

One Earth Solar Farm

Volume 5.0 Reports and Statements [EN010159]

Outline Design Parameters [EN010159/APP/5.9.24]

~~July-August~~ 2025

Document Reference: EN010159/APP/5.9.24

Revision ~~03~~4

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009
– Reg 5(2)(q)



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1. Introduction

- 1.1.1 This document described the Outline Design development for One Earth Solar Farm (the “Proposed Development”) as described in **ES Volume 1, Chapter 5: Description of the Proposed Development [EN010159/APP/6.5]**. The terminology used in this document is defined in the **Glossary of Terms and Abbreviations [EN010159/APP/7.17]**.
- 1.1.2 This document has been submitted at Deadline 1 and again at Deadline 2. The document references have not been updated from the original submission. Please refer to the **Guide to the Application [EN010159/APP/1.3]** for the list of current versions of documents.
- 1.1.3 Technology across photovoltaics, energy transmission, and energy storage is advancing. The detailed design phase of One Earth Solar Farm (the Proposed Development) will therefore take place post consent to allow for the integration of innovation that has occurred. The **draft DCO [EN010159/APP/3.1]** therefore allows for a degree of flexibility regarding the final design. To that end, the DCO application has adopted the Rochdale Envelope approach in the Environmental Statement. This approach ensures that the maximum (and where appropriate minimum) and realistic ‘worst case’ scenario has been assessed.
- 1.1.4 This realistic ‘worst case’ scenario is based on the Outline Design Parameters set out in this document. The Outline Design Parameters are categorised into Works Numbers that correlate to the numbered works described in Schedule 1 of the **draft DCO [EN010159/APP/3.1]** and the **Works Plans [EN010159/APP/2.3]** which show the maximum spatial extent that can be occupied by each numbered work.
- 1.1.5 The detailed design undertaken post consent will be subject to approval, in accordance with the DCO requirements set out in Schedule 2 of the draft DCO, and must accord with the limits set out in the Outline Design Parameters and the spatial extent shown on the Works Plans.
- 1.1.6 The construction, operation and decommissioning of the Proposed Development must also be in accordance with the following management plans, each of which are secured by requirements of the draft DCO:
- > **Outline Construction Environmental Management Plan [EN010159/APP/7.4];**
 - > **Outline Operational Environmental Management Plan [EN010159/APP/7.5];**
 - > **Outline Decommissioning Environmental Management Plan [EN010159/APP/7.6];**

- > **Outline Landscape and Ecology Management Plan [EN010159/APP/7.7];**
- > **Construction Traffic Management Plan [EN010159/APP/7.9];**
- > **Outline Soil Management Plan [EN010159/APP/7.10];**
- > **Outline Battery Safety Management Plan [EN010159/APP/7.11];**
- > **Flood Risk Assessment and Drainage Strategy [EN010159/APP/6.21 (Appendix 7.2)];**
- > **Outline Skills, Supply Chain and Employment Plan [EN010159/APP/7.8]; and**
- > **Outline Public Right of Way Management Plan [EN010159/APP/7.14]**

1.1.7 Anticipated maximum vegetation loss associated with all Works Numbers is shown on the Vegetation Removal Plan provided within the **Outline Landscape and Ecology Management Plan [EN010159/APP/7.7]**.

1.1.8 The Design Principles established at the beginning of the project have informed the Outline Design Parameters and Works Plans. An explanation of this process is provided in the **Design Approach Document [EN010159/APP/5.8]**. The effect of that process is that the Design Principles, listed below, will continue to inform the detailed design of the Proposed Development, via the Works Plans and Outline Design Parameters (and relevant management plans):

- > Climate 1: Maximise the amount of clean energy provided to the National Grid;
- > Climate 2: Seek to reduce embodied carbon throughout the project lifecycle;
- > Climate 3: Craft a scheme that is resilient to the effects of climate change;
- > Climate 4: Protect and improve the local environment;
- > People 1: Protect features that are valued by the local community;
- > Place 1: Protect and enhance places of value;
- > Place 2: Create new places of amenity and ecological value;
- > Value 1: Enhance provision of local assets;
- > Value 2: Contribute to local economy and education; and
- > Value 3: Provide resource for research and development.

