Volume 2: Chapter 3 – Project Description

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3. PROJECT DESCRIPTION

3.1 Introduction

3.1.1 This Chapter describes the various elements required to construct and operate the Proposed Development, which incorporates the diversion of the final easterly sections of two existing OHLs (Alyth to Tealing and Tealing to Westfield 275 kV OHLs) for tie-in to the proposed Emmock 400 kV substation and for a 275 kV tie-back between Emmock substation and the existing Tealing Substation, hereafter referred to as the 'Proposed Development'. This Chapter also describes ancillary development related to the Proposed Development and the Limit of Deviation (LOD) that will apply to the Proposed Development.

3.1.2 The Proposed Development referred to in this EIAR is comprised of the development for which Section 37 Consent and Deemed Planning Permission is sought, and ancillary development, described in **Section 3.3** below and subject to the LODs described in **section 3.5** below.

3.1.3 The Proposed Development described within this Chapter, and assessed within **Volume 2, Chapters** of this EIAR is also presented in **Volume 3, Figure 3.1: Proposed Development for which Section 37 Consent and Deemed Planning Permission is sought**.

3.2 Location of the Proposed Development

3.2.1 The Proposed Development is located in the Local Authority area of Angus, approximately 5 km north of the city of Dundee, in a predominantly agricultural area interspersed, particularly to the north of the Site, by a few small woodland plantations and farm shelterbelts. The land uses mainly comprise areas used for arable production and some grazing land on the fields higher up the slope in the north of the Site. The area around the Site is also characterised by existing utility infrastructure, in particular the OHLs for the existing Alyth to Tealing 275 kV OHL and Tealing to Westfield 275 kV OHL run in a broadly west to east direction before terminating at Tealing Substation to the southeast of the study area. A number of other OHLs also radiate out from the existing Tealing Substation. There are two wind turbines in the fields located to the south of Balkemback (just south of the Alyth to Tealing 275 kV OHL and north of the Tealing to Westfield 275kV OHL) and a large telecommunications tower at the summit of Craigowl Hill, approximately 1 km north of the Alyth to Tealing 275 kV OHL.

3.2.2 The wider setting of the Proposed Development consists of an area of lowlands between the northern fringe of Dundee and the line of the Sidlaw Hills, forming a broad strath of gently sloping ground from south to north across the area crossed by the existing Alyth to Tealing and Tealing to Westfield 275 kV OHLs. The area is sparsely populated with a few small groups of properties generally associated with farms in the areas of Balluderon, Balkemback and Prieston. The village of Kirkton of Tealing is located approximately 1 km northeast of the Proposed Development. The settlement of Tealing lies approximately 1.5 km to the northeast of the Site. Two notable exceptions to the general pattern of the wider landscape are: Craigowl Hill, some 2 km north, with its associated elevations and woodland to the northwest; and the existing Tealing Substation to the southeast along with its associated infrastructure, including the Alyth to Tealing 275 kV and Tealing to Westfield 275 kV OHLs connecting to the existing Tealing Substation, which will be reconductored under a separate consenting process, while being diverted as part of the Proposed Development.

3.3 Development for which Section 37 Consent and Deemed Planning Permission is sought

3.3.1 The Proposed Development, as shown in **Volume 3, Figure 3.1: Proposed Development for which Section 37 Consent and Deemed Planning Permission is sought** comprises the diversion of the final easterly sections of two existing OHLs (Alyth to Tealing and Tealing to Westfield 275 kV OHLs) for tie-in to the proposed Emmock 400 kV substation and for a 275 kV tie-back between Emmock substation and the existing Tealing Substation. It includes:

- installation of a new section of Alyth to Tealing 400 kV OHL including seven new towers from the location of Tower AT2 southwards for a distance of approximately 2.2 km to connect with the northern side of the platform of the proposed Emmock substation;
- dismantling of 11 towers and the removal of tower foundations over a distance of approximately 3.5 km (see **Paragraph 3.7.48**) from Tower AT2 to the current connection at Tealing Substation;

- construction of a temporary tower diversion, consisting of a temporary tower AT1 to maintain transmission on the Alyth to Tealing OHL;
- installation of a new section of Tealing to Westfield OHL, comprising two new towers, WT10 and WT11, northwards for a distance of approximately 150 m to connect with the southern side of the platform of the proposed Emmock substation;
- construction of a temporary tower diversion, consisting of two new towers to maintain transmission on the Tealing to Westfield OHL; and
- installation of two new tie-back connections between Emmock and Tealing substations, the East TT and West TT, with the East-TT requiring installation of four new towers, TE1, TE2, TE3, and TEG1 and upgrading of existing end point tower TE4 currently connected to Tealing Substation; and the West TT requiring installation of tower TW1 and upgrading of existing towers WT9, TW2, TW3 and TW4.

Table 3.1: Tower Specification Summary

Tower No.	Status	Tower Type (& Height)	Easting	Northing
Alyth – Tealing OHL Diversion (from tower 679)				
AT1	Existing	D10 E12(BC) E24(AD) (51.1 m)	336867	738927
AT2	Existing	L8 E4(AD) STD(BC) (47.7 m)	337187	738937
AT3	New	L8(C) DJT E11 (59.1 m)	337592	738949
AT4	New	L8(C) D30 STD (43.7 m)	337866	738705
AT5	New	L8(C) D E11.0 (57.3 m)	337965	738422
AT6	New	L8(C) D60 E3.7 (48.01 m)	338088	738073
AT7	New	L8(C) D E3.7 (49.9 m)	338366	737989
AT8	New	L8(C) D30 STD (43.7 m)	338636	737910
AT9	New	L8(C) DJT STD (48.1 m)	338766	737776
Gantry 1 - Emmock	New	Gantry Emmock (12.0 m)	338749	737721
Gantry 2 – Emmock	New	Gantry Emmock (12.0 m)	338806	737734
Tealing to Westfield OHL Diversion (from tower 180)				
WT9	Existing	L2 D E20 (50.1 m)	338525	737385
WT10	New	L8(C) DJT STD (62.9 m)	338781	737417
WT11	New	L8(C) DJT STD (48.1 m)	338824	737500
WTG1	New	Gantry Emmock (12.0 m)	338790	737542
WTG2	New	Gantry Emmock (12.0 m)	338837	737552
Tie-back – West TT				
TW4	Existing	L2 DT45 M24 (44.6 m)	339843	737078
TW3	Existing	L2 D E20 (50.1 m)	339520	737268
TW2	Existing	L2 D60 E12 (46.6 m)	339209	737448
TW1	New	L8(C) DJT STD (48.1 m)	338894	37516
TWG1	New	Gantry 275 kV (Emmock) (12.0 m)	338899	737567
TWG2	New	Gantry 275 kV (Emmock) (12.0 m)	338868	737560
Tie-back – East TT				
TE4	Existing	L8 DJT STD BK T866 (48.2 m)	339902	737104
TE3	New	L8(C) D E7.3 (53.6 m)	339606	737292
TE2	New	L8C D30 STD (43.7 m)	339311	737480

