole the duct relates to.
- Direction that the test is carried out in.

7.1.89 Once all of the above Inspections and Testing have been completed the Quality Inspection and Test Plan document will be signed by Balfour Beatty, the Employer (NGET) and Taihan representatives who will have been given the opportunity to witness the testing.

8. HV Cable Installation

Preliminary Site Survey for Cable Drum Transportation

8.1.1 Balfour Beatty and Taihan have carried out extensive site surveys and Swept Path Analyses to ensure the correct transportation routes from Bristol (Avonmouth) harbour to the compound access points. The surveys took into consideration:

- Road width.
- Camber.
- Construction type.
- Current condition.
- Traffic flow.
- Street furniture.
- Existing OHL crossings.
- Parking restrictions.
- General navigability and accessibility.

8.1.2 The breakdown of this is contained in the Traffic Management Plan which has been previously submitted as part of the Town and Country Planning Application.

8.1.3 Cable drums shall be transported using low loaders to the primary site compound off Hopton Road. They will then be transported to the designated pulling locations from the main compound using Balfour Beatty's specialist cable hauling equipment.

Collection & Transportation

8.1.4 As part of the civil scope of works Balfour Beatty shall be responsible for the management, collection, and transportation of the cable drums from the Primary Compound's storage area to the pulling location.

8.1.5 Cable Drum deliveries to pulling locations will be delivered in partnership with our specialist logistics partner Allelys This includes the provision of the cable drum transportation vehicles and the planning of transportation routes to site. Any permits or special arrangements required to facilitate the transportation of the cable drums to site will be made and obtained in time to facilitate the installation programme along with any necessary upgrading of roads or facilities including; removal and replacement of street furniture and diversion of third-party utilities required as a result of this activity.

8.1.6 Balfour Beatty is currently looking to procure a self-loading cable drum transportation trailer due to the limited numbers of these specialist vehicles being available to hire and their high demand. Procurement of these trailers would also provide confidence of availability in line with the Projects programme demands. The units are self-loading and capable for use in the cable installation activity as well as the transportation, negating the requirement for expensive ancillary plant and equipment associated with the on and off-loading activities and reducing the Plant Movement interfaces. Figures

43 and 44 below shows a typical example of the type of cable drum transportation trailer currently being considered for procurement by Balfour Beatty.



Figure 47: Example of drum transportation trailer



Figure 48: Example of cable drum transportation trailer

8.1.7 To ensure the cable collection and transportation activity is successfully co-ordinated, Balfour Beatty shall provide Taihan and the Local Authority with a drum delivery programme and share information as required with any other Associated Works Contractors and Stakeholders.

8.1.8 Balfour Beatty shall receive the cable drum(s) at the agreed date from Taihan, in line with the drum delivery programme from the Taihan's store. Taihan shall be responsible for loading the cable drum(s) on the trailer and both parties shall visually inspect the drum once loaded onto the transportation vehicle. Once inspected a cable

drum acceptance form shall be counter signed by both parties. Figure 45 is an example of the Balfour Beatty Cable Drum Acceptance form.

Balfour Beatty

CABLE DRUM ACCEPTANCE FORM
Standard Form: OPS-SF-5503e-CAB

Scheme Name :-		Scheme Number :-			Weather conditions:-		
Location:							
Date of Delivery:-		Time of Delivery:-		Method of Delivery:-		Accepted by:-	
Date of Unloading:-		Time of Unloading:-		Method of Unloading:-		Unloaded by:-	
Cable Drum Number:-				SK Length Number:			
The following checks are to be carried out whilst the cable drum is on the trailer BEFORE it is offloaded.							
Is the Cable Drum secured to trailer correctly with chains	YES	NO	Comments				
Is there any visible damage to the drum (welds, spindle hole etc)?	YES	NO	Comments				
Is there any visible warping to the drum?	YES	NO	Comments				
Is there any visible damage to the batons?	YES	NO	Comments				
Have date stamped photographs of the drum been taken before offloading and attached to this document?	YES	NO	Comments				
The following checks are to be carried out once the cable drum has been offloaded by the Cable Drum Handler							
Is there any visible damage to any welds?	YES	NO	Comments				
Is there any visible damage to the body of the drum?	YES	NO	Comments				
Are all timber batons in place with no visible signs of damage	YES	NO	Comments				
Are there sufficient wooden chocks in place upon the drum?	YES	NO	Comments				
Have date stamped photographs of the drum been taken after the drum has been offloaded and attached to this document?	YES	NO	Comments				
The following checks are to be carried out once the cable protection barrier has been removed from the Cable Drum							
Is there any visible damage to the cable?	YES	NO	Comments				
Is the cable dressed neatly on the cable drum?	YES	NO	Comments				
Is the cable pulling eye fixed correctly?	YES	NO	Comments				
Supplier Signature :		Print Name:		Date -		Comments -	
Delivery Signature :		Print Name:		Date -		Comments -	
Delivered by:				Vehicle Registration:			
Balfour Beatty Signature :		Print Name:		Date -		Comments -	
Note: Please ensure that all photographs and supporting documentation MUST be attached to this form and are placed in the office file AND placed on the shared access drive							

Figure 49: Balfour Beatty's Cable Drum acceptance form

8.1.9 A sheath test shall then be carried out by Taihan immediately before the cable drum is transported to site. The outer sheathing functions as environmental protection to the finished cable therefore Electrical Sheath Resistance testing is a key onsite diagnostic test for identifying potential cable damage and demonstrate the integrity of the cables outer sheath.

8.1.10 Any drums of cable that fail the electrical testing, and/or visual inspections prior to transportation to site shall be clearly identified and be subject to further investigations in accordance with Taihan's Quality Management System. Any resulting Non-Conformance/Deviation/Incident shall be resolved to the satisfaction of the Employer before the drum can leave Taihan's store facility for transportation to site.

8.1.11 Once the drum has been transported to the pulling location Balfour Beatty shall remove the batons and cladding from the cable drum and both parties shall again countersign the cable drum acceptance form to confirm that no damage has occurred

during transportation. Taihan will then carry out another sheath test prior to the Cable installation activity taking place which will be witnessed by Balfour Beatty.

