West Burton Solar Project

Concept Design Parameters and Principles

Revision D

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Revision D

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1 Introduction

1.1.1 This Concept Design Parameters and Principles document supports an application for a Development Consent Order (DCO) for the construction, operation, maintenance and decommissioning of a ground mounted solar park with a generating capacity of over 50 MW, with associated infrastructure including grid connection and an Energy Storage Facility (hereafter referred to as 'Scheme'). The Applicant is West Burton Solar Project Limited, part of Island Green Power. The Scheme is located to the northwest of Lincoln, straddling the Lincolnshire-Nottinghamshire border.

1.1.2 This document sets out the design parameters and principles by which the Scheme has been designed and the Environmental Impact Assessment has been undertaken. It will be secured by a Requirement in Schedule 2 to the draft DCO in order to prescribe the guiding design principles and parameters to inform the detailed design of the Scheme post DCO consent.

1.1.3 This document should be read alongside the submitted Design and Access Statement **[APP-314 and APP-315]**, which sets out the main design principles and design process undertaken for the Scheme and Chapter 4 of the Environmental Statement (ES) 'Scheme Description' **[APP-042]**.

1.1.4 The spatial extent of the Scheme is referred to as the 'Order Limits' and is shown on the Works Plans accompanying the DCO application **[EN010132/EX4/WB2.3_D]** which are secured by Article 3 of the Draft DCO **[EN010132/EX4/WB3.1_E]**. The Environmental Impact Assessment (EIA) presented in the Environmental Statement (ES) **[APP-039** to **APP-061]** has been undertaken based on the maximum extents of each of the Work Numbers described in Schedule 1 to the Draft DCO as shown on the Works Plans. This approach is known as the use of the 'Rochdale Envelope' which is described in footnote 78 to paragraph 4.2.8 of NPS EN-1 as being an assessment based on a *"series of maximum extents of a project for which the significant effects are established. The detailed design of the project can then vary within this 'envelope' without rendering the environmental impact assessment inadequate"*.

1.1.5 Due to the rapidly evolving technology within the solar photovoltaics and energy storage system sectors, the in-built flexibility allows for the most up-to-date technology to be utilised for the development of the Scheme. The full detailed design at the point of construction will be managed post-consent through the Requirements set out in Schedule 2 of the Draft DCO.

1.1.6 This Concept Design Parameters and Principles document defines the key design parameters which reflect the worst-case scenario adopted in the Environmental Impact Assessment that has been undertaken for the Scheme. As the detailed design of the Scheme will be in accordance with these assessed parameters, the conclusions of the ES will be upheld.

1.1.7 The Concept Design Parameters and Principles have been set out in the following section in Tables 2.1-2.11, organised in accordance with the description of the Works

Numbers as set out in Schedule 1 to the Draft DCO **[EN010132/EX4/WB3.1_E]**. The spatial extents of each Work Number are set out in the accompanying Works Plans **[EN010132/EX4/WB2.3_D]**. Where required, this document will refer to other submitted DCO application documentation that will be secured by a Requirement in the Draft DCO (such as the Outline Construction Environmental Management Plan or Outline Landscape and Ecological Mitigation Plan). Where applicable, these outline management plans will set out further details of the design, parameters and mitigation measures that will be complied with as part of the construction, operation, maintenance and decommissioning of the Scheme.

1.1.8 For each Scheme component outlined in Tables 2.1-2.9, the parameter has been defined by its:

- Location – the location of the Scheme component within the Scheme as assessed within the ES;
- Scale – either a minimum or maximum parameter which has been assessed in the ES; and
- Design – relevant design parameter or principle which has been assessed in the ES.

1.1.9 All heights defined in Tables 2.1-2.9 are Above Ground Level (AGL), unless otherwise specified.

1.2 Design Champion

1.2.1 The Overarching National Policy Statement for Energy (NPS EN-1, November 2023) at paragraph 4.7.5. suggests that 'to ensure good design is embedded within the project development, a project board level design champion could be appointed'.

1.2.2 The Applicant considers it important that a person lead the design process through all stages of the Scheme. The team has had a design champion who led the multi-disciplinary approach to the design of the Scheme from the initial stages. This person led the development of plans showing key constraints to development and the site layout. They organised and led multi-disciplinary workshops to review site layouts and drove forward the design, taking into account the views of planning professionals, the technical design team, the Applicant, transport professionals, consultation, the land referencing team and all other technical disciplines that contributed to the ES. They led development of **6.2.4 Environmental Statement - Chapter 4 Scheme Description [APP-042]** and reviewed the design sections of the 7.6 Design and Access Statement **[APP-314 and APP-315]**. They also led development of this document **[EN010132/EX5/WB7.13_D]**, in collaboration with the Applicant, to ensure firm commitments were made to key principles of design.

1.2.3 The design champion is considered a key member of the team and became the 'go to person' when queries were raised around scheme changes, design iterations and layout. They have sufficient influence to ensure multi-disciplinary approaches were taken and the ability to listen to all perspectives and recommend a way forward. The

design process is iterative and continuous. The design champion is a member of the core team, not remote from it, enabling dynamic decision making where opportunities are identified to enhance design, deliver additional benefits, reduce or avoid environmental impacts or respond to requests for changes to the design from landowners, residents, local authorities and consultees. They are supported by a collaborative team working towards the best possible outcomes.