Tower No.	Status	Tower Type (& Height)	Easting	Northing
TE1	New	L8(C) DJT STD (48.8 m)	737566	339120
TEG1	New	Gantry 275 kV (Emmock) (12.0 m)	339096	737611

3.3.2 The reconductoring of the Alyth to Tealing and Tealing to Westfield OHLs from 275 kV to 400 kV form part of separate Section 37 Consent applications, discussed in **Volume 2, Chapter 1: Introduction and Background** although elements of these projects are shown on the figures in Volume 3 and assessed accordingly in the EIAR in the event that there be the need for maintenance operations during the construction of the Proposed Development. The approach to identifying and assessing cumulative impacts is detailed in **Volume 2, Chapter 11: Cumulative Effects**.

3.3.3 There are no borrow pits included in the Proposed Development. If it is found that there is a requirement for a borrow pit it would be an Associated Development, as described in **Section 3.4**. Any soil excavated would be reused for the reinstatement of temporary infrastructure, such as tracks.

Ancillary Development for which Deemed Planning Permission is sought

3.3.4 The following works would be required as part of the Proposed Development, or to facilitate its construction and operation:

- the upgrade of existing, or creation of new, bellmouths at public road access points; the formation of access tracks (permanent, temporary, and upgrades to existing access tracks);
- temporary working areas around infrastructure to facilitate construction;
- formation of flat areas from which the conductor will be pulled during construction, which will contain earthed metal working surfaces referred to as Equipotential Zones (EPZs);
- vegetation clearance and management;
- other temporary measures required during construction, such as measures to protect road and water crossings during construction (scaffolding etc);
- public road improvements which would be required in multiple areas within the vicinity of the Proposed Development to facilitate construction traffic; and
- removal of temporary works and site reinstatement, including replanting where required. These different forms of ancillary development are described in further detail in this Chapter.

3.4 Associated Works

3.4.1 Other associated works are required to facilitate construction of the Proposed Development, or would occur as a result of its construction and operation, and these are listed below. These works are not included in the application for Section 37 Consent and do not form part of the description of the Proposed Development. On that basis they are not assessed in detail in this EIAR. The associated works include:

- borrow pits and quarries (if required) to source stone for the construction of access tracks. The final location and design of borrow pits and quarries (if required) would be confirmed by the Principal Contractors and separate planning permissions would be sought as required;
- temporary construction compounds would be required to facilitate construction. The final location and design of temporary site compounds would be confirmed by the Principal Contractors and separate planning permissions would be sought as required; and
- modification of the existing distribution network in some areas to accommodate the proposed OHLs. These works are likely to comprise short sections of undergrounding within the vicinity of the Proposed Development and would be undertaken by Scottish Hydro Electric Power Distribution (SHEPD). Consent would be sought by SHEPD as required.

3.5 Limits of Deviation

3.5.1 As noted in **Volume 2, Chapter 3: Project Description**, the process of applying LOD variations/restrictions has been used as an embedded mitigation measure to reduce the potential for significant adverse environmental effects which may occur where infrastructure was microsited from the design locations assessed in this EIA.

3.5.2 In general terms a Limit of Deviation (LOD) defines the maximum extent within which a development can be built. In the case of the Proposed Development, an LOD is required for each of the key components of the project, ie each of the new steel lattice towers being installed, access track routes and temporary working areas. The application of LODs therefore acts as a design control and embedded mitigation measure, ensuring that any subsequent micrositing of infrastructure remains within assessed parameters. It should be noted that the design of the Proposed Development described within this EIAR has been established following the identification of detailed environmental and technical considerations. The design process has included the appointment by SSEN Transmission of the Principal Contractor to inform the design and the constructability of the Proposed Development, including construction access. Investigation of sub-surface and geotechnical conditions has not been concluded at this stage in reporting. It is possible therefore that the location of individual towers or other infrastructure might alter following geotechnical investigation and detailed design (referred to as micrositing) to reflect localised land, engineering and environmental constraints. The LOD process provides the necessary flexibility to accommodate such changes, while ensuring that embedded mitigation is retained and that the potential for significant adverse effects remains controlled within the parameters of this EIAR.

3.5.3 Consideration is given to the following principles in defining the LOD for the Proposed Development:

- presumption towards the proposed OHL alignment whilst providing flexibility for micrositing during the detailed design phase;
- presumption towards avoiding sensitive environmental features and minimising impacts on land use; and
- presumption towards avoiding residential properties.

Horizontal LOD

3.5.4 In general, the horizontal LOD for which Section 37 Consent is sought is as follows:

- OHL infrastructure (ie steel lattice towers and all temporary working areas, EPZs and conductors):
  - suspension towers and OHL conductors: 100 m either side of alignment centre[1] line which is shown on **Volume 3, Figure 3.1: Proposed Development for which Section 37 Consent and Deemed Planning Permission is sought** and
  - tension towers: 200 m LOD radius around the tower position (tension towers would move a maximum of 100 m from their current position due to the Operational Corridor).
- All temporary working areas must remain within the LOD. Access tracks outwith the OHL infrastructure LOD (distance refers to either side of the track centre line):
  - 100 m LOD for new temporary or permanent access tracks;
  - 25 m LOD for existing access tracks being upgraded;
  - where access tracks are within the OHL infrastructure LOD, the LODs would be merged.

Vertical LOD

3.5.5 It is possible that further engineering analysis at the detailed design stage may alter the required heights of towers necessary to maintain statutory ground clearance. A vertical LOD, ie the maximum height of a tower above ground level, is therefore also sought to allow a height increase or decrease of 9 m on the proposed tower height presented within **Volume 4, Appendix 3.1: Tower Schedule**. The 9 m variation is consistent with the extensions to which steel lattice towers are designed, and therefore any increase or decrease of steel lattice towers would be no greater than 9 m. As noted within **Section 3.2.1** with respect to the location of infrastructure, there is also a high degree of certainty

[1] In plan this is the line of the earth wire which runs between the peaks of each tower.

in relation to the height of infrastructure given the engineering design work undertaken to date. The vertical LOD provides some flexibility nonetheless.