8.1.12 After the cable has been installed, Balfour Beatty shall transport the empty drums back to Taihan's storage facility for disposal by Taihan.

Cable Installation

8.1.13 The cable installation activities shall be in line with the cable installation and Taihan's Quality Management Plan, to enable supervision by Taihan and witnessed by the Employer. The cable installation shall take place in line with the approved cable installation calculations and installation drawing, an extract of which is shown below:

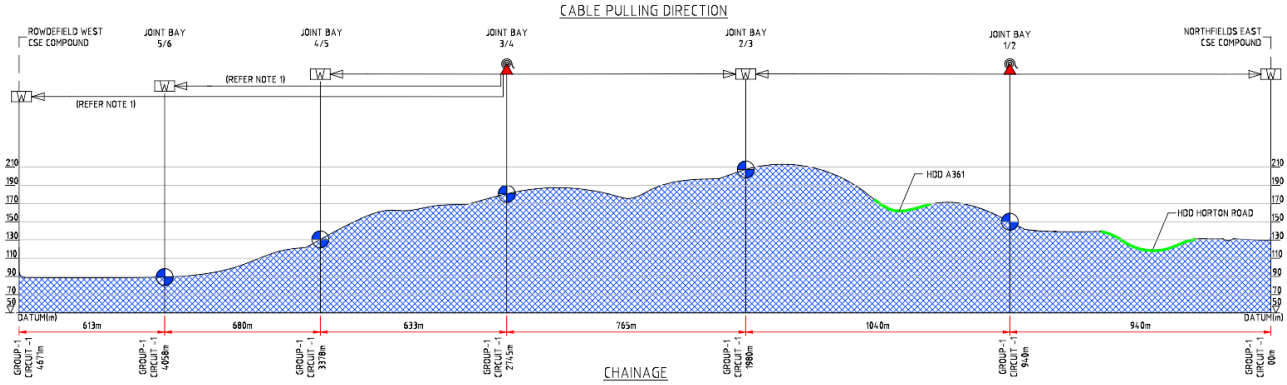

Figure 50: Cable Pulling Directions indicative drawing for the NWD cable route.

8.1.14 During the pre-construction phase Balfour Beatty shall perform the necessary engineering designs and cable pulling calculations, to verify that the cables will not be exposed to forces above their design limit, as specified by Taihan.

8.1.15 The method of cable installation will be dictated by the system design, as the cables are installed within ducts, the installation proposal is for using winches equipped with a dynamometer to nose-pull the cables. Caterpillar pushing may be required on some more difficult pulls located at the cable drum end of the pull or periodically along the cable pull where ducts have not been installed; this will be determined by the detailed design and cable pulling tension calculations.

8.1.16 During the duct preparation the drum site will be set up by moving the drums into place and any required caterpillar will also be installed at this point. A 20t OMAC or similar cable winch will be positioned at the opposite end of the pull along with any required rollers to facilitate adequate positioning of the cable through the ducting. Any bell mouths, lube pits or rollers required will be positioned and installed before the pull, the entry area will also be lubricated with the required specification lubricant (and maintained throughout the pull).

8.1.17 The winch will be anchored appropriately in line with the relevant temporary works specifications. All winches will have field drain earths attached to eliminate the risk of induced/impressed voltage during the cable installation process. The winch will have a calibrated dynamometer to measure and record the tension in the suspended bond

during pulling. Before commencing winching operations, the following checks will be carried out by the operative responsible for winching:

- Check that field drain earths have been connected.
- Check that the winch is suitably anchored.
- Check oil fuel levels of winch, as necessary.
- Check test certificate of the cable bond.
- Check pressure gauge calibration.
- Check maximum pulling force is set.
- Check that the cable pulling eye/stocking has been correctly fitted.
- Check that bell mouths and funnels where required are installed at appropriate points of deflection.
- Check that personnel are suitably located along the route and communicated with.
- Check that radios and communications channels are free and open and all equipment is charged and in full working order.
- Temperature of the cable to be installed.

8.1.18 Cable installation must only take place when both cables and ambient temperature have been recorded at or above the minimum temperature advised by the cable manufacture. If the measured temperature shows that the cable is below the minimum, laying will be deferred until the temperature has been raised.

8.1.19 The maximum permitted cable pulling tensions for the cable system will be set on the winch prior to installation and a print-out will be provided for each section showing exact length and maximum force applied for quality and guarantee purposes.

8.1.20 Again, the auxiliary winch wire bond will be blown through the duct section using a compressor and specialised blowing gun. The wire bond of the 20t OMAC winch will then be attached to the Auxiliary Winch bond and pulled back to the cable drum. As previously mentioned above, this methodology eliminates the requirement for polypropylene rope and the use of capstan winches. The cable will then be attached to the 20t OMAC winch bond via a swivel which will be connected to the pulling eye which will have been factory fitted to the end of the cable during manufacturing.

8.1.21 During the cable installation, any anomalies or defects shall be advised to Taihan and Employer and recorded with references to the metre mark on the outer sheath, in line with Balfour Beatty's Quality Management Plan. Where rollers are used, they shall be inspected to ensure they have no sharp projecting metal parts liable to damage the cable. During the pulling and installation activities Balfour Beatty shall record all pulling measurements. The pulling measurements shall include, but not be limited to; ambient temperature, where precautions have been made to raise the temperature, and pulling tensions. All waste from the cable installation activity apart from the cable drum and cladding material, shall be disposed of by Balfour Beatty.

8.1.22 Following the installation of the cable, dependent on the length of spare cable left on the drum it will be tied down on the drum and transported back to Taihan's storage facility. If there is insufficient cable left to tie down it will be removed from the cable

drum, cut up and sent to a secure skip for later collection. The cable pulling head and caps shall remain in place, to be removed by Taihan at the time of joint works. Taihan shall perform a sheath test directly after cable installation to confirm that no damage has occurred to the cable during the installation process.