1.2.4 A design champion will continue to perform the same functions through the post-consent detailed design stages, including in the preparation of the documents and plans secured through the requirements of the draft Development Consent Order [EN010132/EX5/WB3.1_F].

2 Design Parameter and Principles Tables

2.1 Work No.1 Concept Design Parameters and Principles

Table 2.1: Work No.1 Concept Design Parameters and Principles

Scheme Component	Parameter Type	Design Parameters and Principles
Work No.1: (a) **Work No.1A**— a ground mounted solar photovoltaic generating station with a gross electrical output capacity of over 50 megawatts including— (i) solar modules fitted to mounting structures; (ii) DC electrical cabling and combiner DC boxes; (iii) conversion units including inverters, transformers, switchgear, and monitoring and control systems; and (iv) electrical and communications cabling connecting Work No.1A(iii) to Work No.3A, (b) **Work No.1B**— a ground mounted solar photovoltaic generating station with a gross electrical output capacity of over 50 megawatts including— (i) solar modules fitted to mounting structures; (ii) DC electrical cabling and combiner DC boxes; (iii) conversion units including inverters, transformers, switchgear, and monitoring and control systems; and (iv) electrical and communications cabling connecting Work No.1B(iii) to Work No.3B, (c) **Work No.1C**— a ground mounted solar photovoltaic generating station with a gross electrical output capacity of over 50 megawatts including— (i) solar modules fitted to mounting structures; (ii) DC electrical cabling and combiner DC boxes; (iii) conversion units including inverters, transformers, switchgear, and monitoring and control systems; and (iv) electrical and communications cabling connecting Work No.1C(iii) to Work No.3C,		
Work No.1	Location	Work Nos. 1A, 1B, and 1C must be located within the corresponding numbered area shown on the Works Plans.
	Scale	The maximum area of solar infrastructure, including the solar modules and mounting structures, conversion units including inverters, transformers, switchgear, and monitoring and control systems (Work No. 1A-C(i) to (iii), but excluding the full extent

Scheme Component	Parameter Type	Design Parameters and Principles
		of the electrical cabling and communications connecting Work No 1A-C(iii) to Work No 3 (Work No. 1A-C(iv)) is: • Work 1A "West Burton 1" – 73.51 ha • Work 1B "West Burton 2" – 149.62 ha • Work 1C "West Burton 3" – 284.31 ha
	Design Parameters	Work No. 1, excluding Work No.1A-C(iv), will be offset from the following features: • Ditches – 8m • IDB watercourses – 9m • Other water bodies – 25m • Hedgerows and tree lines – 5m, 8m, 12m, 20m; dependent on ecological quality as defined in the Outline Landscape and Ecological Management Plan **[EN010132/EX4/WB7.3_D]**. • Tree canopies – 8m, 12m, 20m; dependent on ecological quality and orientation of shading pattern as defined in the Outline Landscape and Environmental Management Plan. • Public rights of way: 10m • Residential curtilage: 50m
Solar PV Modules and Mounting Structures (Work No. 1A-C(i))	Scale	The maximum height of the highest part of the tracking solar modules at its greatest inclination will be 4.5m. The maximum height of the highest part of the tracking solar modules when horizontal will be 2.5m. The minimum height of the lowest part of the tracking solar modules at its greatest inclination will be 0.4m.
	Scale	The maximum height of the highest part of the fixed solar modules will be 3.5m. The minimum height of the lowest part of the fixed solar modules will be 0.6m. Electrical infrastructure associated with the panels will be elevated by the mounting structures so that it is no less than 0.6 m above the 0.1% Annual

Scheme Component	Parameter Type	Design Parameters and Principles
		Exceedance Probability (AEP) flood level or where this is not possible as high as practicable).
	Scale	Separation distance between rows of tracking panels will be a minimum of 3.0m at the closest point, and there will be a maximum distance of 12.0m between solar module centrelines.
	Scale	Maximum depth of piled mounting structures will be 3.5m below ground level.
	Design Parameter	The tracking solar modules will be aligned in north-south rows, and incline to the east or west up to a maximum inclination of 60 degrees from horizontal.
	Design Parameter	The fixed solar modules will be aligned in east-west rows, and slope towards the south at a fixed slope of 15 to 35 degrees from horizontal.
	Design Principle	The solar modules are likely to be either black or dark blue. This will be fixed during detailed design.
	Design Principle	The frame type is likely to be anodized aluminium alloy or a similar finish.
	Design Principle	The panel technology will be either monofacial or bifacial panels.
	Design Principle	Modules will be mounted on a rack likely to be made with galvanised steel or similar design material.
	Design Principle	Foundations will typically be galvanised steel poles driven into the ground. These will either be piles rammed into a pre-drilled hole or a pillar attaching to a steel ground screw. Foundations in areas of archaeological interest may constitute concrete feet to which the mounting structures will be affixed. In such circumstances, concrete feet will be set directly on the topsoil with no excavation.
DC electrical boxes (Work No. 1A-C(ii))	Scale	Maximum width 0.55m x maximum length 0.65m x maximum height 0.26m
	Scale	Up to 24 DC boxes per inverter within Works No. 1.
	Design Principle	Where a DC box is required, it would sit on a mounting structure.