2. Outline Design Parameters

- 2.1.1 **Table 2.1** sets out the Outline Design Parameters associated with each of the eight Work Numbers, described Schedule 1 of the **draft DCO [EN010159/APP/3.1]** and the spatial extent of which is shown on the **Works Plans [EN010159/APP/2.3]**.

Table 2.1 Outline Design Parameters

Element Proposed Development	of Type	Parameter
Work No. 1 A ground mounted solar photovoltaic generating station with a gross electrical output capacity of over 50 megawatts, including— a) solar panels fitted to mounting structures; and b) power conversion stations (PCS)		
Solar PV Array	Location	The Solar PV Array Works Area will be located as shown as Works Area No. 1 on the Works Plans [EN010159/APP/2.3] . No infrastructure included within Work No. 1 will be located within the following distances from features: - Hedgerows: 5m - Watercourses, drainage ditches, and waterbodies: 10m - Trees: 15m - Woodland: 25m - Veteran trees: no works within Root Protection Area
	Scale	The maximum height of the PV panels will not exceed 3.5m or 3.8m above ground level (AGL), as shown on the Height Parameter Plan [EN010159/APP/2.5] .

Element Proposed Development	of Type	Parameter
	Scale	The height of the lowest part of the PV Panels will not be lower than 0.7m AGL. The maximum height of the lowest part of the PV Panels will be 1.8m AGL, as shown on the Height Parameter Plan [EN010159/APP/2.5] .
	Scale	The minimum spacing gap between consecutive rows of PV tables will be 3m.
	Design	The PV Tables will slope south at an angle between 10 – 25 degrees. The angle will be consistent across the extent of Work Area 1 as far as practicable.
	Design	The PV Panels will be dark blue, grey or black in colour with an anti-reflective coating.
	Design	The appearance of the PV mounting structures will be bare metal or galvanised with a matt finish.
	Design	The PV Mounting Structure will be pile driven or screw driven to a maximum depth of 3m below ground level; or will be fixed to a concrete base.
	Design	5.3m minimum clearance shall be maintained in still and conductor swing from the National Grid 400kv or 275kv overhead lines to the highest point of the PV tables
Power Conversion Stations (PCS)	Location	All PCS will be within the area marked as Work No. 1 on the Works Plan [EN010159/APP/2.3] .

Element Proposed Development	of Type	Parameter
	Location	Where practicable PCS units will not be located within 100m of residential dwellings and 50m of existing public rights of way and in all cases will be designed to ensure a night time noise rating level at residential receptors of no greater than 35dB(A).
	Design	PCS enclosures will measure up to 13m long x 3m width.
	Design	PCS located outside the extent of the designed flood event (as set out in ES Chapter 7 [EN010159/APP/6.7]) will not exceed height 4.5m AGL.
	Design	PCS located within the extent of the designed flood event (as set out in ES Chapter 7 [EN010159/APP/6.7]) will be mounted on stilts and will not exceed height 6m AGL.
	Design	PCS will be a muted colour to be sympathetic with surroundings.
	Design	The foundation depth and material of PCS will comprise concrete pads up to 2m deep. Stilts will be a driven or helical pile installed to a maximum depth of 3m.
	Design	PCS units will not be located within 100m of residential dwellings, and 50m of existing public rights of way without acoustic mitigation.