Management of Micrositing Within LOD

3.5.6 Where there is a requirement to vary the location (or height) of infrastructure within the LODs, the relevant environmental information within the EIAR would be reviewed to establish any potential constraints or adverse change in effect. Further advice on LOD changes would be sought from environmental specialists, and where relevant consultation would be sought from Angus Council (as local authority) and other statutory consultees as required.

3.5.7 Prior to any change being made to the Proposed Development within the LOD, a change control process would be undertaken to ensure that there is no unacceptable increase in adverse impacts as a result of the change. This process is managed via the Applicant's internal change control process'.

3.5.8 The proposed alignment in the Application, from which the LOD is calculated, is shown on **Volume 3, Figure 3.1: Proposed Development for which Section 37 Consent and Deemed Planning Permission is sought** and is referred to in this EIAR as the "Alignment".

3.6 Description of Overhead Line Infrastructure

Steel Lattice Towers

Standard Towers

3.6.1 Three basic types of towers are proposed as OHL support structures within the Proposed Development, as illustrated in **Volume 3, Figure 3.2: Tower Design** and as follows:

- suspension towers: these are used for straight sections of OHL where there is no need to manage uplift loads on the support structure. The conductors are suspended from the tower arms;
- angle/tension towers: these are used either for straight sections, where there is a need to manage uplift loads on the support structure, where there is an operational security requirement, or where there is a need to change the direction of the OHL alignment. The conductors extend from the tower arms horizontally; and
- terminal towers: proposed at the substations, from which the termination of the OHL to the substation is made. The conductors extend from the tower arms horizontally and downwards into the substation.

3.6.2 **Table 3.1: Tower Design Parameters** presents the tower designs which will be used for the Proposed Development, all lattice design, and constructed from fabricated galvanised steel which will be grey in colour.

Table 3.1: Tower Design Parameters

	Proposed 400 kV OHL
Tower suite	Proposed L8 Tower Suite
Figure reference	**Figure 3.2: Tower Design**
Average height (m)	49.6
Design height range (m)	43.66 to 62.87
Total no. of towers (permanent)	3 suspension towers 9 angle/tension towers 7 terminal towers **19 towers total**
Total no. of towers (temporary)	3

3.6.3 Tower locations, structure type and design heights (above ground level) are provided in **Volume 4, Appendix 3.1: Tower Schedule**.

Conductors and Span Length

Proposed 400 kV OHL

3.6.4 The proposed steel lattice towers would support six conductor bundles (three wires per bundle) on six horizontal cross-arms (three on each side). The conductor bundles would be supported from insulator sets (also known as suspension or tension sets) attached to each of the cross arms; insulators are proposed to be glass, but can also be made of other material, either porcelain or composite materials. The OHL insulator sets will use a mix of single and twin suspension strings per arm depending on the required strength and tower type. The insulator sets will be approximately 5.1 m long for suspension towers and approximately 7.7 m for tension towers.

3.6.5 The span length (distance between towers) will vary depending on topography, constraints, and land usage. The current average span length is approximately 225 m with maximum span of 375 m along the OHL alignment.

3.6.6 An earth wire conductor with a fibre optic core (referred to as Optical Ground Wire or OPGW) will be suspended between tower peaks, above the phase conductors. For some tension towers where the conductor arms are of unequal lengths, the earthwire would be off-set to one side of the tower peak to maintain its position equidistant from the conductors on each side. Phase conductors will have a diameter of 37.3 mm and earthwire will have a diameter of 23.9 mm.

3.6.7 The conductors will achieve a minimum clearance to ground of 9 m under normal operating conditions in all areas. There may be locations along the routes that call for additional clearance requirements.

3.7 Typical Construction Activities for Overhead Line Infrastructure

3.7.1 High voltage OHL construction typically follows a standard sequence of events as follows:

- Phase 1 – enabling works;
- Phase 2 – construction works;
- Phase 3 – commissioning;
- Phase 4 – dismantling existing OHLs; and
- Phase 5 – reinstatement.

Phase 1 – Enabling Works

Existing Distribution and Transmission Lines

3.7.2 Works would be required to some existing electricity distribution network infrastructure and 275 kV transmission network infrastructure to facilitate safe working and operating conditions given the proximity of the existing OHLs to the proposed OHL. It is anticipated that these network assets would be realigned or undergrounded to make way for the Proposed Development. Where this relates to electricity transmission infrastructure (132 kV and above), it is included as part of the Proposed Development, see **Section 3.1** above. For electricity distribution infrastructure specific details are not available at this stage; these works do not form part of the Proposed Development but are included here as 'associated works' for the purposes of the EIA, see **Section 3.4**.

Access During Construction

3.7.3 Safe construction access will be required to each tower construction site for delivery of materials, plant, fittings, fixtures, working platforms and operatives. Access requirements to each tower depend on the tower type and the construction operations required at that tower.

3.7.4 Many individual tower sites will be accessible from public roads and existing farm/forestry tracks. The location of individual towers has been developed along the proposed OHL alignment to utilise (where possible) existing accesses, however access spurs from these tracks may be required.

3.7.5 Many of the existing accesses have been identified as requiring upgrades to bring them to a standard required for delivery of the type of plant and volume of materials required to construct the Proposed Development.

3.7.6 Existing road junctions will be utilised where possible, where field or farm tracks exist; however, new or upgraded access junctions will require formation in agreement with the respective local authority roads department.

3.7.7 Access for construction traffic will also utilise access routes and passing places identified within the proposed Emmock 400 kV substation (Angus Council Ref: 24/00699/FULN) application, namely via Emmock Road and those proposed within the Kintore to Tealing 400 kV OHL (ECU Ref: ECU00005225). These access tracks and passing places provide a means of accessing the Site while avoiding the need for new construction access. The use of these road works within the Proposed Development will be subject to consideration of environmental constraints assessed **in Volume 4, Appendix 3.5: Indicative Public Road Improvement Works**, which include potential effects on Ancient Woodland Inventory (AWI), protected species, flood risk areas, and cultural heritage assets. Any passing places or junction upgrades will be designed to avoid or minimise adverse effects, and all works will be undertaken in accordance with SSEN Transmission's General Environmental Management Plans (GEMPs) and Species Protection Plans (SPPs) as appropriate.