Scheme Component	Parameter Type	Design Parameters and Principles
Conversion units (including inverters, transformers, switchgear, and monitoring and control system incorporated within a container (Work No. 1A-C(iii))	Design Parameter	Conversion units will be required on each Site at a maximum rate of one conversion unit per 2.5 MW of peak solar energy generation.
	Design Parameter	The maximum parameters of a conversion unit will be 15m in length by 5m in width and a maximum height of up to 3.5m.
	Design Parameter	Conversion units are to be located within Flood Zone 1. Where this is not feasible, the conversion units will be raised 0.6 m above the 0.1% AEP + CC flood level or where this is not possible as high as practicably possible
	Design Principle	Conversion units will sit in containers, externally finished to be in keeping with the prevailing surrounding environment. The exact colour will be subject to manufacturer specifications and agreed with the relevant planning authority prior to construction but will be as similar as feasibly possible to a light grey (RAL 7004) colour finish.
	Design Principle	Monitoring and control systems would consist of manual controls at the conversion units, and automatic and centralised monitoring and control features at the control rooms on the onsite substations.
	Design Principle	A concrete foundation slab, strips or footings for each of the conversion units and a levelling layer of aggregate with a maximum depth of 0.8m will be required, or a concrete plinth set atop the topsoil where non-ground-penetrative works are required.
Conversion Units – Standalone inverters, transformers, switchgear, and monitoring and control system		
Standalone inverters, transformers, switchgear, and monitoring and control equipment	Design Principle	A concrete foundation slab, strips or footings for each of the standalone units, and a levelling layer of aggregate with a maximum depth of 0.8m will be required, or a concrete plinth set atop the topsoil where non-ground-penetrative works are required.
	Design Parameter	Critical infrastructure is to be located within Flood Zone 1. Where this is not feasible, the conversion units will be raised 0.6 m above the 0.1% AEP + CC flood level or where this is not possible as high as practicably possible

Scheme Component	Parameter Type	Design Parameters and Principles
Inverters	Scale	The maximum parameters of an inverter will be 9m in length by 6.5m in width and 3.5m in height, sited within the dimensions of the conversion unit.
	Design Principle	Externally finished to be in keeping with the prevailing surrounding environment. The exact colour will be subject to manufacturer specifications and agreed with the relevant planning authority prior to construction but will be as similar as feasibly possible to light grey (RAL 7035) colour finish.
Transformers	Scale	The maximum parameters of the transformer will be 6.5m in length by 5.5m in width and 3.5m in height.
	Design Principle	Externally finished to be in keeping with the prevailing surrounding environment. The exact colour will be subject to manufacturer specifications and agreed with the relevant planning authority prior to construction but will be as similar as feasibly possible to a light grey (RAL 7035) colour finish.
Switchgear	Scale	The maximum parameter of the switchgear will be 6.5m in length by 2.5m in width and 3.5m in height, sited within the dimensions of the conversion unit. There will be one switchgear at every inverter location.
	Design Principle	Externally finished to be in keeping with the prevailing surrounding environment The exact colour will be subject to manufacturer specifications and agreed with the relevant planning authority prior to construction but will be as similar as feasibly possible to a light grey (RAL 7035) colour finish.
DC electrical cabling (Work No. 1A-C(ii))	Scale	Cabling from and between solar modules, to inverters and transformers: The maximum dimensions of the onsite trench will be a minimum of 0.4m deep and 0.4m wide where cables are buried or a trenchless technique will be used. Suspended cables will be suspended between 0.4m to 2.4m above ground level.
	Design Principle	Cabling will be above ground level between the solar modules. These will be fixed to the mounting structure along the row of racks.

Scheme Component	Parameter Type	Design Parameters and Principles
		Cabling between the solar modules and conversion units will be buried within underground trenches, or a trenchless technique will be used or cables will be suspended where non-ground-penetrative works are required.
Electrical cabling and communications connecting Work No 1A-C(iii) to Work No 4 (Work No. 1A-C(iv))	Scale	Cabling between transformers and the switchgear and from switchgear to the onsite substation: where underground, maximum cable trench dimension will be a minimum of 0.4m deep and 0.4m wide or a trenchless technique will be used. Suspended cables will be suspended between 0.4m to 2.4m above ground level.
	Design Principle	Cables between conversion units to the onsite substation will be buried within underground trenches or suspended where non-ground-penetrative works are required.
Temporary horizontal directional drilling pits if trenchless technique used for Work No. 1A-C(ii) or (iv)	Scale	Maximum dimensions of 25m by 25m in plan, with onsite equipment and structures being of a maximum of 6m in height.
	Design Principle	Groundcover will consist of hardcore aggregate, or track matting, with soil protection measures, dependent on the result of geophysical surveys to establish ground bearing capacity.

