



WHITESTONE
solar farm

WHITESTONE SOLAR FARM

Volume 7 Additional prescribed Information and Other Documents

7.3 Outline Design Parameters

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REPORT

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SPACE FOR DISCLAIMER

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Glossary

Term	Meaning
<i>Cable Corridors</i>	Corridors within which the high voltage cables would be constructed.
<i>Order Limits</i>	Total area comprising the Site and Cable Corridors.
<i>The Applicant</i>	Whitestone Net Zero Ltd.
<i>The Application</i>	The Application to be submitted to the Secretary of State for a Development Consent Order.
<i>The Proposed Development</i>	The proposed Whitestone Solar Farm.
<i>The Site</i>	The land planned to be used for solar PV array and associated infrastructure, BESS, substation, landscaping and habitat enhancement. The Site is split into W1, W2, and W3.
<i>Whitestone 1 (W1)</i>	The northern parcels of the Whitestone Solar Farm.
<i>Whitestone 2 (W2)</i>	The middle parcels of the Whitestone Solar Farm.
<i>Whitestone 3 (W3)</i>	The southern parcels of the Whitestone Solar Farm.

Acronyms

Acronym	Meaning
<i>DCO</i>	Development Consent Order
<i>PCS</i>	Power Conversion Station

Units

Units	Meaning
<i>km</i>	Kilometres
<i>kV</i>	Kilovolt
<i>m</i>	Metres
<i>mm</i>	Millimetres

1 INTRODUCTION

- 1.1.1 This document has been prepared on behalf of Whitestone Net Zero Ltd (the Applicant) in support of an application for a Development Consent Order (DCO) for the construction, operation, maintenance, and decommissioning of Whitestone Solar Farm. This document sets out the parameters that control the limits of each element included within Whitestone Solar Farm (the Proposed Development).
- 1.1.2 Technology across photovoltaics, energy transmission, and energy storage is advancing. As such, the detailed design of the Proposed Development will take place post consent to allow for the integration of any innovation and advancement that has occurred. The **draft DCO [EN0110020/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, which is described in footnote 86 to paragraph 4.3.12 of NPS EN-1 as being an assessment “*sufficient to fully assess the project’s impact on the environment and establish clearly defined worst case parameters for the assessment*” in the Environmental Statement.
- 1.1.3 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 to the **draft DCO [EN0110020/APP/3.1]**. The spatial extent of each Work Area is shown on the **Works Plan [EN0110020/APP/2.3]**.
- 1.1.4 The detailed design must be developed in accordance with the limits provided in this document and will be subject to approval in accordance with the DCO requirements set out in Schedule 2 to the **draft DCO [EN0110020/APP/3.1]**.
- 1.1.5 The construction, operation, maintenance and decommissioning of the Proposed Development must also be in accordance with the following management plans:
- **Outline Construction Environmental Management Plan [EN0110020/APP/5.9];**
 - **Outline Operational Environmental Management Plan [EN0110020/APP/5.10];**
 - **Outline Decommissioning Environmental Management Plan [EN0110020/APP/5.11];**
 - **Outline Construction Traffic Management Plan [EN0110020/APP/5.12];**
 - **Outline Landscape and Ecology Management Plan [EN0110020/APP/5.13];**
 - **Outline Public Rights of Way and Access Strategy [EN0110020/APP/5.14];**
 - **Outline Battery Safety Management Plan [EN0110020/APP/5.15];**
 - **Outline Written Scheme of Investigation [EN0110020/APP/5.16];**
 - **Outline Surface Water Drainage Strategy [EN0110020/APP/5.17];**
 - **Outline Skills and Supply Chain Management Plan [EN0110020/APP/5.18];** and
 - **Outline Cable Construction Method Statement [EN0110020/APP/5.19].**
- 1.1.6 The extent of vegetation loss anticipated across the Order Limits is shown on the Vegetation Removal Plan provided within Appendix C of the **Outline Landscape and Ecology Management Plan [EN0110020/APP/5.13];**

1.1.7 The Outline Design Parameters provided within this document have been defined in line with the design principles which were established at the outset of the project (the Design Principles). An explanation of how the design has evolved in line with the Design Principles is provided within the **Design Approach Document [EN0110020/APP/5.7]**. The Design Principles will also guide design development undertaken post consent and are listed below:

- Maximise the amount of clean energy provided to the National Grid;
- Craft a project that is resilient to the impacts of climate change;
- Take opportunities to limit the amount of embodied carbon across the Proposed Development;
- Engage with stakeholders to develop the design;
- Support local ecology and enhance biodiversity, enriching ecosystems where possible;
- Find out what is important to people about the local area and seek to protect it
- Consider how people engage with their local environment and retain these patterns and practices where possible;
- Enhance recreational access across the landscape;
- Respect landscape character and cultural heritage;
- Minimise visual impact;
- Take opportunities throughout the project lifecycle to contribute to the local economy; and
- Support research and development.

2 OUTLINE DESIGN PARAMETERS

2.1.1 **Table 2.1** sets out the Outline Design Parameters associated with each of the Works Nos. described in Schedule 1 to the **draft DCO [EN0110020/APP/3.1]** and shown on the **Works Plan [EN0110020/APP/2.3]**.

Table 2.1: Outline Design Parameters

Element of the Proposed Development	Type	Parameter
<p>Work No. 1, encompassing sub areas 1-1, 1-2A – 1-2G, 1-3A – 1-3C: a ground mounted solar photovoltaic generating station with a gross electrical output capacity of over 100 megawatts including—</p> <ul style="list-style-type: none"> a) solar PV panels; b) power conversion stations; c) secondary construction compounds; and d) internal cabling including cables crossing ordinary watercourses. 		
Solar PV array	Location	No infrastructure within Work No. 1 will be located within the following distances from the following features: <ul style="list-style-type: none"> - Hedgerows: 5m - Trees: 15m - Woodland: 25m - Veteran trees: no works within the Root Protection Area
	Location	No infrastructure within Work No. 1 will be located within 10m of watercourses, drainage ditches, and waterbodies other than where crossed by cables which may be via trenched or trenchless methods. Trenches will only be used across dry ditches and drains or other watercourses with low ecological value in consultation with the Lead Local Flood Authority.
	Location	5.3m minimum clearance will be maintained between the highest point of the PV tables to National Grid 400kv and 275kv overhead lines, accounting for both still and conductor swing.
Solar PV panels and PV frames	Scale	The maximum height of the PV panels will not exceed 3.8m above ground level, other than within the Penny Hill restriction area, as shown in Environmental Statement Chapter 5: The Proposed Development Figure 5.3 [EN0110020/APP/6.8] , within which they will not exceed 3m above ground level.
	Scale	Prior to flood modelling data, the height of the lowest part of the PV panels will maintain a 600mm freeboard to assumed flood depths. Supported by modelling, the freeboard may reduce to 300mm. The base of PV panels will not be lower than 0.4m above ground level.
	Design	Rows of PV panels will be a minimum of 3.5m apart.
	Design	The PV tables will slope south at an angle between 8 – 25 degrees.

Element of the Proposed Development	Type	Parameter
	Design	Solar PV panels will be black, blue, or dark grey in colour with an anti-reflective coating.
	Design	Solar PV panels will be bifacial.
	Design	Solar PV frames will be bare metal or galvanised with a matt finish.
	Design	Solar PV frames will be pile driven or screw driven to a maximum depth of 4m below ground level. Where ground is unsuitable for piles or screws, or in areas of sensitive archaeology, a concrete ballast or appropriate alternative will be used.
	Design	Fencing around the solar PV areas will comprise wooden post and wire or wooden post with galvanised welded mesh up to 2.2m above ground level. A double fence, separated by approximately 2m, may be installed. Mammal gates may be incorporated.
	Design	All DC cables will be secured to the PV frame or buried underground up to a depth of 1.2m below ground level in a trench typically measuring 0.3m wide but up to 1.5m where multiple circuits are within a single trench.
Power Conversion Stations (PCS)	Location	PCS units will be designed to ensure a nighttime noise rating level at residential receptors of no greater than 5dB(A) above baseline conditions.
	Scale	PCS enclosures will measure up to a maximum of 13m long x 3m wide x 3.5m high, other than within the Penny Hill restriction area, as shown in Environmental Statement Chapter 5: The Proposed Development Figure 5.3 [EN0110020/APP/6.8] within which they will not exceed 3m above ground level.
	Design	The foundation of PCS enclosures will be a maximum of 2m below ground level or up to a 5m below ground level pile foundation.
	Design	PCS enclosures will be a muted colour sensitive to the surrounding environment.
	Design	Fencing around PCS enclosures will be up to 3.5m above ground level and comprise galvanised welded mesh with metal posts.
	Location	PCS will not be located within the extent of Flood Zone 2 or 3.
Secondary construction compounds	Location	
	Scale	Secondary construction compounds will measure up to 100m x 100m.
<p>Work No. 2 encompassing sub areas 2-A – 2N: works to lay high voltage electrical cables and to facilitate the connection of the authorised development to the National Grid substation including -</p> <ul style="list-style-type: none"> a) electrical cables b) works required for crossing, moving re-routing or over/undergrounding of existing utility assets (including water, gas, sewer pipes, electricity distribution/transmission cabling, telecommunications, drainage etc.); c) earthworks; 		