8.1.23 Both the Employer and Balfour Beatty shall be invited to witness the sheath testing.

DTS & Fibre Optic Cable Installation & Jointing

8.1.24 During the pre-construction design phase, the location of the termination cubicles within side the CSECs will have been agreed between the Converter Station Contractor, Land Cable Contractor (Taihan), and Employer and Balfour Beatty. A termination wiring diagram will also have been agreed between these associated works contractors and Employer. Designs for buried fibre jointing and pulling pit will also have been agreed.

8.1.25 During the design stage and construction of the joint bays, fibre optic jointing chambers will have been allowed for and installed at each joint bay location. However, where section lengths can be optimised the configuration of the fibre optic design may require pulling through a joint bay, where this is envisaged the Fibre ducting will be complete though the joint bay. Pulling pits will also be installed at strategic location to assist with pulling the longer lengths.

8.1.26 On arrival of the fibre optic cable drums to site Balfour Beatty will carry out optical tests to confirm length and quality of each fibre against the factory test delivery document. Once the power cables have been installed on each relevant section the fibre optic cable will be blown. On some of the more difficult sections it may necessary to locate the cable drum at a pulling pit at the halfway point and pull the cable one way to the next pit, the rest of the cable would be then flaked off and pulled in the opposite direction.

8.1.27 During cable installation remake loops will be left in each jointing pit should they be need for future make offs. Following the installation of each section and prior to intermediate jointing on each section Optical Time Domain Reflectometer (ODTR)

testing will be carried out to test specification ITU-T-G650.3 as per the requirements in the project Technical Specification.

8.1.28 Intermediate jointing will then be carried out and the pit sealed ready for backfilling. The location of the pit will be recorded via GPS and marked up on the As-Built records.

8.1.29 Once all fibre cable has been installed and intermediate jointing complete between the two CSECs a final end to end ODTR test will be carried out prior to termination works. Once the end-to-end testing is complete the fibre cables will be terminated.

8.1.30 During the Cable jointing Balfour Beatty will then carry out the jointing of the installed fibre optic.

8.1.31 DTS cable shall also be installed in a similar manner between the two new CSECs and through the joint bays. DTS fibres shall be terminated in special end boxes at each CSEC. There is no DTS monitoring system to be installed under this contract.

8.1.32 Requirements for an end to end through test will be confirmed and agreed with the employer.

9. HV Cable Jointing and Terminating

Jointing

9.1.1 During the jointing activities Balfour Beatty shall provide the necessary pumps and resource to maintain the joint bays dry of ground water.

9.1.2 Once the jointing works are completed (and dependent on the type of jointing methodology carried out) Taihan will lower the joints into the bay and snake the excess cable into pits which will have been excavated at either end of the bay. Balfour Beatty will then cleat the cables in position in the snaking pits via U channel which will be bolted to the concrete floor of the snaking pit.

Cable Terminations

9.1.3 At each CSEC, following cable installation the cable ends shall be terminated into the new substation sealing end equipment. The arrangement of this equipment is shown below:

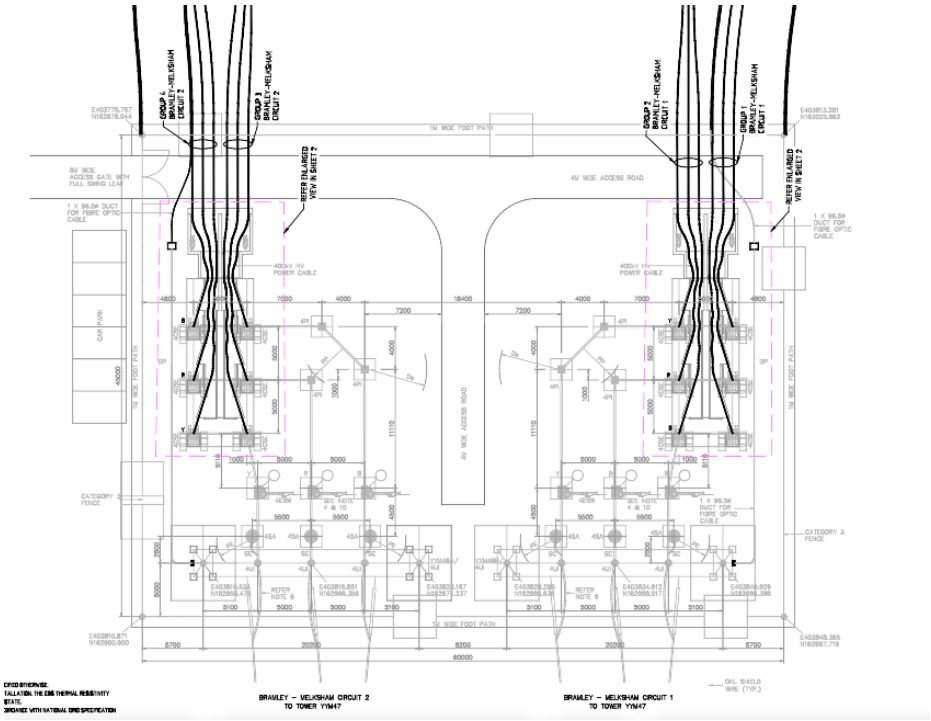

Figure 51: Typical Cable Sealing End Compound Layout

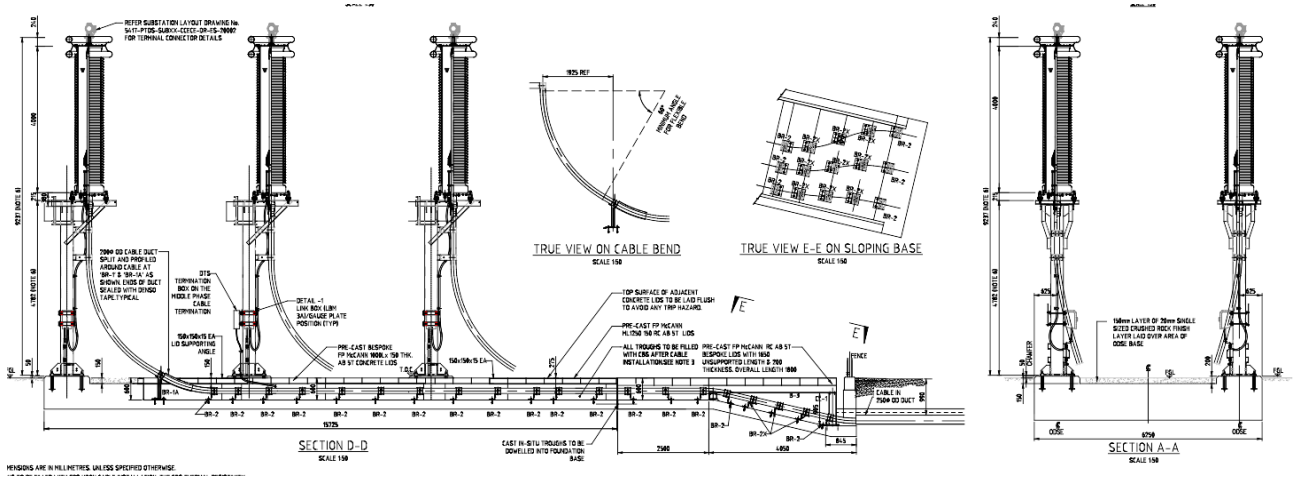

Figure 52: Layout of completed Cable Sealing Ends

9.1.4 In order to work at height to complete the terminations, a scaffold shall be erected around the new cable sealing ends and steelwork to enable Taihan's jointers to work

at height and complete the cable terminations. An example of this scaffold is shown below:

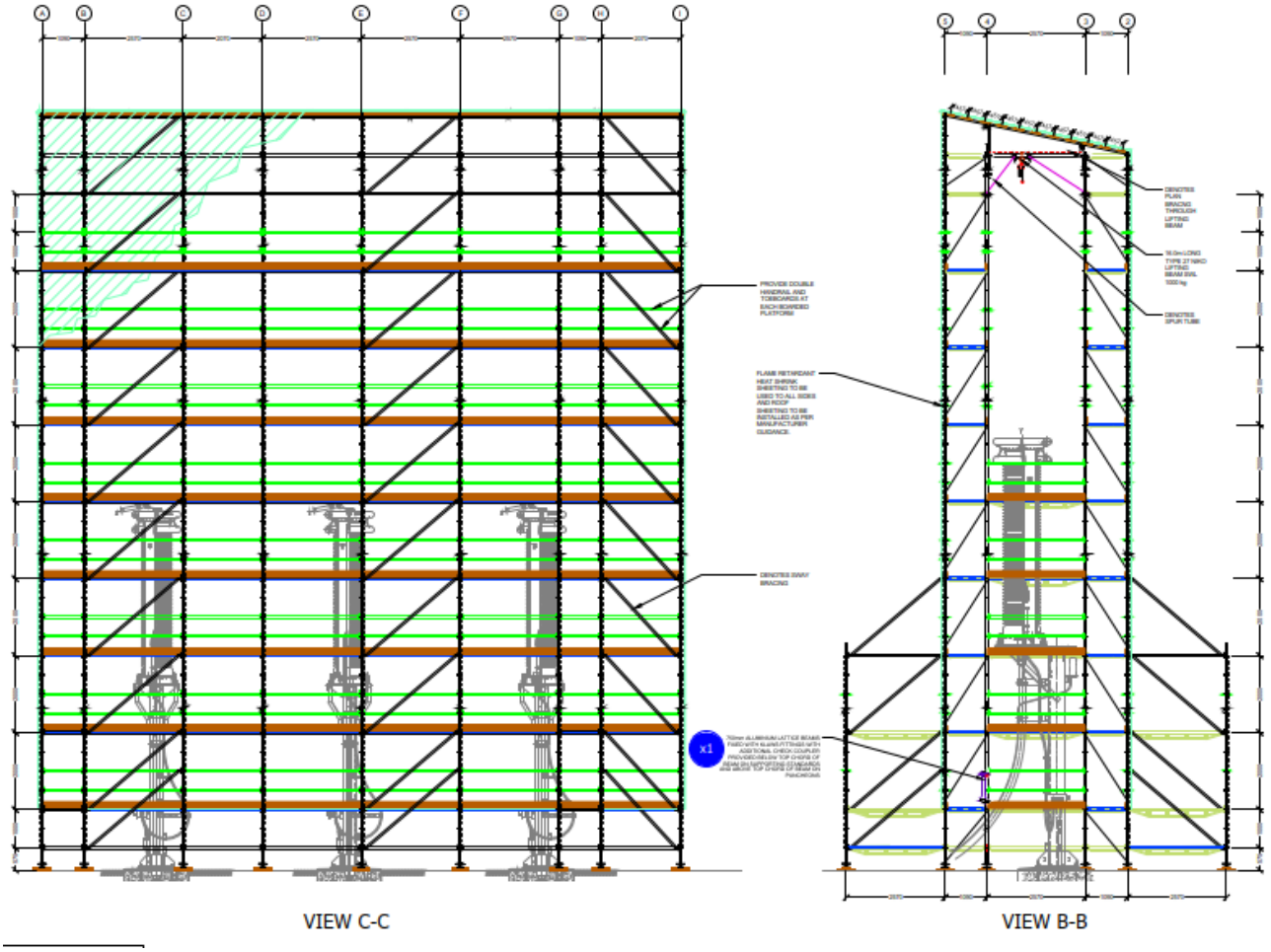

Figure 53: Example of a 400kV Termination Scaffold

9.1.5 Once terminations are complete, the scaffolding shall be removed, and the area cleared for HV Testing and Commissioning.

Grouting HDD Ducts with Bentonite

9.1.6 Where thermal resistivity cable ratings dictate that due to the depth of the HDD's Bentonite fluid is required, this shall be pumped in after the cables have been

installed. To achieve this, while maintaining a full ducted system, a grout plug method which creates the seal between the duct and cable, will be implemented.

9.1.7 This method comprises of six stages, two of which are pre-cable installation and four which are post-cable installation:

Table 8: Pre-cable and post-cable installation stages.