2.2 Work No.2 Concept Design Parameters and Principles

Table 2.2: Work No.2 Concept Design Parameters and Principles

Scheme Component	Parameter Type	Design Parameters and Principles
Work No.2 - an energy storage facility comprising (a) battery energy storage cells with automatic fire suppression system or dry pipe sprinkler system; (b) a structure protecting the battery energy storage cells comprised in Work No.2(a) and ancillary equipment, being either one container or multiple containers joined to each other, mounted on a reinforced concrete foundation slab or concrete piling; (c) interconnection units including heating, ventilation and air conditioning or liquid cooling systems and temperature management either housed within the containers comprised in Work No.2(b), attached to the side or top of each of the containers, or located separate from but near to each of the containers; (d) conversion units including inverters, transformers, switchgear and energy management system; (e) monitoring and control systems housed within a container with Work No.2(c) or located separately in its own container or control room; (f) electrical cabling including electrical cables connecting Work No. 2 to Work No.3C; (g) bunded impermeable surface to manage surface water drainage; (h) water storage facility for the purposes of firefighting water supply; and (i) bunded impermeable surface and associated infrastructure to contain used firewater.		
Energy Storage Facility (Work No. 2)	Location	Work No. 2 must be located within the corresponding numbered area shown on the Works Plans.
	Scale	The maximum footprint of the energy storage facility is up to 1.75ha.
	Design Principle	The Energy Storage Facility will utilise a lithium ion energy storage system.
	Design Principle	The design of energy storage facility will include a number of design elements to both prevent, detect and control a fire should one occur. These include: • The use of batteries that are sealed by design so do not vent when in normal use and have no free electrolyte. • The battery modules will contain cells separated by a thermal barrier or an air gap to prevent one cell affecting the temperature

Scheme Component	Parameter Type	Design Parameters and Principles
		of the adjacent one, with the modules themselves also separated from one another by another thermal barrier or an air gap. The thermal barrier or an air gap is intended to ensure that should one cell/module heat up it will not impact on the adjacent cell/module so as to prevent a thermal cascade. • The batteries will be controlled by charging management systems that will detect if a cell or battery is not operating correctly and the whole BESS will be fitted with a fire monitoring system so if one cell or module were to catch fire the fire suppression system will automatically be triggered to slow down the propagation of thermal runaway in the BESS enclosure. • If the BESS system is designed to safely burn out to remove the risk of stranded energy in the battery systems, then this type of BESS system will integrate a dry pipe sprinkler system.
A structure protecting the battery energy storage cells comprised in Work No.2(a) and ancillary equipment, being either one container or multiple containers joined to each other, mounted on a reinforced concrete foundation slab or	Scale	The maximum dimensions of an individual BESS enclosure is 12.2m by 3.0m footprint and up to 3.5m in height.
	Design Parameter	Strings of BESS enclosures and interconnector containers will be separated from each other and surrounding infrastructure by a minimum distance that complies with any relevant NFCC or NFPA guidelines at the time of detailed design.
	Design Principle	Externally finished to be in keeping with the prevailing surrounding environment. The exact colour will be subject to manufacturer specifications and agreed with the relevant planning authority prior to construction but will be as similar as feasibly possible to a cream (RAL 9001) colour finish.
	Design Principle	HVAC or liquid cooling systems will be housed either within each of the containers, attached to the side or top of each of the containers, or located separate from but near to each of the containers.

Scheme Component	Parameter Type	Design Parameters and Principles
concrete piling (Work No. 2(b))	Design Parameter	The foundations for the containers will either be a reinforced concrete base to a maximum depth of 1m, or, if a piling solution is required, piles to a maximum depth of 12m would be used.
Conversion Units (Work No. 2(d))	Scale	The conversion unit will have a maximum height of 3.5m.
	Design Principle	A conversion unit incorporates inverters, transformers, switchgear and energy management systems. These will either be located outside or housed together in a container.
	Design Parameter	The foundations for the conversion units will either be with a concrete foundation slab (to a maximum depth of 1m) for each of the power conversion units and inverters and a levelling layer of gravel with a concrete perimeter pavement when located outside, or on a concrete foundation slab when housed in a container. A piling solution may also be required, for both the indoor and outdoor options, depending on the results of geotechnical surveys. If this is the case, piles to a maximum depth of 12m would be used.
Electrical cabling including electrical cables connecting to Work No.3C (Work No. 2(f))	Scale	Where the cabling is underground, the minimum cable trench dimension will be a depth of 0.4m and 0.4m wide.
	Design Principle	Cabling between battery containers and conversion units will be above ground in cable trays or laid in an underground trench. Cabling between conversion units and the onsite substation will be in an underground trench.
Monitoring and control systems housed within a container with Work No.2(c) or located separately in its own container or control room	Scale	The monitoring and control systems will be housed in a building or container and will be up to a maximum of 12.0m x 3.5m in plan and up to a maximum of 3.5m in height.
	Design Principle	The monitoring and control system will be housed either in an adapted container or built from glass reinforced plastic (GRP).

