WHITESTONE SOLAR FARM

Draft Environmental Statement

Volume 1, Chapter 5, The Proposed Development

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Prepared by:

ERM

Prepared for:

Whitestone Net Zero Ltd

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Glossary

Term	Meaning
Cable Corridor Options	Corridors within which the high voltage cables would be constructed.
Draft ES	Draft Environmental Statement which presents the preliminary environmental information relating to the Proposed Development.

Term	Meaning
	The Draft ES has been prepared to present information for statutory consultation in accordance with current EIA regulation.
Proposed Order Limits	Total area comprising the Site and Cable Corridor Options.
The Applicant	Whitestone Net Zero Ltd
The Application	The Application will be submitted to the Secretary of State for Energy Security and Net Zero for a Development Consent Order.
The Proposed Development	The proposed Whitestone Solar Farm.
The Site	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
Brinsworth B	The new 400 kilovolt substation proposed on land immediately east of Long Lane, Brinsworth, S60 4JJ.
National Grid Brinsworth Substation	The existing 275 kilovolt substation at Brinsworth, located on Howarth Lane, Brinsworth, S60 5LW
Point of Connection	The new National Grid substation at Brinsworth (Brinsworth B) where the Proposed Development would connect to the National Grid.
Solar PV infrastructure	Solar PV arrays and supporting infrastructure

Acronyms

Acronym	Meaning
AC	Alternating Current
AGL	Above Ground Level
BESS	Battery Energy Storage System
BGL	Below Ground Level
BNG	Biodiversity Net Gain
CCTV	Closed-Circuit Television Systems
CEMP	Construction Environmental Management Plan
CR	Cable Route
oCTMP	Outline Construction Traffic Management Plan
DC	Direct Current
DCO	Development Consent Order
DEFRA	Department for Environment, Food, and Rural Affairs
DEMP	Decommissioning Environmental Management Plan
Draft ES	Draft Environmental Statement
EIA	Environmental Impact Assessment
ES	Environmental Statement

Acronym	Meaning
HDD	Horizontal Directional Drilling
LPA	Local Planning Authority
NGR	National Frid Reference
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
oBSMP	Outline Battery Safety Management Plan
oCEMP	Outline Construction Environmental Management Plan
oDEMP	Outline Decommissioning Environmental Management Plan
oOEMP	Outline Operation Environment Management Plan
oSWMP	Outline Site Waste Management Plan
PCS	Power Conversion Stations
PRoW	Public Rights of Way
oPRoWMP	Outline Public Right of Way Management Plan
PV	Photovoltaic
W1	Whitestone 1
W2	Whitestone 2
W3	Whitestone 3
POC	Point of connection
MV	Medium Voltage
LV	Low Voltage
TBM	Tunnel Boring Machine
CTM	Conventional Tunnelling Method
OLBMP	Outline Landscape and Biodiversity Management Plan

Units

Units	Meaning
cm	Centimetres
ha	Hectares
km	Kilometres
kV	Kilovolt
m	Metres
MW	Megawatts

5 THE PROPOSED DEVELOPMENT

5.1 Introduction

5.1.1 This chapter provides a description of the Proposed Development, and the associated activities proposed during the construction, operation, and decommissioning phases. The following description of the Proposed Development informs the preliminary technical assessments of **Volume 1, Chapters 6 to 17** of this Draft Environmental Statement (Draft ES).

5.1.2 The Proposed Development involves the construction, operation and maintenance, and decommissioning of approximately 750 megawatts (MW) of solar photovoltaic (PV) array, Battery Energy Storage System (BESS), onsite substations and supporting infrastructure, and grid connection infrastructure. The grid connection infrastructure would connect the Proposed Development to the National Grid at the new National Grid substation and Brinsworth (Brinsworth B), located east of Long Lane, Rotherham. National Grid are currently undergoing consultation on plans for the development of this new substation[1] which is expected to be operational in time for the Proposed Development to connect in 2029. This substation is therefore not included in the Proposed Development and will be subject to a separate planning application taken forward by National Grid.