Element Proposed Development	of Type	Parameter
	Design	Fencing around the PCS will comprise a palisade style fence up to 3m above ground level, painted in a muted colour sympathetic to the surrounding environment.
Work No. 2 energy storage facility comprising battery energy storage system compounds including— a) battery energy storage system (BESS) units each comprising an enclosure for BESS electro-chemical components and associated equipment, joined or close coupled to each other, mounted on a concrete foundation slab; b) transformers and associated bunding; c) inverters, switch gear, power conversion systems and ancillary equipment; d) containers or enclosures housing all or any of Work Nos. 2(a), (b) and (c) and ancillary equipment; e) monitoring and control systems housed within the containers or enclosures comprised in Work Nos. 2(a) or (d) or located separately in its own container or enclosure; f) heating, ventilation and air conditioning or liquid cooling systems either housed on or within each of the containers or enclosures comprised in Work Nos. 2(a), (d) and (e), integrated into or attached to the side or top of each of the containers or enclosures, or located separate to but near to each of the containers or enclosures; g) fire safety infrastructure including water storage units, aerosol systems, automatic sprinklers and a shut-off valve for containment of fire water and hard standing to accommodate emergency vehicles; h) containers or similar structures to house spare parts and materials required for the day to day operation of the BESS facility; i) acoustic fencing; and ancillary buildings including control room, office, welfare, storage, workshop and metering.		
BESS	Location	Works will be located within Work No. 2 as shown on the Works Plans [EN010159/APP/2.3]. No infrastructure included with Work No. 2 will be located within the following distances from features: - Hedgerows: 5m

Element Proposed Development	of Type	Parameter
		- Watercourses, drainage ditches, and waterbodies: 10m - Trees: 15m - Woodland: 25m - Veteran trees: no works within Root Protection Area
	Location	There will be up to two BESS sites as identified as Work No. 2 on the Works Plans [EN010159/APP/2.3] .
	Location	BESS compound(s) will be located adjacent to an on-site substation (Work No. 3).
	Location	The BESS equipment will be located at a distance of at least 300m from residential properties and will be designed to ensure a night time noise rating level at residential receptors of no greater than 35dB(A).
	Scale	The western BESS will occupy a footprint up to 112,000m ² .
	Scale	The eastern BESS will occupy a footprint up to 85,000m ² .
	Scale	The batteries will be housed within enclosures, each measuring 13m x 5m (w x d) and up to 3.5m above proposed ground levels.
	Scale	Ancillary buildings will be located within each BESS compound, up to 8m tall above existing ground levels, with a footprint of up to 1200m ² .

Element Proposed Development	of Type	Parameter
	Design	The BESS foundation design will comprise reinforced concrete footings of no more than 2m below proposed ground level.
	Design	The BESS will be a muted colour, sympathetic to the surrounding environment.
	Design	Fencing will comprise a palisade style fence up to 3m above ground level, painted in a muted colour sympathetic to the surrounding environment, with an additional 1m of electrified fencing.
	Design	Soil storage in the form of bunds will measure up to 3m tall and be positioned, as far as practicable, to screen parts of the BESS from visual receptors.
Work No. 3 works in connection with onsite substation compounds including— a) substation including transformers, 400kV switchgear either housed within a building or air insulated, 33kV switch room buildings and ancillary equipment including harmonic filters and reactive power units; and ancillary buildings and structures including control buildings, metering equipment, office welfare, storage and workshop.		
One Earth substations	Location	There will be two onsite substation compounds located within the areas marked as Work No. 3 on the [EN010159/APP/2.3]. No infrastructure included with Work No 3 will be located within the following distances from features: - Hedgerows: 5m - Watercourses, drainage ditches, and waterbodies: 10m

Element Proposed Development	of Type	Parameter
		- Trees: 15m - Woodland: 25m - Veteran trees: no works within Root Protection Area
	Location	The substation equipment will be located at a distance of at least 300m from residential properties and will be designed to ensure a night time noise rating level at residential receptors of no greater than 35dB(A).
	Scale	The substation compound located west of the River Trent will occupy a maximum of area of 250m x 190m (up to 47,500m ²)
	Scale	The substation compound located east of the River Trent will occupy a maximum area of 170m x 140m (up to 23,800m ²)
	Scale	The onsite substations will be up to 13.5m above existing ground level in height with lightning rods extending up to 25m above existing ground level in height.
	Design	The concrete foundation depth will be a maximum of 2m below proposed ground level.
	Scale	Ancillary buildings will be located within each substation compound, up to 8m tall above existing ground level, with a footprint of up to 1200m ² .
	Design	Fencing will comprise a palisade style fence up to 3m above ground level, painted in a muted colour sympathetic to the surrounding environment, with an additional 1m of electrified fencing.