Scheme Component	Parameter Type	Design Parameters and Principles
(Work No. 2(e))		
Fire suppression system (Work No. 2(a))	Design Principle	Any automatic fire suppression system will comply with any applicable NFCC or NFPA guidelines at the time of detailed design.
	Design Principle	Automatic fire suppression systems, if integrated into the design of each container, will be located either within or outside the container. If located outside, the fire suppression agent containers will either be decentralised and located at each container or centralised.
Water storage structures for the purposes of firefighting water supply (Work No. 2(h))	Location	The external firefighting water storage structures will be located no less than 50m and no more than 300m from the battery containers.
	Scale	The external firefighting water storage units will be no less than 228000 litres in capacity in line with current NFCC guidelines (2023).
	Design Principle	Water storage will either be in sectional steel panel tanks, or cylindrical steel tanks, above or below ground; or will be bunded or excavated ponds.
	Design Principle	Where above ground, tanks will be supported on structural concrete slab foundations which will be to a maximum depth of 1m.
Used firewater containment structures and infrastructure (Work No. 2(i)	Design Principle	A sump will be integrated into each battery storage container for internal fire suppression.
	Design Principle	The compound will be bunded and linked to a bunded lagoon or geocellular crate storage area which will be provided to capture fire water run-off from external fire water.

2.3 Work No.3 Concept Design Parameters and Principles

Table 2.3: Work No.3 Concept Design Parameters and Principles

Scheme Component	Parameter Type	Design Parameters and Principles
Work No.3 - works in connection with onsite substations including: (a) **Work No. 3A**— a substation with works comprising – (i) an up to 132kV substation, with associated transformer bays, feeder bays, transformers, switchgear buildings and ancillary equipment including reactive power units; (ii) control building or container relay rooms with associated offices, storage and welfare facilities; (iii) monitoring and control systems for Work Nos. 1A and 3A; (iv) maintenance compound; (v) electrical cabling; and (vi) earthworks, including soil stripping and site levelling. (b) **Work No. 3B**— a substation with works comprising – (i) an up to 132kV substation, with associated transformer bays, feeder bays, transformers, switchgear buildings and ancillary equipment including reactive power units; (ii) control building or container relay rooms with associated offices, storage and welfare facilities; (iii) monitoring and control systems for Work Nos. 1B and 3B; (iv) maintenance compound; (v) electrical cabling; and (vi) earthworks, including soil stripping and site levelling. (c) **Work No. 3C**— a substation with works comprising – (i) an up to 400kV substation, with associated transformer bays, feeder bays, transformers, switchgear buildings and ancillary equipment including reactive power units; (ii) control building or container relay rooms with associated offices, storage and welfare facilities; (iii) monitoring and control systems for Work Nos. 1C and 3C; (iv) maintenance compound; (v) electrical cabling; and (vi) earthworks, including soil stripping and site levelling.		

Scheme Component	Parameter Type	Design Parameters and Principles
Onsite substations (Work No.3)	Location	Work Nos. 3A, 3B, and 3C must be located within the corresponding numbered area on the Works Plans.
	Scale	Maximum parameters for the onsite substations, including control building or container, welfare facilities, hardstanding areas and hardstanding parking areas therein are outlined below: Site Area Parameter: • Work 3A "West Burton 1" – 0.71 ha • Work 3B "West Burton 2" – 0.71 ha • Work 3C "West Burton 3" – 2.85 ha Height Parameter: • Work 3A "West Burton 1" – 6.5m • Work 3B "West Burton 2" – 6.5m • Work 3C "West Burton 3" – 13.2m
	Design Principle	The substation area is to be levelled and covered in a layer of levelling gravel.
	Design Parameter	Onsite infrastructure will be mounted on a concrete base or monolith plinth to a maximum depth of 1m. If a piling solution is required, piles to a maximum depth of 12m would be used.
Control buildings or containers (Work No. 3A-C(ii)	Scale	Maximum parameters for control buildings or containers within the substation compound are outlined below: Work 3A: • 132kV control room: 10.0m x 5.0m, height 3.5m • 33kV control room: 10.0m x 4.5m, height 3.5m Work 3B: • 132kV control room: 10.0m x 5.0m, height 3.5m • 33kV control room: 10.0m x 4.5m, height 3.5m Work 3C: • 400kV control building: 18.0m x 7.0m, height 3.5m • 132kV control room: 12.0m x 5.0m, height 3.5m • 33kV control room: 18.0m x 7.0m, height 3.5m

Scheme Component	Parameter Type	Design Parameters and Principles
	Design Parameter	Foundations will either be concrete base or plinth to a maximum depth of 1m.
	Design Parameter	Lighting not affixed to a building will be mounted on a lighting column with a maximum height of 3m.
	Design Principle	The control buildings will be modular unit design finished in neutral colours to be in keeping with the prevailing surrounding environment. The exact colour will be subject to manufacturer specifications and agreed with the relevant planning authority prior to construction but will be as similar as feasibly possible to a grey such as Goose Grey (HEX code 848889).
Electrical cabling (Work No.3A-C(v))	Scale	Where underground, maximum cable trench dimension will be a depth of 1.5m and 1.1m wide.
	Design Principle	Where underground, cable trenches will be cut with vertical walls.
	Design Principle	Cables will be rated at 33kV, 132kV and 400kV dependent on their use within the Scheme.