3.7.8 The design of access tracks has been developed by the project team considering both construction and operational access requirements, and with reference, where relevant, to NatureScot's good practice guide on constructing access tracks in Scottish uplands[2]. All new access tracks will be constructed in accordance with good practice working methods with watercourse crossings designed and constructed to comply with legislation set out in *The Water Environment (Controlled Activities) (Scotland) Regulations 2011* (as amended). Typical access solutions are set out below with respect to the different technology types proposed and a typical access track design is presented in **Volume 3, Figure 3.3: Typical Access Track Cross Sections (Indicative)**.

3.7.9 Access track upgrades, construction and ground protection can be undertaken in a number of ways. The preferred method for each site will be selected by the Principal Contractors based on the suitability to withstand expected construction loads, cause the least environmental damage, and be installed/recovered at the lowest cost.

3.7.10 The range of construction accesses proposed include:

- patching/upgrade of existing access tracks;
- installation of permanent access track routes to new tower locations to assist with ongoing operation, maintenance and repair of the proposed asset, and where land use/land management activities can accommodate or benefit from this;
- installation of temporary metal or plastic roadway panels (eg Trackway, Dura-Base or similar);
- installation of temporary stone tracks with geo-textile fabric base; or
- use of specialised low ground bearing pressure vehicles.

Existing Accesses Upgrade and Repair

3.7.11 Where possible, the Proposed Development seeks to use existing access track networks to facilitate construction. Approximately 3 km of existing access tracks require upgrading to make suitable for safe construction access. These upgrades vary in extent, from filling of potholes, to adding additional layers of aggregates to the running surface, in some cases requiring additional geotextile or geogrids as well as stone to be added to the track structure. Some accesses such as those requiring widening of the running surface may also require changes to drainage arrangements. During use, the access tracks may require ongoing maintenance to ensure a suitable running surface is maintained.

Temporary Access Tracks

3.7.12 Approximately 4.3 km of temporary access track will be required to be installed using one of the following construction methods:

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[2] Scottish Natural Heritage, 2013 (Updated 2015). Constructed tracks in the Scottish Uplands (2nd Edition). [Online] Available at: https://cairngorms.co.uk/wp-content/uploads/2019/09/CD039-Scottish-Natural-Heritage-Constructed-tracks-in-the-Scottish-Uplands-2015.pdf

- Temporary Stone Tracks: Temporary stone tracks on a geo-textile fabric base may be used to facilitate safe construction vehicular access to tower locations for construction where no permanent access is required, or where nearby access is sufficient for ongoing operation of the Proposed Development. All temporary stone tracks will be removed and reinstated on completion of construction. Track widths will be 3.5 m as a minimum, but most access tracks will be approximately 7 m (including drainage ditches), reduced to 5 m for floated access tracks.
- Temporary Roadway Panels: Metal or plastic interlocking roadway panels (eg Trackway, Dura-Base or similar) can be installed over existing access tracks or to form new access for the duration of construction works. The delivery/installation vehicle would travel to the Site loaded with panels and may also pull a trailer loaded with additional panels. The panels are usually unloaded and laid individually directly from the delivery/installation vehicle using the Hiab crane device mounted on the vehicle. The first panels would be laid onto the access then the wagon would drive onto the panels and advance along the access, installing additional panels to extend the 'road' as it proceeds.
- Specialist Low Ground Bearing Pressure Vehicles: Vehicles with low ground bearing pressure tyres or with rubber tracks may be employed for certain lightweight operations eg taking small quantities of material or a small team of operatives to remote sites where no track exists. Additional access protection may not be needed if these operations can be carried out without leaving track marks, usually only possible in dry conditions. The tracks for these vehicles are referred to as 'All-Terrain Vehicle (ATV)' tracks.

3.7.13 Soil stabilisation techniques are used to enhance the durability and functionality of access tracks, whether temporary or permanent. Temporary methods, such as mechanical and chemical stabilization, provide immediate support and reduce erosion. Permanent techniques, like cement and lime stabilization, ensure long-term durability and minimal maintenance. These methods also reduce the need for extensive stone and vehicle movements compared to full stone access tracks, making them more efficient and environmentally friendly.

New Permanent Access Tracks

3.7.14 New permanent access tracks will be required in some locations for the inspection, maintenance and repair of the Proposed Development during its operation. These permanent access tracks are subject to further design and landowner agreement; however, where agreement to retain an access is not acquired, the access will be removed and the ground will be reinstated through a methodology and standard agreed with the landowner (see Temporary Stone Tracks section above in **Section 3.7.11**. The access routes shown are current best options identified, but subject to site investigation and detailed design, may be subject to change (within the specified LOD) to achieve favourable gradients or avoid identified constraints.

3.7.15 See **Volume 3, Figure 3.3: Typical Access Track Cross Sections (Indicative)** for illustrations of typical track design under different circumstances. Temporary track widths will be approximately 7 m (including drainage ditches). Approximately 2.7km of new permanent access track will be required to be installed which will be approximately 4.5 m wide.

Access Junctions/Bellmouths

3.7.16 Formation of numerous temporary and permanent bellmouth/access junctions within the existing road network are required. Existing bellmouths will be also utilised, which are anticipated to require minimal upgrade work. Typical bellmouth layouts are provided in **Volume 3, Figure 3.4: Typical Bellmouth Layout (Indicative)**, and their locations are shown on **Volume 3, Figure 3.1: Proposed Development for which Section 37 Consent and Deemed Planning Permission is sought**. Deemed Consent is being sought for access tracks, bellmouths, and junction upgrades as part of the Section 37 application.

Public Road Improvement (PRI) Works

3.7.17 To enable larger construction vehicles to access the Site, a number of PRI works would need to take place. The type of works required include short sections of road widening, junction widening, passing places and bridge strengthening. **Volume 4, Appendix 3.5: Public Road Improvement Works** details the maximum number of potential passing places and maximum parameters for road widening. It presents high-level information which will be progressed further at the detailed design stage, including environmental information and mitigation. Location plans are also provided in:

- **Volume 3, Figure 3.5: Indicative Public Road Improvement Works**

Watercourse Crossings

3.7.18 Watercourses have been avoided in the design of the proposed tower positioning and associated accesses as far as possible, although due to the linear nature of Proposed Development and topographical challenges, some existing watercourse crossings will be used for proposed tower accesses. The design of any upgrade to these crossings will be agreed by the Principal Contractors as part of the detailed design, following best practice in consultation with the Scottish Environment Protection Agency (SEPA). Appropriate authorisations will be obtained by the Principal Contractors, as required. Typical designs are provided in **Volume 3, Figure 3.6: Typical Watercourse Crossing Sections (Indicative)**.