Pre-Cable Installation	
Stage 1	Using a 2” hole cutter, cut through the HPPE Duct approx. 250mm from each end of the HPPE Duct
Stage 2	Install Electrofusion 63mm Tapping Saddles approx. 500mm from each end of the HPPE Duct and tap through (see Figure 54 below)
Post-Cable Installation	
Stage 3	Using a mix of grout and cement install a plug through the pre-formed 2” hole packing the plug into the duct bore to ensuring the plug is completely around the cable
Stage 4	Allow the plugs to set for 24 hours prior to bentonite grout pumping
Stage 5	Pump in the bentonite grout via a 2” injection pipe connected to the 63mm Electrofusion Tapping Saddle at one end and purge out of a venting pipe connected to the 63mm Electrofusion Tapping Saddle at the other end
Stage 6	Allow the bentonite grout to cure for 24 hours then seal off the injection and venting pipework allowing excavation to be backfilled

9.1.8 The works will be carried out in a logical sequence with a typical three-man bentonite installation team working alongside the cable installation teams. Where aggregate haul road has not been installed during the enabling works, trackway matting will be installed to access the point of works.



Figure 54: Electrofusion 63mm tapping saddle.

10. HV Testing and Commissioning

Overview of Testing and Commissioning

10.1.1 Commissioning tests conducted will be to SCT36. Recommended maintenance tests will be defined in the O & M.

10.1.2 Link pillars will be provided at all joint bay locations for commissioning tests and maintenance over-sheath testing. These link pillars house SVL's where required by the system design and these can be removed under outage conditions for replacement / repair as required. All link pillars have suitable disconnection links to enable commissioning and future maintenance tests to be conducted. Cable sheath bonding arrangements at the link pillars divide the route into section lengths of between 700m to 1300m which will simplify the location of any faults in the system.

10.1.3 Gantry-mounted link boxes will be provided at the termination locations at a suitable height for the removal of links for over-sheath commissioning tests and any future maintenance tests.

10.1.4 All link boxes / pillars will be compliant with NGTS 3.5.4 and will have the necessary connections and methods for connection of suitable temporary earths. A temporary earthing kit and procedure for fitment will be supplied.

AC testing

10.1.5 The cables will be tested for AC and Partial Discharge. There will be suitable access for the resonant test sets to required location. There will be sufficient space for the resonant test AC and PD equipment to be set up and for adequate safety clearance to carry out the test.

Proposed equipment to be used

10.1.6 Oversheath test: HV DC test equipped to measure the leakage current at 10kV DC, connect HV side to the metal sheath and the earth side to the PE sheath at the Link box/Link pillar positions. This will be located at the joint bays for each individual section and for the completed circuit at cable sealing end compounds.

10.1.7 AC voltage & PD tests: A sufficient number of resonant set transformers for the circuit length will need to arrive by lorry at the cable sealing end compounds. The circuit will be tested at 260kV for 60 minutes and a partial discharge test will also be performed at the same time with the circuit to be PD free and the noise level to be less than 10pC. For the length of this circuit, the frequency is calculated to be approximately 37Hz during the HV voltage test at 260kV.

10.1.8 Sheath Voltage Limiter tests: Variable voltage DC supply and ammeter

11. Traffic Management

11.1.1 A Traffic Management Plan (TMP) (Document Number: 5417-PTDC-CABXX-XX-RP-PDM-000076) has been prepared and issued as part of the Town and Country Planning Application.

11.1.2 Please refer to this TMP and sections within it in line with the table on Page 2 and Page 3 for details on discharging the specific conditions from the Town and Country Planning Application

12. Land Use

12.1.1 During the planning of the construction methodology, Balfour Beatty has taken into consideration the minimisation of both land use and damage to land that will be used. This has included reducing the number of site compounds and where possible installing temporary trackway as opposed to aggregate haul roads.

12.1.2 The exact cable route within the easement corridor will be finalised during pre-construction design stage and will take into consideration the cable system design requirements i.e. maximum cable bending radius of Cable, joint bay location, fibre pit location, access requirements, etc. and will be agreed with the Employer, Taihan and landowners.

12.1.3 The site easement has been designed to limit the working width to 75m (as per Figure 55), allowing the haul road, trenches and numerous spoil stockpiles to fit and conform to the installation requirements (helpful images in Figures 56 to 58).

12.1.4 The easement will then be marked out by Balfour Beatty Engineers using GPS equipment with pegs installed along the boundaries at regular intervals. Demarcation fencing will be erected along this pegged out line and no deviation will be allowed outside this without prior agreement from the Employer.

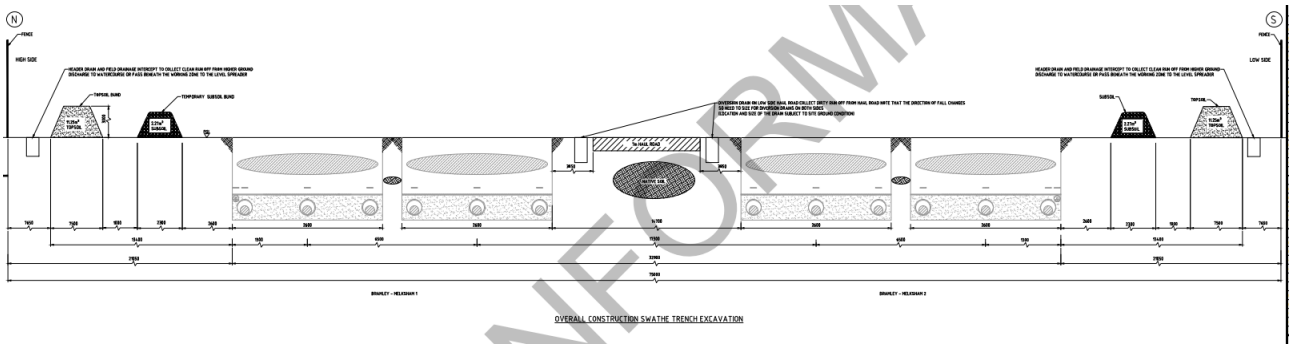

Figure 55: NWD Construction Easement Cross Section



Figure 56: Easement Example of Balfour Beatty topsoil strip on Brahmam 132kV project



Figure 57: Example of haul road on another Balfour Beatty project.



Figure 58: Easement construction example from another Balfour Beatty project.