2.4 Work No.5 Concept Design Parameters and Principles

Table 2.4: Work No.5 Concept Design Parameters and Principles

Scheme Component	Parameter Type	Design Parameters and Principles
Work No.5 - works in connection with electrical cabling including: (a) **Work No.5A –** works to lay electrical cables, accesses, and temporary construction laydown areas for the electrical cables including - (i) high voltage electrical cables connecting Work No.3C to Work No.4; (ii) high voltage electrical cables connecting Work No.3C to Work No.3A; (iii) high voltage electrical cables connecting Work No.3C to Work No.3B; (iv) laying down of access tracks, ramps, footpaths, roads, including the laying and construction of drainage infrastructure, signage and information boards; (v) joint bays, link boxes, cable ducts, cable protection, joint protection, manholes, marker posts, underground cable marker, tiles and tape, communications chambers, fibre optic cables and lighting and other works associated with cable laying; (vi) tunnelling, boring and drilling works; and (vii) temporary construction laydown areas comprising – (aa) areas of hardstanding, compacted ground or track matting; (bb) car parking; (cc) area to store materials and equipment; (dd) site and welfare offices and workshops; (ee) security infrastructure, including cameras, perimeter fencing and lighting; (ff) safety infrastructure to manage traffic when crossing roads or other obstacles; (gg) site drainage and waste management infrastructure (including sewerage); and (hh) electricity, water, waste water and telecommunications connections. (b) **Work No.5B** – works to lay electrical cables, accesses, and temporary construction laydown areas for the electrical cables including – (i) high voltage electrical cables connecting Work No.3C to Work No.4; (ii) laying down of access tracks, ramps, footpaths, roads, including the laying and construction of drainage infrastructure, signage and information boards; (iii) joint bays, link boxes, cable ducts, cable protection, joint protection, manholes, marker posts, underground cable marker, tiles and tape,		

Scheme Component	Parameter Type	Design Parameters and Principles
communications chambers, fibre optic cables and lighting and other works associated with cable laying. (iv) tunnelling, boring and drilling works; and (v) temporary construction laydown areas comprising – (aa) areas of hardstanding, compacted ground or track matting; (bb) car parking; (cc) area to store materials and equipment; (dd) site and welfare offices and workshops; (ee) security infrastructure, including cameras, perimeter fencing and lighting; (ff) safety infrastructure to manage traffic when crossing roads or other obstacles; (gg) site drainage and waste management infrastructure (including sewerage); and (hh) electricity, water, waste water and telecommunications connections.		
High voltage electrical cables connecting Work No.3C to Work No.4	Location	Work Nos. 5A and 5B must be located within the corresponding numbered area on the Works Plans.
	Location	Perimeter fencing will be a minimum of 3.0m from the nearest solar panel table and mounting structure.
	Scale	Where set in surface-dug trench, the maximum width of the dug cable trench for the electrical cables is 1.1m set within the 50m cable corridor. This applies except where jointing bays or horizontal directional drilling sections are located.
	Scale	Where set in surface-dug trench with no constraints, the maximum depth of the dug cable trench is 1.5m below ground level. Where crossing existing buried utilities or apparatus, the maximum depth of the dug cable trench is 1.5m below the level of the existing apparatus.
	Scale	Where multiple circuits are trenched along parallel paths, the minimum separation distances between cable circuits is 5.0 m within Work No 5A(i) and 5B.
	Scale	Where set in horizontal directional drilling sections, the 3no. cables making up a single electrical cable circuit will be drilled through individual bores

Scheme Component	Parameter Type	Design Parameters and Principles
		separated by approximately 3.0m set within the 50m cable corridor.
	Scale	Where set in horizontal directional drilling sections, the maximum bore of a single drilled cable tunnel is 1.0m.
	Scale	Where multiple circuits are directional drilled along parallel paths, the minimum separation distances between drilled cable circuits is 5.0m.
	Scale	Where set in horizontal directional drilling sections, the maximum depth of the drilled cable tunnel is 25m below ground level.
	Design Principle	Electrical cables will be set in ducts or directly buried arranged in parallel formation.
	Design Principle	Trenches will be cut with vertical walls.
High voltage electrical cables connecting Work Nos. 3A and, 3B to Work No.3C	Scale	Where set in surface-dug trench, the maximum width of the dug cable trench for a single 132kV circuit is 0.6m set within the 50m cable corridor. This applies except where jointing bays or horizontal directional drilling sections are located.
	Scale	Where set in surface-dug trench, the maximum width of the dug cable trench for two parallel 132kV circuits is 1.0.m set within the 50m cable corridor. This applies except where jointing bays or horizontal directional drilling sections are located.
	Scale	Where set in surface-dug trench with no constraints, the maximum depth of the dug cable trench is 1.5m below ground level. Where crossing existing buried utilities or apparatus, the maximum depth of the dug cable trench is 1.5m below the level of the existing apparatus.
	Scale	Where set in horizontal directional drilling sections, the maximum bore of a single drilled cable tunnel is 1.0m.
	Scale	Where multiple circuits are directional drilled along parallel paths, the minimum separation distances between drilled cable circuits is 3.0m.
	Scale	Where set in horizontal directional drilling sections, the maximum depth of the drilled cable tunnel is 25m below ground level.