3.7.19 All watercourse crossing engineering works will be in compliance with the *Water Environment (Controlled Activities) (Scotland) Regulations 2011* and will follow best practices in line with SEPA guidance.

Access During Operation

3.7.20 New permanent access tracks are only proposed where topography and ground conditions are not adequate for ATV/trackway access. It is intended however to keep requirements for permanent access tracks to a minimum. Where required, permanent access tracks would be reinstated to a width suitable for 4x4 vehicles and with reference, where relevant, to NatureScot's good practice guide on constructing access tracks in Scottish uplands[3].

Vegetation Management

3.7.21 An Operational Corridor is defined as the designated area around the OHL that is maintained to ensure safe and reliable operation of the OHL. As noted in **section 3.5.4** the Operational Corridor would never extend beyond the LOD. Trees are therefore removed within the Operational Corridor to facilitate construction and ensure continued safe operation of the OHL.

3.7.22 The operational corridor width will typically be 45m either side of the overhead line centreline, but this may vary depending on local topography. Within the Operational Corridor, habitat will be allowed to regenerate naturally; however, natural regeneration of trees will be managed through tree removal/trimming to prevent them interfering with the safe operation and maintenance of the line ('resilience felling'). The Applicant will be using a process of 'managed resilience' which will seek to retain naturally regenerated broadleaved trees and shrubs as close as possible to the line to keep as much tree cover as possible. Smaller-growing species/shrubs thus being able to be retained closer to the line than larger growing species. OHL tree maintenance would take place on a four-yearly cycle.

Site Compounds and Borrow Pits

3.7.23 As mentioned in **Section 3.4** it is currently anticipated that construction compounds and laydown areas would be required given the scale of the Proposed Development, the locations of which would be confirmed by the Principal Contractors. The obtaining of any necessary planning consent or other authorisations required for the Site compounds will be the responsibility of the Principal Contractors. The final location and design of borrow pits and quarries would be confirmed by the Principal Contractors and separate planning permissions would be sought as required.

Temporary Diversions

3.7.24 To facilitate the construction of the Proposed Development, temporary diversions are required to be constructed to allow for continued operation of the network. It is anticipated that there are two areas where temporary diversions will

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[3] Scottish Natural Heritage, 2013 (Updated 2015). Constructed tracks in the Scottish Uplands (2nd Edition). [Online] Available at: https://cairngorms.co.uk/wp-content/uploads/2019/09/CD039-Scottish-Natural-Heritage-Constructed-tracks-in-the-Scottish-Uplands-2015.pdf

be required across the Proposed Development, at locations where the proposed OHL will interact with existing circuits on the network. Details of these temporary diversions are presented in **Volume 3, Figure 3.1: Proposed Development for which Section 37 Consent and Deemed Planning Permission is sought** include:

- Alyth to Tealing Temporary OHL, tower
- Tealing to Westfield Temporary OHL, towers

3.7.25 The temporary diversions are required to be installed prior to any modifications of the existing network taking place to maintain the operability of the existing network. To minimise the outage requirements, the temporary tower(s) is usually offset from the existing alignment to create sufficient space to carry out the construction.

3.7.26 The first construction activity to take place is installation of temporary and permanent access tracks to the proposed temporary tower(s) and to any of the existing towers within the same section. Once access to the tower locations is established the next step is installation of the foundations. The towers are constructed in the same process as a permanent tower which is described below in Phase 2 – Construction Works.

3.7.27 Once the temporary tower assembly is complete the stringing operations can then take place to move the existing circuit over to the temporary tower(s). Access is typically required to the closest tension towers at each end of the temporary diversion on the existing line to adjust the conductors as they are moved over to the temporary tower. The sequence for moving the circuits over to the temporary towers is typically as follows:

- a short single circuit outage is taken on the existing OHL to allow for the circuit to be moved across to the temporary tower;
- this is followed by a double circuit outage to allow for the earth wire to be moved across or an additional earth wire to be installed on the temporary diversion to the temporary tower to provide lightning protection and communications for protection of the circuit; and
- upon completion of this, the circuit that has been moved over can then be energised and the temporary diversion is then complete.

3.7.28 Once the main construction works have been completed the above sequence is then reversed to move the circuit back over to the modified existing OHL and the temporary tower(s) can then be dismantled and surrounding area reinstated.

Construction Lighting

3.7.29 Winter working may require task-specific lighting due to the shorter duration of daylight, when lighting will be required at the beginning and end of the day. Lighting will be used only when required during core working hours, unless otherwise stated, and will comprise lighting of work areas and access and egress with low level directional lighting. Outside of working hours lighting will only be used for critical safety and security purposes. Security cabins will require lighting during the hours of darkness, within and outwith working hours.

Phase 2 – Construction Works

Foundations

3.7.30 Different approaches to forming foundations may be used for steel lattice towers, subject to ground conditions at each location. These are likely to comprise:

- conventional pad and column foundations (no piling installation); and
- pile caps (concrete foundations formed around the piles to tie the structure into competent ground).

3.7.31 Foundation types and designs for each tower will be confirmed following detailed geotechnical investigation at each tower position. All tower positions will require foundations at each leg. The foundation type is expected to be a combination of conventional (concrete pad and column) and piled type. This assumption is based on an initial geotechnical desktop survey and the anticipated different construction methodologies required due to the varying terrain. Conventional foundations are typically used in locations of good ground conditions. Piled foundations are used where ground conditions are found to be poor, such as in areas of flooding and peat. Dimensions of pad and column foundations will be confirmed following micrositing, but usually consist of formation to depths of between 3 m and 6 m below ground level (bgl) and will typically be in the order of 6 m by 6 m in plan size for each tower leg. The foundation is located beneath the ground with a layer of soil covering it of sufficient depth for habitats to reinstate. The permanent footprint above ground is approximately 1 m by 1 m and referred to as the 'muff'. The structure footprint for each tower, ie the area of the tower base bounded by the four legs, is presented in **Volume 4, Appendix 3.1: Tower Schedule**.

3.7.32 In areas with carbon rich soils, heavily contaminated land or where otherwise a significant reduction in environmental impact can be achieved, the Applicant may seek, with the landowner's permission, to install piles with the pilecap above ground. In these cases, the leg footprint would increase to a maximum of 6 m x 6 m and be up to 2 m thick. Such occurrences would be by exception and would not typically be employed in arable farmland.