Element Proposed Development	of Type	Parameter
	Design	Buildings and containers will be muted in colour, sympathetic to surroundings.
	Design	Soil storage in the form of bunds will measure up to 3m tall and be positioned, as far as practicable, to screen parts of the substation from visual receptors.
Work No. 4 works to lay high voltage electrical cables and to facilitate the connection of the authorised development to the National Grid High Marnham Substation and access for the electrical cables, including— a) works to lay up to 400 kilovolt electrical cables connecting Work No. 3 into the National Grid High Marnham Substation; b) laying down of temporary construction areas and internal access tracks, ramps, means of access, footways, including the laying and construction of drainage infrastructure, signage and information boards; and c) electrical engineering works in and around the National Grid High Marnham Substation.		
Grid connection cable route	Location	The 400kV cable route will be located within Work No. 4 as shown on the Works Plan [EN010159/APP/2.3] .
	Design	The 400kV cables will be underground.
	Design	The 400kV cables will be installed at a maximum depth of up to 3m BGL, except where trenchless crossings are used.
	Design	The Grid Connection Cable Route trench(es) will be up to a combined width of 10m.

Element Proposed Development	of Type	Parameter
	Design	Installation of the 400kV cables beneath drains and minor watercourses will be via trenchless crossings, to a depth of at least 1.5m below the bed of each watercourse, avoiding disturbance within 10m from the water edge.
	Design	Installation of the 400kV cables beneath the River Trent will be at least 5m below the lowest surveyed point of the bed of the river and set back at least 106m from the water edge.
Work No. 5 Ancillary works including— a) electrical cables up to 132kV; b) fencing, gates, and other boundary treatments; c) security measures including CCTV columns, lighting columns, cameras, weather stations, and communication infrastructure; d) landscape and biodiversity mitigation and enhancement including planting of new vegetation and seeding; e) vegetation removal; f) electrical, gas, water, foul water drainage and telecommunications infrastructure connections, diversions and works to, and works to alter the position of, such services and utilities connections; g) laying down and creation of internal access tracks, ramps, means of access and footpaths and improvement of access tracks; h) temporary footpath diversions; i) earthworks; j) tunnelling, boring and drilling works; k) sustainable drainage system ponds and general drainage; and laying down of permissive paths, signage and information boards.		
Ancillary works	Location	The extent of works comprised in Work No. 5 will be located within Work No. 5 as shown on the Works Plan [EN010159/APP/2.3] .

Element Proposed Development	of Type	Parameter
	Design	A minimum buffer of 10m <u>16m</u> from the River Trent will be maintained within which there will be no above ground infrastructure included in Work Number 5.
Access Tracks	Design	Access tracks will be up to 6.5m wide
	Design	Soil storage in the form of bunds will measure up to 3m tall and be positioned, as far as practicable, to provide visual mitigation.
	Design	New access tracks will be impermeable with appropriate SuDS style drainage comprising ditches and/or swales. The makeup will be unbound stone over a geotextile membrane or equivalent.
	Design	The first 50m of access track, where connecting to an adopted highway, will comprise asphalt or similar.
	Location	Access tracks will not pass within 50m of residential properties.
Security measures	Scale	CCTV cameras will be mounted on a pole measuring no more than 4.5m AGL.
	Design	CCTV cameras will face inwards
	Design	CCTV lighting will be infrared (not visible) during hours of darkness.