12.1.5 In line with the Balfour Beatty Excavation Procedure, trench excavations may be dug to a maximum depth of 1.2m without the need for shoring designs (dependent on suitable ground conditions). As advised in the project Technical Specification a general agricultural trench depth of 1.2m to protection tile level is required; this gives an overall burial depth of 1.6m (Figure 54).

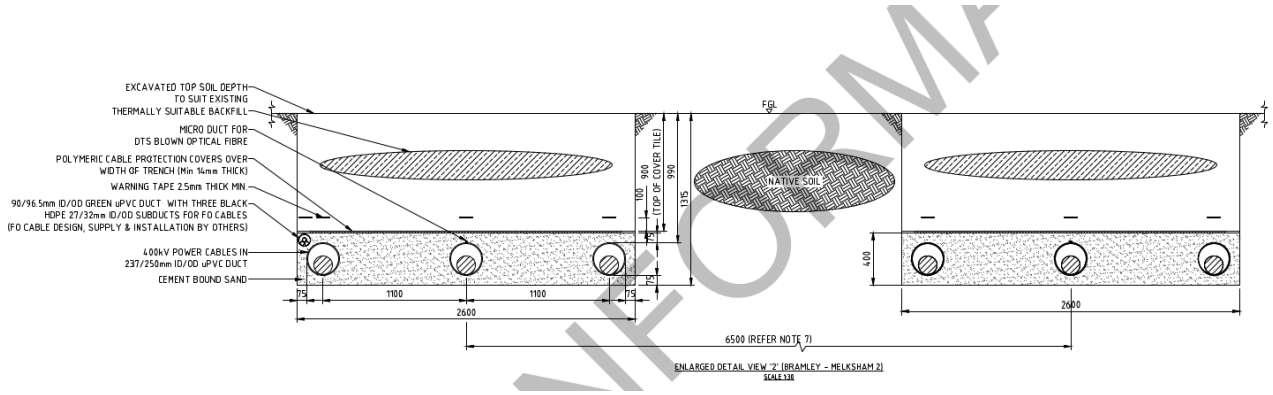

Figure 59: Trench Cross Section from drawing

12.1.6 In good cohesive ground and assuming 400mm or more of topsoil will already have been stripped to create the working width, the maximum trench excavation depth of 1.2m can be achieved potentially without the need for shoring using our current methodology of utilising a standard type trenching bucket.

12.1.7 Should the trench depth specification of 1.2m increase or if less then 400mm of topsoil is stripped, the sub soil on either side of the trench will need to be stepped back to the relevant depth to allow excavation to 1.2m potentially without the need for shoring.

12.1.8 Should ground water be encountered along any part of the route throughout the calendar year, where this is the case both methods given above may not be practical,

therefore in order to manage this the gradient on the trench sides may need to be increased which can be achieved by battering back or utilising a bespoke designed swivel or `V' type trenching bucket, see Figures 57 and 58 below. Significant de-watering will also be required which is explained in more detail in the Dewatering section of this document.

12.1.9 The battering back method (shown in Figure 57) was recently used by Balfour Beatty on a twin circuit 132kV project in Lincolnshire for Western Power Distribution.



Figure 60: Battering back method for trench excavation from another Balfour Beatty project





Figure 61: Typical Swivel or V type trenching bucket

13. Environmental Considerations

13.1.1 As Part of the Town and Country Planning application, a Construction Environmental Management Plan (CEMP) has been produced and submitted. Please refer to document number 5417-PTDC-CABXX-XX-RP-PDM-000072.

13.1.2 Please refer to the relevant sections in this CEMP as stated in the table on Page 2 and Page 3 for specific actions to discharge the planning conditions listed in the Planning application.

14. Reinstatement & Demobilisation

14.1.1 All reinstatement works will be completed in line with the land restoration plans which will be agreed with the relevant local planning authority before works commence.

Haul Road Removal and Demobilisation

14.1.2 Upon completion of the works in a section and where the requirement for the haul road is no longer in place, it will be removed and all site equipment demobilised and removed. This will be a logical process starting from the end of a haul road and working backwards towards the relevant compound. All flumes and other temporary infrastructure will be removed as required. Temporarily relocated hedges will be reinstated and the topsoil will be replaced where this will not impact on the post-construction drainage installation.

14.1.3 Imported aggregates, geogrid and geotextile shall be removed following completion of cable installation and all associated works.

14.1.4 The aggregate will be lifted by 360-tracked excavators and transported to the TCC's by road haulage vehicles and / or dump trucks. Disposal of aggregate shall be carried out in line with the Site Waste Management Plan (SWMP) with appropriately certificated organisations.

Culvert Removal

14.1.5 Ditch reinstatement will follow the reverse process of the installation. The aggregate will be removed and transported to the TCC's by road haulage vehicles and / or dump trucks. Disposal of aggregate shall be carried out in line with the material management plan. Used geotextile (terram) will be removed and taken off site to a recycling plant in line with the SWMP. The pipes will be removed, and the ditch embankments graded back to their original condition and seeded where required.

Post-Construction Drainage

14.1.6 Following the removal of the haul road, the post-construction drainage team will move into the area to install the post construction drainage in accordance with the agreed design. The methodology for final drain installation will be similar as the pre-construction drainage installation method.

Topsoil Reinstatement

14.1.7 All topsoil replacement works shall be carried out in line with the Soil Resources and Survey Management Plan and as part of the CEMP/CCoP. Prior to top soiling, where required, ripping of the subsoil will be carried out to improve the soil structure.

14.1.8 The storage bunds for the stripped topsoil will be carefully excavated and the material spread over the stripped easement. Following distribution, the topsoil shall be

prepared and seeded where required using an appropriate seed mix or returned to arable cultivation.

14.1.9 The exact requirements will be outlined during the detailed design stage and will follow on from the liaison undertaken by the ALO's. This will ensure that agricultural fields shall be restored to their previous condition in-line with the requirements of the landowner and/or tenant(s).

Compound Removal & Highway Access Point Reinstatement

14.1.10 Once all cabins, offices and welfare facilities have been removed and utility connections decommissioned at the TCC's, the compound areas will also be reinstated using the method given above in the Topsoil Reinstatement section.