5.1.3 The location of the Proposed Development is described in **Volume 1, Chapter 3: The Site and Surrounding Area**. The Proposed Order Limits, as shown in **Volume 2, Figure 3.1**, encompass all land within the Site and Cable Corridor Options, which would include:

- Solar PV Infrastructure (PV Panels, Mounting Structures, Fencing, and Power Conversion Stations (PCS));
- BESS;
- Substations (Primary and Satellite);
- Grid Connection Corridor;
- Ancillary Works (including on-site cabling, access tracks, fencing, security, and drainage works);
- Temporary Construction Compounds;
- Highway Works; and
- Landscape and biodiversity mitigation / enhancement.

5.1.4 This chapter is supported by the following figures which can be found in **Volume 2: Figures** of this Draft ES:

- **Figure 3.1: Proposed Order Limits;**

[1] National Grid (2024) Project Summary Document: Substation Near Brinsworth. Available at https://www.nationalgrid.com/electricity-transmission/document/155231/download Accessed May 2025

- **Figure 3.2: Site Referencing**; and
- **Figure 5.1: Penny Hill Wind Farm Height Restriction Area**.

5.1.5 This chapter is supported by the following appendices, found in **Volume 3: Technical Appendices** of this Draft ES:

- **Appendix 5.1 Indicative Operation Masterplan**;
- **Appendix 5.2 Indicative Construction Masterplan**; and
- **Appendix 5.3 Indicative Mitigation Masterplan**.

5.2 Applying the Rochdale Envelope

5.2.1 Large scale developments often undergo significant design changes during the pre-application stage. Consequently, development design must remain adaptable to economic and technological shifts. The Planning Inspectorate acknowledges the importance of design evolution and flexibility, especially considering how pre-application and Environmental Impact Assessment (EIA) consultations can positively influence the Proposed Development's design[2]. A "Rochdale Envelope" approach is used to accommodate flexibility in design, as described in the Planning Inspectorate's Advice Note Nine[3].

5.2.2 The advice note acknowledges that there may be aspects of the Proposed Development's design that are not yet fixed, and therefore, it may be necessary for the EIA to assess likely worst-case variations to ensure that all foreseeable significant environmental effects of the Proposed Development are considered. For the purpose of the preliminary technical assessments in **Volume 1, Chapters 6-17**, the worst -case scenario is presented using the maximum potential extent of each component of the Proposed Development, as described in Section 5.4.

5.2.3 Through this approach, an EIA robustly assesses the likely significant effects of the Proposed Development on the environment by taking account of reasonable design flexibility and variations. Such an approach is good practice, as reflected in case law that led to the definition of the 'Rochdale Envelope' principle: *R. v Rochdale MBC ex parte Milne (No. 1) and R. v Rochdale MBC ex parte Tew [1999] and R. v Rochdale MBC ex parte Milne (No. 2) [2000].* Suitably applied in EIA it can help to avoid the need for protracted resubmission procedures at a later stage, whilst giving a comprehensive assessment of the likely environmental effects.

5.3 Proposed Development Parameters and Good Design

5.3.1 A list of Outline Proposed Development Parameters has been developed to represent the maximum spatial extent for each element of the Proposed Development and are presented in the relevant descriptions of Section 5.4. The

[2] Nationally Significant Infrastructure Projects: Advice on Good Design. Available at: https://www.gov.uk/guidance/nationally-significant-infrastructure-projects-advice-on-good-design Accessed: May 2025

[3] The Planning Inspectorate (2018) Nationally Significant Infrastructure Projects – Advice Note Nine: Rochdale Envelope (version 3). Available at https://www.gov.uk/government/publications/nationally-significant-infrastructure-projects-advice-note-nine-rochdale-envelope/nationally-significant-infrastructure-projects-advice-note-nine-rochdale-envelope Accessed May 2025

maximum extent of each element of the Proposed Development has determined the parameters for the preliminary technical assessments in **Volume 1, Chapters 6 to 17** of this Draft ES.