3.7.33 Specialised foundations, such as floating foundations, are used where neither conventional nor piled foundations are suitable for the localised ground conditions. At this stage there are no specialised foundations expected for the Proposed Development however, this is subject to further site-specific ground investigations.

3.7.34 Where conditions are suitable, the Applicant may opt to use steel equivalent foundations, known as steel grillages, instead of reinforced concrete. The construction activities and environmental impact, bar the pouring and transport of concrete, are anticipated to be effectively the same where steel grillages are utilised.

3.7.35 For the purposes of this EIAR it has been assumed that individual tower foundations and associated construction activities will require a fenced off temporary working area of up to 100 m x 100 m around each individual tower location. The exact dimensions of the temporary working area around each tower will be confirmed following micrositing and further design by the Principal Contractors.

3.7.36 Where encountered, topsoil will be stripped from the temporary working area to allow installation of tower erection pad(s) as necessary in order to accommodate construction plant. Concrete is likely to be brought to site ready-mixed, although tower locations with difficult and remote access may require limited batching on-site. Once the concrete has been cast and set, the excavation will be backfilled, using the original topsoil where possible.

3.7.37 It is anticipated that formation of each tower foundation will take approximately four weeks. **Plate 3.1: Illustrative Image of Tower Foundation Construction** provides an illustrative image of tower foundation construction.

Plate 3.1: Illustrative Image of Tower Foundation Construction

Steel Lattice Tower Construction

3.7.38 Tower construction can typically commence four weeks after the foundations have been cast, subject to weather conditions and concrete curing rates. Tower steelwork would be delivered to each tower construction site either as individual steel members or as prefabricated panels, depending on the method of installation and the available access. A temporary working area up to 100 m by 100 m, is required at each tower location to facilitate access, laydown and assembly. **Plate 3.2: Indicative Temporary Working Area Arrangement** illustrates the temporary working area arrangement for towers which differ depending on the tower type (suspension and tension) but will have the following constituents:

- crane pad constructed out of crushed stone, geogrid and geotextiles to form a level stable base on which the crane can safely work. The pad can be installed as soon as tower foundation is complete. It must be constructed in accordance with the temporary works design (compacted and tested) to ensure the made up ground meets the ground bearing capacity required during crane lifting operations;
- piling stone pad where required to provide suitable ground to support the piling rig during operations, either a one level pad or split-level pads to suit the ground profile. The pad can be installed as soon as access is ready. It must be constructed in accordance with the design (compacted and tested) to ensure the made-up ground meets the ground bearing capacity required for the drilling rig;
- telehandler stone pad is required to provide suitable ground to support the telehandler during operations. The pad can be installed as soon as tower foundation is complete. It must be constructed in accordance with the temporary works design (compacted and tested) to ensure the made-up ground meets the ground bearing capacity required during crane lifting operations;
- tower access surround, this area will not require stone however will be used as a laydown area for materials throughout the tower construction process. Where ground is level, trackway matting may be utilised to spread the load across the ground. If the Site is particularly sloped, then the compound will be microsited as much as possible to provide a sufficient working area; and
- tension towers require a temporary ‘holding out position’ to raise the tower working platforms which will be utilised when stringing the conductors (see **paragraph 3.7.41** below). This platform is winched into position by a tractor at one and a half the tower height away and once in position gets locked off and attached to concrete sledges. Where this holding out position cannot be left in situ for the duration of the stringing works due to on-site constraints (eg roads/walkways) the platform can be locked off to alternative concrete sledges closer to the tower body.

3.7.39 **Plate 3.3: Illustrative Image of Tower Construction** provides an illustrative image of the construction of a tower.

Plate 3.2: Indicative Temporary Working Area Arrangement

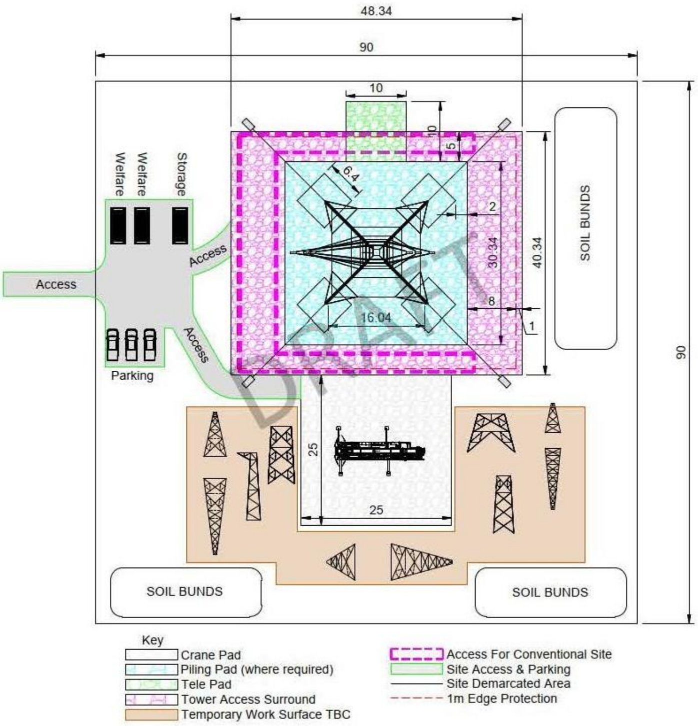

Plate 3.3: Illustrative Image of Tower Construction

Conductor Stringing

3.7.40 The conductor would be delivered to the Site on wooden drums in pre-determined pulling section lengths. Prior to stringing the conductors, temporary protection measures (eg netted scaffolds), would be required across public roads, existing access tracks. Where conductors are pulled between towers, methods will ensure that conductors do not come to ground and therefore watercourses will be protected; standard measures such as a wooden A-frame will be used over smaller burns and scaffolding and/or traffic control over navigable rivers.

3.7.41 **Plate 3.4: Illustrative Image of Temporary Construction Scaffolds** provides an illustrative image of temporary scaffolding.

Plate 3.4: Illustrative Image of Temporary Construction Scaffolds

3.7.42 Conductor stringing equipment (ie winches, tensioners and ancillary equipment) are set out at EPZs at either end of pre-selected sections of the OHL. They are usually placed approximately one and a half times the tower height from the tension tower which terminates the section being pulled. The EPZ landforms will be restored to their original profile. Pulling locations require a permanent access track.