14.1.11 Where required temporary welfare units will be mobilised to site for use by the civil teams deployed to reinstate the Highways Access points to their original condition.

14.1.12 Where requested by land owners and then formally agreed with the Local Authority, access points may/could be left in-situ for future use by the landowner.

15. Appendix A

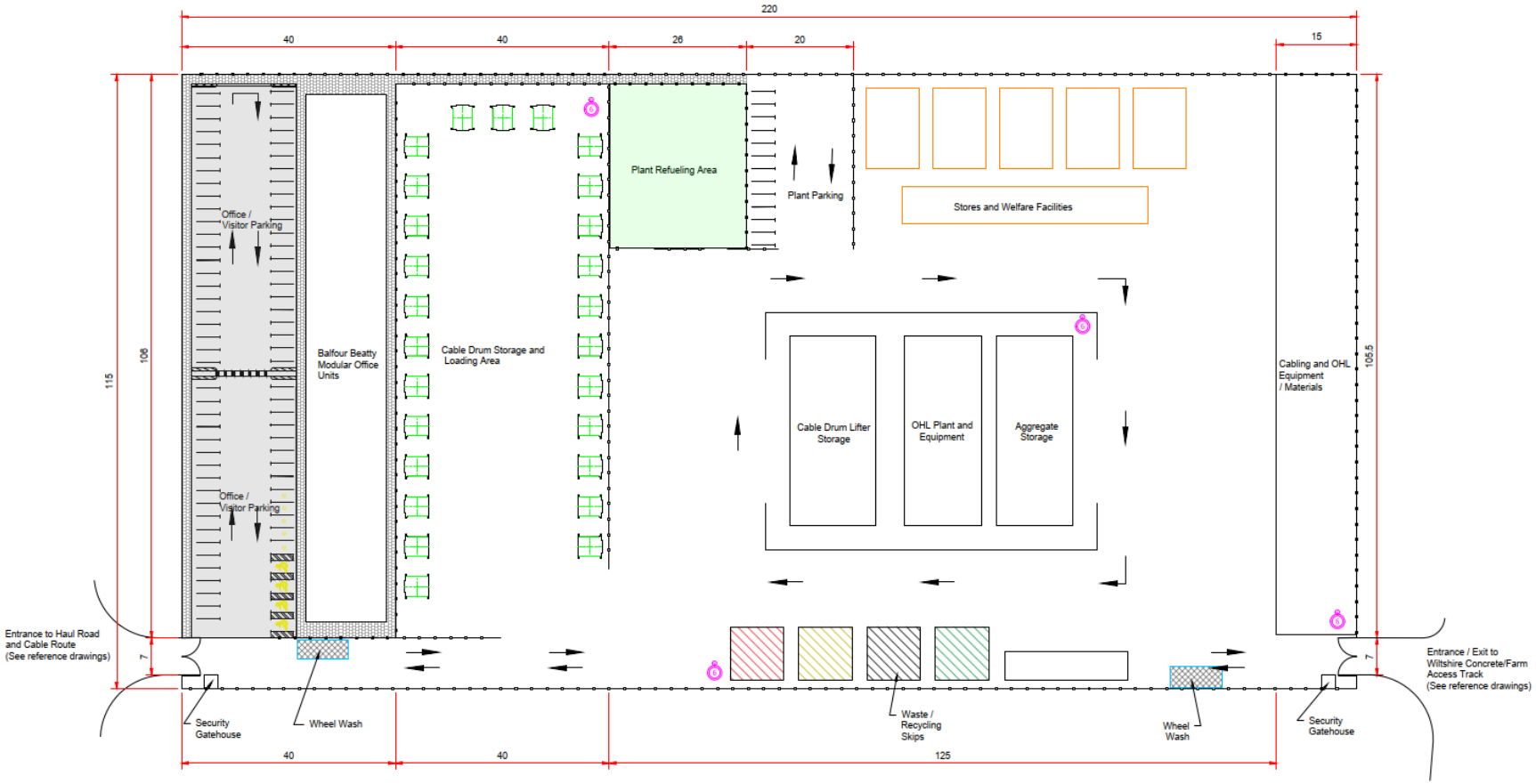

Figure 62: Site CDM layout for Primary Compound showing parking, plant and material storage, wheel wash facilities and office location. Compound to be located to the rear of Wiltshire Concrete Ltd.