Scheme Component	Parameter Type	Design Parameters and Principles
	Design Principle	Electrical cables will be direct buried or set in ducts arranged as either a single or two parallel circuits, with each circuit set in trefoil formation.
	Design Principle	Trenches will be cut with vertical walls.
Joint bays (Work No. 5A(v) and Work No. 5B(iii)	Scale	The maximum dimensions of a jointing bay are 20m long and 6m wide and approximately 3m deep.
	Scale	Jointing bays will be a minimum of 150m apart and a maximum of 2000m apart.
Fibre communications chambers	Scale	The maximum dimensions of the fibre communications chambers are 1.5m by 1.0m in footprint and 1.5m in depth. The chamber covers would stand up to 0.05m above ground level.
	Scale	Fibre bays will be up to a maximum of 2000m apart.
	Design Principle	Covers for fibre bays will be black or dark grey or green metal or plastic.
Tunnelling, boring and drilling works (Work No. 5A(vi) and Work No. 5B(iv))	Scale	Maximum dimensions of 25m by 25m in plan, with onsite equipment and structures being of a maximum of 6m in height. The HDD depth will be a maximum of 25m below the bottom of the river bed and a minimum of 5m below the lowest surveyed point of the River Trent riverbed in order to prevent risk of any scour exposing cable.

2.5 Work No.6 Concept Design Parameters and Principles

Table 2.5: Work No.6 Concept Design Parameters and Principles

Scheme Component	Parameter Type	Design Parameters and Principle
Work No.6 - works including: (a) **Work No.6A**— works including— (i) fencing, gates, boundary treatment and other means of enclosure; (ii) works for the provision of security and monitoring measures including CCTV columns, lighting columns and lighting, cameras, weather stations, communication infrastructure, and perimeter fencing; (iii) landscaping and biodiversity mitigation and enhancement measures including planting; (iv) improvement, maintenance and use of existing private tracks; (v) laying down of internal access tracks, ramps, means of access and footpaths; (vi) temporary footpath diversions; (vii) earthworks; (viii) sustainable drainage system ponds, runoff outfalls, general drainage and irrigation infrastructure and improvements or extensions to existing drainage and irrigation systems; (ix) acoustic barriers; (x) electricity and telecommunications connections; and (xi) secondary temporary construction laydown areas, (b) **Work No.6B**— works including— (i) fencing, gates, boundary treatment and other means of enclosure; (ii) works for the provision of security and monitoring measures including CCTV columns, lighting columns and lighting, cameras, weather stations, communication infrastructure, and perimeter fencing; (iii) landscaping and biodiversity mitigation and enhancement measures including planting; (iv) improvement, maintenance and use of existing private tracks; (v) laying down of internal access tracks, ramps, means of access and footpaths; (vi) temporary footpath diversions; (vii) earthworks; (viii) sustainable drainage system ponds, runoff outfalls, general drainage and irrigation infrastructure and improvements or extensions to existing drainage and irrigation systems;		

Scheme Component	Parameter Type	Design Parameters and Principle
(ix) acoustic barriers; (x) electricity and telecommunications connections; and (xi) secondary temporary construction laydown areas, (c) **Work No.6C**— works including— (i) fencing, gates, boundary treatment and other means of enclosure; (ii) works for the provision of security and monitoring measures including CCTV columns, lighting columns and lighting, cameras, weather stations, communication infrastructure, and perimeter fencing; (iii) landscaping and biodiversity mitigation and enhancement measures including planting; (iv) improvement, maintenance and use of existing private tracks; (v) laying down of internal access tracks, ramps, means of access and footpaths; (vi) temporary footpath diversions; (vii) earthworks; (viii) sustainable drainage system ponds, runoff outfalls, general drainage and irrigation infrastructure and improvements or extensions to existing drainage and irrigation systems; (ix) acoustic barriers; (x) electricity and telecommunications connections; and (xi) temporary construction laydown areas.		
Fencing	Location	Work No. 6A, 6B and 6C must be located within the corresponding numbered area on the Works Plans
	Location	Perimeter fencing will be a minimum of 3.0m from the nearest solar panel table and mounting structure.
	Scale	The maximum height of fencing will be 2.5m except for the means of enclosure around Work No. 2 and Work No. 3 which will be 2.6m.
	Scale	The maximum height of any acoustic barriers (fencing or louvres) within Work No.1, No. 2 or Work No. 3 will be 3.0m.
	Design Principle	The primary means of enclosure around Work No. 3 will be metal palisade security fencing with integrated gates for access.
	Design Principle	Acoustic barriers will be timber (or another appropriate synthetic material), with a minimum density of 10kg/sqm.