Element of the Proposed Development	Type	Parameter
d) power conversion stations; e) secondary construction compounds; and f) cable crossings over ordinary watercourses.		
Interconnection cables	Design	All interconnection cables will be underground.
	Design	Interconnection cables will be installed at a maximum depth of 3m below ground level. The depth will vary where crossing existing utility corridors or where trenchless crossings are used.
	Design	The trench associated with the interconnection cables will measure a maximum of 10m wide. Joint bays will extend up to a maximum of 20m wide.
	Design	No infrastructure within Work No. 2 will be located within 10m of watercourses, drainage ditches, and waterbodies other than where such features are crossed by cables which may be via trenched or trenchless methods. Trenches will only be used across dry ditches and drains or other watercourses with low ecological value in consultation with the Lead Local Flood Authority. Where trenchless crossings to watercourses are used, they will be to a depth of at least 1.5m below the bed of each watercourse.
	Location	Temporary construction compounds required for installation of the cable measuring 50m x 50m, may be located within Work No. 2-A – 2-N.
Work No. 3: a battery energy storage system in Whitestone 2 including— a) battery energy storage cells; b) electricity stabilizer units including inverters, transformers, DC-AC converters, power conversion stations and ancillary equipment; c) monitoring and control systems; d) heating, ventilation and air conditioning systems; e) fire safety infrastructure and water connection or storage; f) ancillary buildings ; g) containers or enclosures housing all or any of (a) to (f); and h) access gates and track and security palisade fencing.		
BESS	Location	No infrastructure within Work No. 3 will be located within the following distances from the following features: - Hedgerows: 5m - Watercourses, drainage ditches, and waterbodies: 10m - Trees: 15m - Woodland: 25m - Veteran trees: no works within Root Protection Area
	Scale	Buildings within the BESS compound will measure up to 8m tall above ground level with a combined footprint of up to 40m x 40m.
	Scale	Batteries will be housed within enclosures, each measuring up to approximately 13m long x 5m wide x 3.5m high above ground level.