3.7.43 Pilot wires (or ‘bonds’) would be pulled through the section to be strung. These would be hung on blocks (wheels) at each suspension tower and connected to a winch and tensioner at the respective end of the section. The winch, in conjunction with the tensioner, is used to pull the pilot wires between the structures. The conductor is pulled via the pilot wires through the section under tension to avoid contact with the ground and any underrunning obstacles. Once the conductor has been strung between the ends of the section it is then tensioned and permanently clamped at each tower.

Helicopter Use During Construction

3.7.44 Helicopters may be used during the conductor stringing phase at any point along the entire length of the Proposed Development, to introduce the pilot wire which will then be used to pull the conductors and earth wires through.

3.7.45 In some cases, helicopters may be used more widely, for example for tower erection (instead of a crane) or to deliver steel for foundation installation. Where helicopters are used, construction plant will still require access to each tower location to facilitate construction and erection of towers. Helicopter landing zones would also need be identified, which would be the responsibility of the Principal Contractors.

Phase 3 – Commissioning

3.7.46 The OHL and support towers would then be subject to an inspection and snagging process. This allows the Principal Contractors and the Applicant to check that the works have been built to specification and are fit to energise. The circuits would then be energised from the substations in a phased sequence.

Phase 4 - Dismantling Existing OHLs

3.7.47 The following elements require dismantling/removal:

- removal of the redundant section of the existing Alyth to Tealing 275 kV OHL north of Emmock substation, following its rerouting into Emmock substation; and
- removal of the redundant section of the existing Tealing to Westfield 275 kV OHL south of Emmock substation, following its rerouting into Emmock substation.

3.7.48 Conductors and insulators would be removed. The conductors would be collected using winch and cable drum, using a method similar to that described above. Tower removal is typically completed by cutting the legs and felling the tower in a controlled manner. The towers are then cut into sections using hydraulic shears and sections of tower will either be extracted from the Site using an ATV or flown out by helicopter depending on the location of the tower. The tower leg stubs and concrete foundation are normally decommissioned in situ, with stubs folded into an excavation of approximately 1 m depth within the tower's footprint, and the ground reinstated.

3.7.49 The existing Operational Corridor will be returned to the landowner to be incorporated into previous use.

Phase 5 – Reinstatement

3.7.50 Following commissioning of the Proposed Development, all construction sites will be reinstated. Reinstatement will form part of the contract obligations for the Principal Contractors and will include the removal of all temporary lattice tower diversions, temporary access tracks, all work sites around the tower locations and the re-instatement of all construction compounds. An Outline Site Restoration Plan is provided in **Volume 4, Appendix 3.3: Outline Site Restoration Plan** and reinstatement principles are detailed in the Applicant's General Environmental Management Plans (GEMPs) provided in **Volume 4, Appendix 3.2 General Environmental Management Plans (GEMPs) and Species Protection Plans (SPPs)** including soil management.

Reinstatement of Tower Access Tracks

3.7.51 Reinstatement of excavated temporary stone access tracks will involve the replacement of subsoil and topsoil, and grading and installation of drainage, as required, with turves replaced vegetation side up. Where required, donor turves may be sourced from adjoining areas to replace lost turves and provide a mosaic from which vegetative cover of the established species are able to recover. Where there are insufficient turves, the ground will be allowed to vegetate naturally, although some seeding may be required to stabilise sites and prevent erosion, or where landowner requirements dictate otherwise. Temporary access tracks placed on top of the existing ground level (of floated construction type) may not require any reinstatement measures after removal of the stone and geotextile base.

Reinstatement of Temporary Working Areas

3.7.52 Topsoil will be stored within the temporary working area for each tower during construction. Where possible, turves will be removed and stored on top of the topsoil bunds for use in the reinstatement. Sub-soils removed to enable the construction of the foundations will be temporarily stockpiled in separate bunds within the temporary working area. Soil management will follow the principals in the Applicant's GEMP as provided in **Volume 4, Appendix 3.2 General Environmental Management Plans (GEMPs) and Species Protection Plans (SPPs)**.

3.7.53 Where a temporary working area was previously vegetated, they will be allowed to re-vegetate naturally wherever possible.

Reinstatement of Construction Compounds

3.7.54 Construction compounds will be reinstated at the end of construction with all buildings and materials removed and soils appropriately reinstated.

3.8 Land Take

3.8.1 **Table 3.2: Approximate Land Take for Construction and Operation of the Proposed Development** summarises the indicative land take associated with the Proposed Development, based on the nature of activities described in the preceding sections.

Table 3.2: Approximate Land Take for Construction and Operation of the Proposed Development

Activity	Construction (m^2)	Operation (m^2)
Access Track - Temporary stone (track length 4.33 km x width 7 m)	30,317	N/A
Access Track - New Permanent; excluding existing accesses. (track length 2.69 km x width (4.5 m)	12,087	12,087
Existing Track Upgrade (track length 3.05 km x assume 3 m widening)	N/A	9.153
Temporary Working Areas Including EPZ	583,875	N/A
Permanent Land Take for towers (1 m^2 per tower leg)	N/A	52
Permanent Land re-instatement at towers (1 m^2 per tower leg)	N/A	52

3.9 Construction Programme

3.9.1 It is anticipated that construction of the Proposed Development would take place over a four-year period. The detailed programming of works will be the responsibility of the Principal Contractors in agreement with the Applicant. It is anticipated that construction will commence in 2026 (subject to consents and approvals being granted) with a proposed energisation date of late 2030. The construction programme would closely align with the Kintore to Tealing 400 kV OHL project. The construction phasing and programme is subject to change based upon progress with the necessary statutory consents being granted, the discharge of any pre-commencement conditions, and voluntary wayleaves being agreed or granted through the necessary wayleave process. The final decisions in relation to construction methods and phasing would be made by the appointed Principal Contractors, having regard to any conditions attached to the statutory consents.

3.10 Construction Employment and Hours of Work

3.10.1 The delivery of a major programme of capital investment provides the opportunity to maximise support of local communities.

3.10.2 Employment of construction staff would be the responsibility of the Principal Contractors, but SSEN Transmission encourages the Principal Contractors to make use of suitable labour and resources from areas local to the works through sustainable procurement codes and supplier guidance.

3.10.3 It is envisaged that there would be a number of separate teams working at the same time at different locations along the Proposed Development. The resource levels would be dependent on the final construction sequence and would be determined by the Principal Contractors.