Scheme Component	Parameter Type	Design Parameters and Principle
	Design Principle	Perimeter fencing will consist of deer wire mesh and wooden post fencing.
CCTV and site monitoring equipment	Scale	The maximum height of CCTV poles will be 3.0m.
	Design Principle	CCTV poles will be galvanised steel and painted green.
	Design Principle	CCTV cameras will rely on infrared light.
Internal access tracks	Scale	The width of internal access tracks will be between a minimum of 3.0m and a maximum of 6.0m.
Internal site laydown areas	Scale	Stored onsite equipment and material will be of a maximum of 3.0m in height.

2.6 Work No.8 Concept Design Parameters and Principles

Table 2.6: Work No.8 Concept Design Parameters and Principles

Scheme Component	Parameter Type	Design Parameters and Principles
Work No.8 - works to facilitate access to Work Nos.1 to 7 and 9 to 11 including: (a) **Work No.8A**— works to facilitate temporary construction and decommissioning access to Work Nos.1 to 7 and 9 to 11 including — (i) creation of accesses from the public highway; (ii) creation of visibility splays; (iii) works to alter the layout of any street or highway temporarily; and (iv) offsite works adjacent to highways land including those to structures, boundary features, drainage features on private land required for the facilitation of movement of abnormal indivisible loads associated with Work Nos.3 and 5. (b) **Work No.8B**— works to facilitate permanent access to Work Nos.1 to 7 and 9 to 11 including— (i) creation of accesses from the public highway; (ii) creation of visibility splays; and (iii) works to alter the layout of any street or highway permanently.		
Works to facilitate access to Work Nos.1 to 7 and 9 to 11 (Work No. 8)	Location	Work No. 8A and Work No.8B must be located within the corresponding numbered area shown on the Works Plans.
	Scale	Construction and decommissioning access points will be a minimum of 5.0m in width for two-way movements up to a maximum of 6.5m in width where passing places are required.
	Scale	Accesses required for permanent operation and maintenance access will be a minimum of 3.5m in width up to a maximum of 6.0m in width.
	Design Principle	Access tracks will be trackpad covered ground; compacted earth, hardcore, or gravel over a levelling layer of substrate; or metalled surface if pre-existing, subject to ground load-bearing capacity and archaeological features, and utilising of existing accesses.

2.7 Work No.9 Concept Design Parameters and Principles

Table 2.7: Work No.9 Concept Design Parameters and Principles

Scheme Component	Parameter Type	Design Parameters and Principles
Work No.9 - works to create and maintain habitat management areas including: (a) fencing, gates, boundary treatment and other means of enclosure; (b) earth works including bunds, embankments, ponds, trenching and swales; (c) landscaping and biodiversity mitigation and enhancement measures including planting; (d) means of access; and (e) drainage.		
Works to create and maintain habitat management areas (Work No. 9)	Location	Work No. 9 must be located within the corresponding numbered area shown on the Works Plans.
Fencing (Work No. 9(a)	Scale	The maximum height of fencing will be 2.5m.
	Design Principle	Perimeter fencing will consist of deer wire mesh and wooden post fencing.
Internal access tracks	Scale	The width of internal access tracks will be between a minimum of 3.0m and a maximum of 6.0m.
	Design Principle	Internal access tracks will be compacted earth, hardcore or gravel over a levelling layer of substrate, subject to ground load-bearing capacity and archaeological features.

2.8 Work No.10 Concept Design Parameters and Principles

Table 2.8: Work No.10 Concept Design Parameters and Principles

Scheme Component	Parameter Type	Design Parameters and Principles
Work No.10 - works to create and maintain a habitat management area, comprising: (a) fencing, gates, boundary treatment and other means of enclosure; (b) landscaping and biodiversity mitigation and enhancement measures including planting; (c) improvement, maintenance and use of existing private tracks; (d) earthworks; (e) drainage; and (f) means of access.		
Works to create and maintain habitat management areas (Work No. 10) Fencing (Work No. 10(a))	Location	Work No. 10 must be located within the corresponding numbered area shown on the Works Plans.
	Scale	The maximum height of fencing will be 2.5m.
	Design Principle	Perimeter fencing will consist of deer wire mesh and wooden post fencing.

2.9 Work No.11 Concept Design Parameters and Principles

Table 2.9: Work No.11 Concept Design Parameters and Principles

Scheme Component	Parameter Type	Design Parameters and Principles
Work No.11 - creation of a permissive footpath comprising: (a) Creation of a permissive footpath to run from the Track off Sykes Lane along the Codder Lane Belt and then south and west to rejoin Sykes Lane opposite Hardwick Scrub; (b) fencing, gates, boundary treatment and other means of enclosure; and (c) landscaping and biodiversity mitigation and enhancement measures including planting.		
Permissive footpath	Location	Work No. 11 must be located within the corresponding numbered area shown on the Works Plans.
	Scale	The permissive path will have a maximum usable width of 5.0m.
	Design Principle	The permissive path will be made from compacted earth planted over with grass.
Fencing	Scale	The maximum height of fencing will be 2.5m.
	Design Principle	Perimeter fencing will consist of deer wire mesh and wooden post fencing.