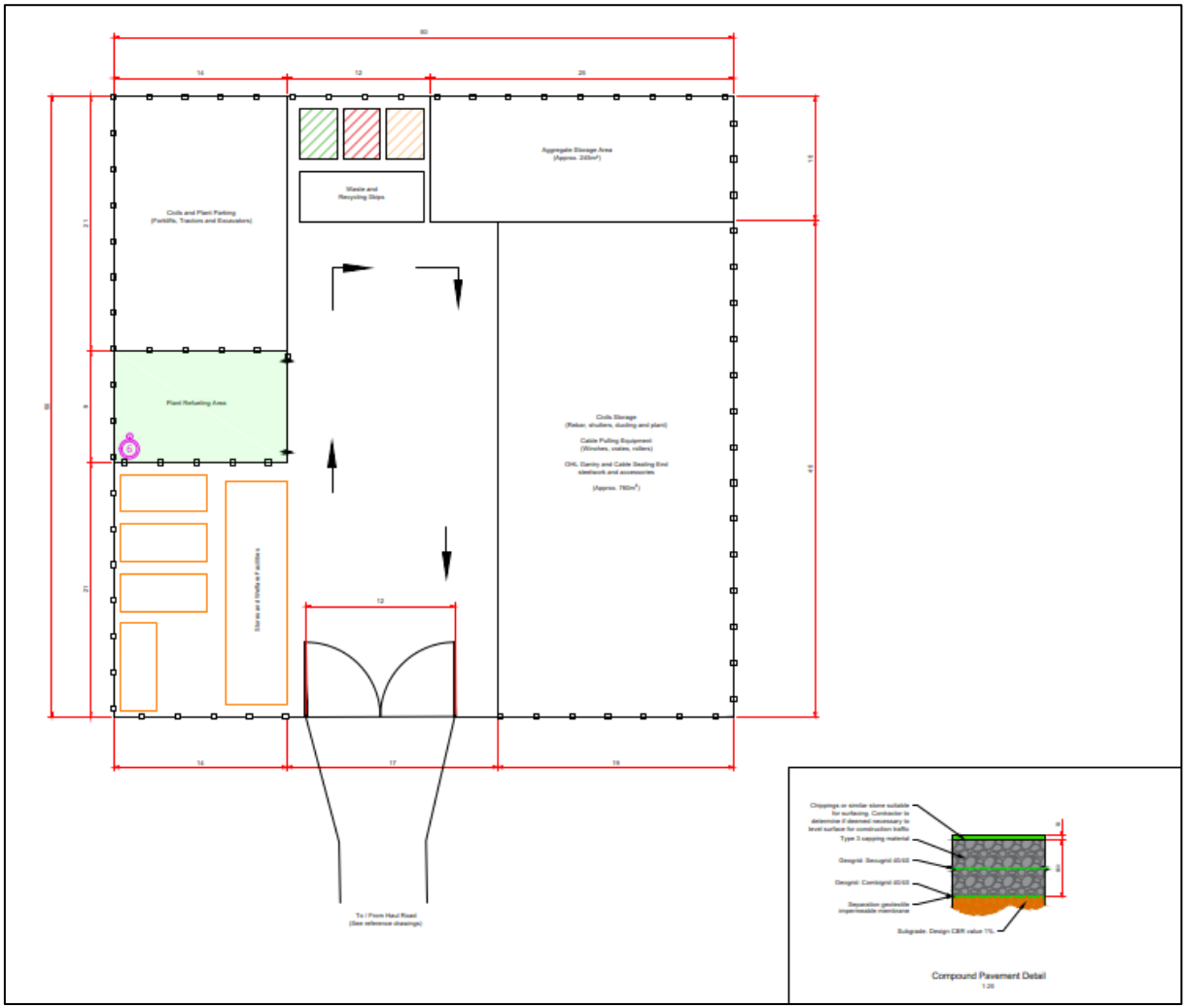

Figure 63: Site CDM layout of the Secondary Construction Compound at the Western CSEC

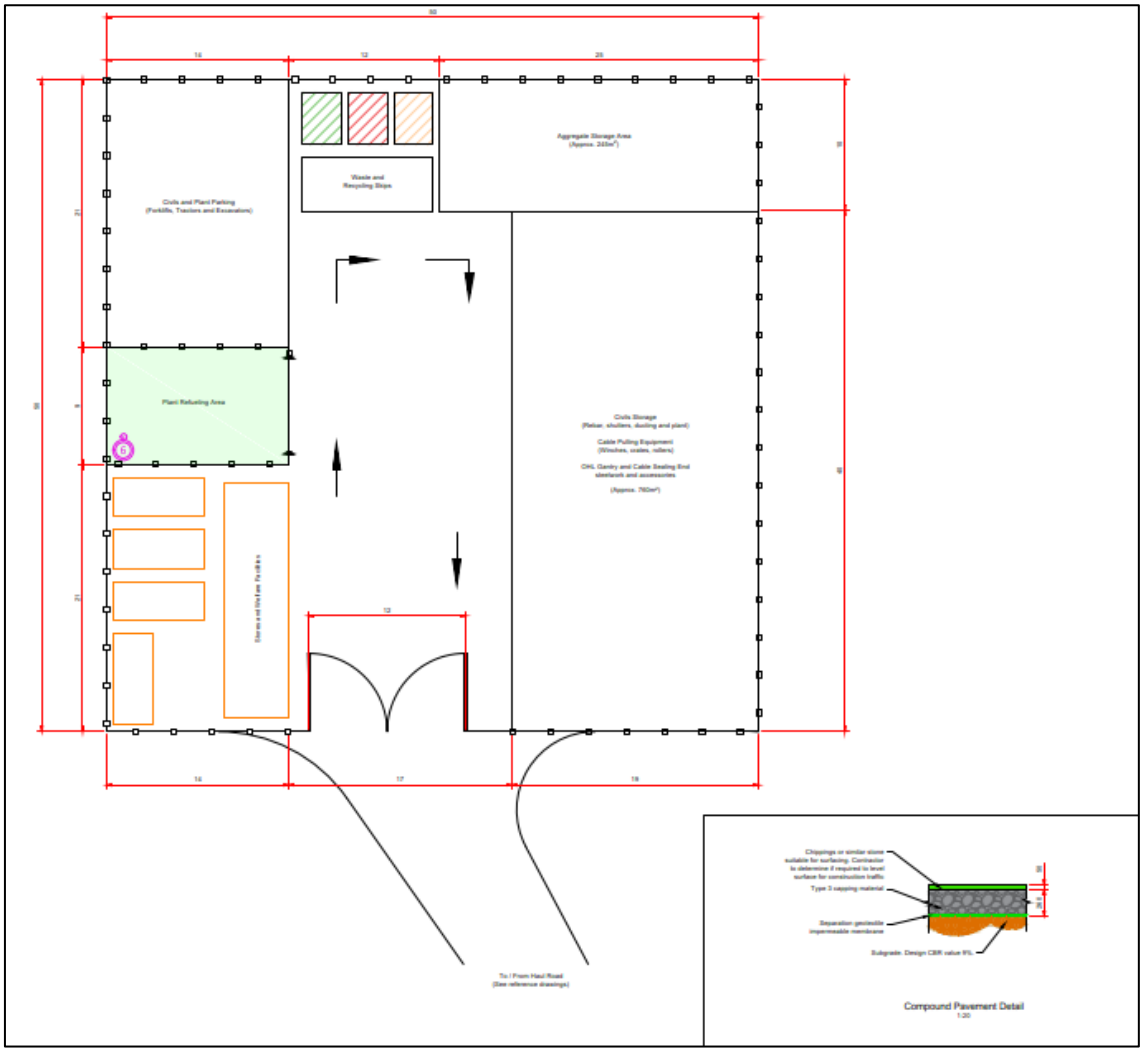

Figure 64: Site CDM layout of the Secondary Construction Compound at the Eastern CSEC