3.10.4 Construction working is likely to be during daytime periods only. Working hours are currently anticipated to be between approximately 07:00 to 19:00 during British Summer Time (BST) and 07:00 to 18:00 during Greenwich Mean Time (GMT), seven days a week. Special measures and arrangements would be made for works in proximity to sensitive receptors. Any out of hours working would be agreed in advance with the relevant local planning authority.

3.11 Construction Traffic

3.11.1 Construction of the Proposed Development will give rise to regular numbers of staff transport movements, with small work crews travelling to and from work site areas. The construction compounds will have a safe area for parking away from public roads.

3.11.2 Vehicle movements will be required to construct temporary or upgraded access tracks, deliver the foundation and tower components and conductor materials to the Site, and deliver and collect materials and construction plant from the main Site compound and to individual tower locations.

3.11.3 The Principal Contractors will determine where access is required, and for which items of plant, and prepare Traffic Management Plans in consultation with the Applicant and the local authorities. Traffic Management Plans will describe all mitigation and signage measures that are proposed on the public road accesses based on access maps and subsequent site assessments. An Outline Construction Traffic Management Plan (CTMP) is presented in **Volume 4, Appendix 3.8: Combined Transport Statement (TS) and Construction Traffic Management Plan (CTMP)**.

3.11.4 Temporary traffic lights may be required at some locations (eg for delivery of scaffold materials or formation of new road access points). For minor tracks and other crossings, the installation of appropriate warning signs and provision of staff with stop/go boards to control any passing traffic may be adequate.

3.12 Environmental Management During Construction

3.12.1 The assessment in this EIAR has been carried out on the basis that all works would be carried out in accordance with industry best practice construction measures, guidance and legislation, together with the following documents and procedures:

General Environmental Management Plans

3.12.2 GEMPs have been developed by the Applicant. The GEMPs considered relevant for this project are listed below and provided in **Volume 4, Appendix 3.2: General Environmental Management Plans (GEMPs) and Species Protection Plans (SPPs)**:

- Oil Storage and Refuelling;
- Soil Management;
- Working in or near Water;
- Working with Concrete;
- Watercourse Crossings;
- Waste Management;
- Contaminated Land;
- Private Water Supplies;
- Dust Management;
- Biosecurity on Land;
- Restoration; and
- Bad weather.

Species Protection Plans

3.12.3 SPPs have been developed by the Applicant and have been agreed with NatureScot. This full suite is listed below and provided in **Volume 4, Appendix 3.2: General Environmental Management Plans (GEMPs) and Species Protection Plans (SPPs)**:

- Badger;
- Bat;
- Beaver;
- Bird;

- Fresh Water Pearl Mussel;
- Otter;
- Red squirrel;
- Pine marten;
- Water Vole;
- Wildcat; and
- Wood Ant.

Construction Environmental Management Plan

3.12.4 The approach to impact assessment in this EIAR will be undertaken on the basis that mitigation will be applied at various stages in the design, construction and operations phases. This can be considered mitigation through design; embedded mitigation and control measures. The intention during construction will be to avoid, reduce or manage potential significant effects through the adoption of SSEN Transmission management plans which have been developed and implemented effectively on other SSEN Transmission projects, as a condition of the construction contracts entered into by the Principal Contractor.

3.12.5 A Construction Environmental Management Plan (CEMP) will be developed and implemented by the appointed Principal Contractor during the construction phase. The CEMP provides information on the proposed infrastructure and aids in avoiding, minimising, and controlling adverse environmental impacts associated with the Proposed Development. Furthermore, this document will include relevant consent conditions, industry good practice, as well as specific actions required to implement mitigation identified in the EIAR, the planning process and/or other licencing or consenting processes.

3.12.6 The CEMP would also reference the aforementioned GEMPs and SPPs. The implementation of the CEMP would be managed on-site by a suitably qualified and experienced Environmental Clerk of Works (ECoW), with support from other environmental professionals as required.

3.12.7 An Outline CEMP is included in **Volume 4, Appendix 3.4: Outline Construction Environmental Management Plan (CEMP)**.

3.13 Operation and Maintenance

3.13.1 In general, OHLs require very little maintenance. Regular inspections are undertaken to identify any unacceptable deterioration of components, so that they can be replaced.

3.13.2 The Proposed Development consists of OHLs and connections to Emmock and Tealing substations. Operation of the substations is controlled remotely from SSEN Transmission's control centre, with some occasional visits for routine maintenance, inspection or repairs. The Proposed Development itself would be subject to periodic inspection for routine maintenance, in cases of damage to the lines or towers, or in the event of a power outage.

3.13.3 The Operational Corridor of the OHL is also monitored through periodic inspection to identify growth of trees which may compromise the resilience of the OHL. Where trees are identified which could pose a risk the safe operation of the line in the future, these are felled. Removal of other vegetation, eg gorse and rhododendron, may be required to ensure the area under the conductors is clear so access can be taken and to facilitate safe maintenance or repair in the event of failure.

3.13.4 From time to time, inclement weather, storms or lightning can cause damage to either the insulators or the conductors on OHLs. If conductors are damaged, short sections may have to be replaced. Insulators and conductors are normally replaced after about 40 years, and towers may require painting as part of maintenance.

3.13.5 In the event of a fault on the line, delivery of working platforms may be required to tension towers to allow the towers to be safely worked on. These platforms can be delivered on large tracked all-terrain vehicles. In steep or remote areas, it is required to retain access formation to these tension towers to ensure that safe access can be made.

3.13.6 If a section of damaged conductor is to be replaced, a new conductor may be pulled through a section, as such it is required to maintain some of the earth work formations made during construction to ensure there is a safe suitable area to create EPZs.

3.14 Decommissioning

3.14.1 The Proposed Development would not have a fixed operational life. The effects associated with the construction phase can be considered to be representative of worst-case decommissioning effects, and therefore no separate assessment on decommissioning has been undertaken as part of this EIAR.

3.14.2 Should the Proposed Development be decommissioned, the site would be restored as follows:

- The infrastructure would be removed;
- Where removal of infrastructure such as tower foundations would result in more damage than leaving them in place, they would be left in-situ; and
- Disturbed ground would be reinstated.

3.14.3 An outline mitigation strategy for decommissioning has been provided as **Volume 4, Appendix 3.6: Outline Decommissioning Mitigation Strategy** to inform such future requirements and to help avoid the potential for Significant effects associated with this project stage.