Element of the Proposed Development	Type	Parameter
	Design	BESS units will be a muted colour sympathetic to the surrounding environment.
	Design	Perimeter fencing will comprise a double fence, separated by approximately 2m, of galvanised welded mesh with metal posts up to 3m above ground level with an additional 1m of electrified fencing.
	Design	BESS foundations will comprise reinforced concrete footings extending a maximum of 2m below ground level, unless a pile foundation is required in which case foundations will extend to 15m.
	Design	The BESS will be designed to ensure a night time noise rating level at residential receptors of no greater than 5dB(A) above baseline conditions. Where acoustic fencing is required, this will comprise a fence / louvre up to 4m above ground level, painted in a muted colour sympathetic to the surrounding environment.
	Design	An impermeable lining will be incorporated to prevent escape of potential contaminants.
<p>Work No. 4 encompassing sub-areas 4-1A, 4-2A and 4-2B: development of onsite substations including—</p> <p>(a) Work No. 4-2A—Works on Whitestone 2, as shown on sheets 10 and 11 of the Works Plans comprising—</p> <ul style="list-style-type: none"> (i) Primary Substation, switch room buildings, concrete foundations and ancillary equipment [including reactive power units]; (ii) power conversion system units including inverters, switch gear, transformers and ancillary equipment; (iii) control building, storage containers and space, welfare facilities, [and waste storage within a fenced compound, hard standing areas and car parking]; (iv) communications infrastructure; (v) monitoring and control systems; (vi) harmonic filter compound; (vii) deluge system including water tanks and fire suppression, and drainage and water containment features and associated infrastructure; <ul style="list-style-type: none"> (i) lightning rods; (ii) electrical cables; and (iii) access gates and tracks and security palisade and electrified fencing and bunding. <p>(b) Work No. 4-1A Works on Whitestone 1, as shown on sheets 1, 3 and 4 of the Works Plans, comprising</p> <ul style="list-style-type: none"> (i) Satellite Substation, switch room buildings, concrete foundations and ancillary equipment [including reactive power units]; (ii) power conversion system units including inverters, switch gear, transformers and ancillary equipment; (iii) control building, storage containers and space, welfare facilities, [and waste storage within a fenced compound, hard standing areas and car parking]; (iv) communications infrastructure; (v) harmonic filter compound; 		

Element of the Proposed Development	Type	Parameter
		<ul style="list-style-type: none"> (vi) deluge system including water tanks and fire suppression, and drainage and water containment features and associated infrastructure; (vii) lightning rods; (viii) electrical cables; and (ix) access gates and tracks and security palisade and electrified fencing and bunding. <p>(c) Work No. 4-2B Works on Whitestone 2, as shown on sheets 19 and 20 of the Works Plans comprising</p> <ul style="list-style-type: none"> (i) Satellite Substation, switch room buildings, concrete foundations and ancillary equipment [including reactive power units]; (ii) power conversion system units including inverters, switch gear, transformers and ancillary equipment; (iii) control building, storage containers and space, welfare facilities, [and waste storage within a fenced compound, hard standing areas and car parking]; (iv) communications infrastructure; (v) harmonic filter compound; (vi) deluge system including water tanks and fire suppression, and drainage and water containment features and associated infrastructure; (vii) lightning rods; (viii) electrical cables; and (ix) access gates and tracks and security palisade and electrified fencing and bunding.
Substations	Location	<p>No infrastructure within Works No. 4 will be located within the following distances from the following features:</p> <ul style="list-style-type: none"> - Hedgerows: 5m - Watercourses, drainage ditches, and waterbodies: 10m - Trees: 15m - Woodland: 25m - Veteran trees: no works within Root Protection Area
	Location	Substation equipment will be located at a distance of at least 300m from residential properties and will be designed to ensure a nighttime noise rating level of no more than 5dB greater than baseline conditions.
	Scale	Substations will measure up to 13.5m above ground level.
	Scale	The footprint of the substation located in Works No.4-1A, will measure a maximum of 90m x 130m.
	Scale	The footprint of the substation within Works No.4-2A will measure a maximum of 100m x 170m.
	Scale	The footprint of the substation located in Works No. 4-2B will measure a maximum of 90m x 130m.
	Scale	Buildings within the substation compounds will measure up to 8m above ground level with a combined footprint of up to 1,200m ² per substation.
	Design	Buildings and containers will be muted colours, sympathetic with the surrounding environment.