Element Proposed Development	of Type	Parameter
	Design	Fencing will comprise a deer fence of wooden posts and metal wire mesh measuring up to 2m AGL (the fence posts may extent up to 2.2m). Appropriate mammal gates will be incorporated. (The parameters associated with fencing of the BESS and Substation are detailed in Work No. 2 and Work No. 3.)
Cables	Design	Interconnecting cables will be installed at a depth of up to 3m BGL in a trench up to 10m wide.
	Design	Trenchless techniques will be used to install cables under drains and minor watercourses to a depth of at least 1.5m below the bed of the water course, avoiding disturbance within 10m from the water edge.
	Design	All DC cables will be secured to the PV mounting structure or buried underground up to a depth of 1.2m deep in a trench up to 5m wide.
Lighting	Design	No external lighting will be permanently operated.
	Design	Operational lighting will be directional, orientated internally, away from the surrounding environment, and will be fitted with features to minimise light spillage.
Permissive paths	Location	Permissive paths will be provided following the alignment shown in the oLEMP [EN010159/APP/7.7] .
Work No. 6		

Element Proposed Development	of Type	Parameter
temporary construction and decommissioning compounds including— a) Work No. 6A – up to two primary temporary construction and decommissioning areas— - areas of hardstanding; - car parking; - site and welfare offices, canteens and workshops; - area to store materials and equipment; - storage and waste skips; - area for download and turning; - security infrastructure, including cameras, perimeter fencing and lighting; - site drainage and waste management infrastructure; and - electricity, water, wastewater and telecommunications connections; and b) Work No. 6B – up to ten secondary temporary construction and decommissioning areas— - areas to store materials and equipment; - storage and waste skips; - area for download and turning; - security infrastructure including cameras, lighting and fencing; and - site and welfare offices, canteens and workshops.		
Primary construction compounds	Location	There will be two primary construction compounds located within Work No. 6A as shown on the Works Plans [EN010159/APP/2.3]. No above ground infrastructure included with Work No 6A will be located within the following distances from features: - Hedgerows: 5m - Watercourses, drainage ditches, and waterbodies: 10m - Trees: 15m - Woodland: 25m
	Scale	The primary construction compound located west of the River Trent will cover a maximum area of: 5ha.
	Scale	The primary construction compound located east of the River Trent will cover a maximum area of 5ha.

Element Proposed Development	of Type	Parameter
Secondary construction compounds	Location	There will be up to 10 secondary construction compounds across Work No. 6B as shown on the Works Plans [EN010159/APP/2.3]. No above ground infrastructure included with Work No 6B will be located within the following distances from features: - Hedgerows: 5m - Watercourses, drainage ditches, and waterbodies: 10m - Trees: 15m - Woodland: 25m
	Scale	Each secondary construction compound will cover a maximum area of 1ha.
Work No. 7 works to facilitate access to Work Nos. 1 to 6 and 8 including— - creation of accesses from any street or highway; - creation of visibility splays; - works to alter the layout of any street or highway; - works to widen and surface any streets; and - making and maintaining passing places.		
Access	Location	The extent of highway works will be as shown as Work No. 7 on the Works Plans [EN010159/APP/2.3] and the Streets, Rights of Way and Access Plans [EN010159/APP/2.4] .
	Scale	There will be two primary access points, one on the east and one on the west of the river, to access the primary site compounds during construction. An additional 13 access points will be located within Work No. 7.
Work No. 8		

Element Proposed Development	of Type	Parameter
works to create, enhance and maintain green infrastructure and mitigation, including—		
a. landscape and biodiversity mitigation and enhancement areas; b. habitat creation and management, including earthworks, landscaping, means of enclosure, and the laying and construction of drainage infrastructure; and c. improvements to existing public rights of way, signage and information boards.		
Landscape and ecology enhancement	Location	The extent of landscape and ecology enhancement will be as shown as Work No. 8 on the Works Plans [EN010159/APP/2.3] .
	Design	The planting of new vegetation and new seeding, and the management of existing vegetation, will occupy Work No. 8.
	Design	No built development will occupy Work No. 8 other than boundary fencing comprising wooden post and wire up to 2m tall (the wooden posts may extend to 2.2m)



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