Element of the Proposed Development	Type	Parameter
	Scale	Lightning rods within the substation compound will measure up to 20m above ground level.
	Scale	Substation foundations will extend up to 5m below ground level, or up to 15m below ground level where a pile foundation is required.
	Design	Perimeter fencing will comprise a double fence, separated by approximately 2m, of galvanised welded mesh with metal posts up to 3m above ground level with an additional 1m of electrified fencing.
<p>Work No. 5 works to facilitate access to Works Nos. 1 to 4 and 6 to 9 including—</p> <ul style="list-style-type: none"> (a) creation of accesses from the street; (b) enhancement of existing accesses from the street; (c) creation of visibility splays; (d) creating of passing places; and (e) works to widen and surface the street and private means of access. 		
Highway Works	Location	The extent of highway works will be no greater than shown on Work No. 5 on the Works Plan [EN0110020/APP/2.3] .
<p>Work No. 6 works to create and maintain areas of green infrastructure and habitat management including—</p> <ul style="list-style-type: none"> (a) landscape and biodiversity mitigation and enhancement measures including, tree and hedgerow planting; (b) habitat creation and management including, earth works including embankments, landscaping and construction of drainage infrastructure; (c) laying down of permissive paths, signage and information boards; and (d) fencing, gates, boundary treatment and other means of enclosure. 		
Landscape and ecological works	Design	The planting of new vegetation and new seeding, and the management of existing vegetation, will occupy Work No. 6.
<p>Works No. 7 drainage pipeline and discharge point for primary substation to the north of Upper Whiston including—</p> <ul style="list-style-type: none"> (a) access track (b) temporary laydown areas; and (c) laydown area. 		
Drainage pipeline and discharge point	Location	The pipeline will be buried, with depth varying based on the topography of the ground to ensure suitable fall across its length.
	Scale	The trench for installation will be no greater than 3m wide at the surface. The trench for pipeline installation will be no greater than 3m wide at existing ground level. Sections may also be installed using trenchless methods, dependent on final topography.
	Material	The pipeline will be constructed of concrete, plastic, or similar material.

Element of the Proposed Development	Type	Parameter
	Location	The discharge point will be at the western end of the pipeline.
	Materiality	The discharge point will be constructed of concrete predominantly.
<p>Work No. 8 temporary primary construction compounds including—</p> <ul style="list-style-type: none"> (a) areas of hardstanding; (b) car parking; (c) site and welfare offices, portacabins; (d) security infrastructure, including cameras, perimeter fencing and lighting; (e) site drainage and waste management infrastructure; (f) electricity, water, waste water and telecommunications connections or storage; (g) storage of equipment, materials and waste; (h) wheel washing areas; (i) area for offload and turning; and (j) works to reinforce ground with weight-bearing support infrastructure. 		
Primary construction compounds	Location	No infrastructure within Work No. 8 will be located within the following distances from the following features: <ul style="list-style-type: none"> - Hedgerows: 5m - Watercourses, drainage ditches, and waterbodies: 10m - Trees: 15m - Woodland: 25m - Veteran trees: no works within Root Protection Area
	Scale	Primary construction compounds will measure up to 200m x 200m.
<p>Work No. 9 works to create vehicular or pedestrian crossing structures including—</p> <ul style="list-style-type: none"> (k) works to allow installation of bridge or culvert crossings over ordinary watercourses and drains; and (l) works to alter, maintain, repair or replace existing crossing structures over ordinary watercourses and drains. 		
Crossing structures	Scale	Track top over the watercourse will measure up to 6m wide.
	Design	Crossing foundations will extend up to 5m below ground level, or up to 15m below ground level where a pile foundation is required.
	Design	Options for crossings include, but not limited to, bridges and culverts (with potential for box culverts).
<p>Other Works: to be across extent of Order limits other than Works No. 5 and 7.</p>		
Access tracks	Design	Access track tops will typically measure between 3.5m – 6m wide and comprise crushed hard core. The first 50m of access track joining the public highway will comprise a tarmac (or similar) surface.

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Element of the Proposed Development	Type	Parameter
	Design	Drainage ditches and/or swales will be installed to drain water from access tracks.
	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 4m above ground level.
	Design	CCTV cameras will be orientated to face inwards.
	Design	CCTV lighting will be infrared (invisible).
	Design	Fencing will comprise wooden post and wire or wooden post with galvanised welded mesh up to 2.2m above ground level. A double fence, separated by approximately 2m, may be installed. Mammal gates may be incorporated.
Lighting	Design	No external lighting will be permanently operated.
	Design	Operational lighting will be directional, manually or sensor operated, or passive infra-red lighting, orientated internally away from the surrounding environment, and will be fitted with measures to minimise light spillage.
Glint and glare fencing	Location	Fences installed to mitigate glint and glare impacts will not be located within 5m of edge of carriageway.
	Scale	Glint and glare mitigation fences will measure up to 4m above ground level and include gates for access as required.
Cable	Location	Underground cables may be laid across the extent of the Order limits up to a depth of 1.2m below ground level.



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