5.3.2 National Planning Statement (NPS) Overarching National Policy Statement for Energy (EN-1)[4] sets out the importance of good design. This has been considered from the early stages of the Proposed Development's lifecycle, influencing site selection, suitable use of land, and physical appearance of the Proposed Development. This process is detailed further in **Volume 1, Chapter 4: Alternatives and Design Evolution** in this Draft ES. Design principles were developed at the concept stage of the Proposed Development and have been updated throughout the Proposed Development's lifecycle. The design principles are based on an understanding of the Proposed Development's local context, the people it would affect, and the potential outcomes and benefits it can deliver. The design principles for the Proposed Development are detailed in **Volume 1, Chapter 4: Alternatives and Design Evolution**. These principles have been considered throughout design development and are continuously tested and improved in response to baseline surveys, design evolution and stakeholder feedback and have informed the Outline Proposed Development Parameters.

5.3.3 Additionally, the design has incorporated a number of standard buffers from easily identifiable features, with the aim of reducing any potential impacts to sensitive receptors. These buffers are:

- 5 m from hedgerows;
- 25 m from woodland;
- 15 m from individual trees;
- 10 m from waterbodies; and
- 15 m from Public Rights of Way (PRoWs).

5.4 Description of the Proposed Development

Components of the Proposed Development

5.4.1 This section describes each component of the Proposed Development. These have been divided into packages in line with the Outline Proposed Development Parameters described in Section 5.3 and are set out below. The proposed location and spatial extent of each of these components is shown in **Volume 3, Appendix 5.1 Indicative Operation Masterplan** and **Appendix 5.2: Indicative Construction Masterplan**.

5.4.2 The Proposed Order limits as described in **Volume 1, Chapter 3: The Site and Surrounding Area** and shown in **Volume 2, Figure 3.1: Proposed Order Limits** and would contain the following components:

- Solar PV Infrastructure;
- BESS;
- Substations;

[4] Department for Energy Security and Net Zero (2024) Overarching National Policy Statement for Energy (EN-1). Available at https://www.gov.uk/government/publications/overarching-national-policy-statement-for-energy-en-1 [accessed May 2025]

- Cable Corridor Options;
- Ancillary Works;
- Temporary Construction Compounds;
- Highway Works; and
- Landscaping and biodiversity mitigation / enhancement.

5.4.3 A detailed description of each element of the Proposed Development is set out below, and where appropriate has been divided by site reference. The site reference is described in **Volume 1, Chapter 3: The Site and Surrounding Area** and shown in **Volume 2, Figure 3.2: Site Referencing.**

Solar PV Infrastructure

5.4.4 This section describes the solar PV arrays and supporting infrastructure (solar PV infrastructure) proposed to be developed. These can be seen in **Volume 3, Appendix 5.1: Indicative Operation Masterplan**. The solar PV infrastructure is divided between Whitestone 1 (W1), Whitestone 2 (W2), and Whitestone 3 (W3).

5.4.5 The extent of solar PV arrays has been determined through ongoing technical assessment and consultation with local communities and consultee groups. Further details of the design process are available in **Volume 1, Chapter 4: Alternatives and Design Evolution**.

5.4.6 The below description of the solar PV array is applicable to each of W1, W2, and W3, and so a separate section for each is not necessary.

Solar PV Modules

5.4.7 Solar PV modules are designed to transform sunlight into direct current (DC) electricity. These individual modules, often measuring approximately 2.5 m in length and 1.5 m in width, are typically composed of a sequence of PV cells protected by a layer of hardened glass. The module is typically built from anodised aluminium. As the field of PV technology continues to develop rapidly, performance and design of PV modules may evolve by the time of construction. Consequently, the generating capacity should not be seen as an appropriate tool to constrain the impacts of a solar development, therefore the size of individual solar PV modules are not specified in the Draft ES. Instead, the maximum total area of solar PV array is shown in **Volume 3, Appendix 5.1: Indicative Operation Masterplan**.

5.4.8 The DC generating capacity of each solar PV module cannot be confirmed at this early stage as it will depend on advances in technological capabilities that are available at the time of construction.

5.4.9 The modules are attached to a support structure in clusters, referred to as ‘strings’. The quantity and arrangement of modules in each string would be influenced by several factors, including the need to minimise ground disturbance, particularly when avoiding archaeological assets that must be preserved in their original state. Additionally, some flexibility will likely be required to adapt to future technological advancements. **Image 1** shows a typical solar PV array similar to the Proposed Development. It should be noted that **Image 1** is an indicative representation of a similar development, and the Proposed Development may not look exactly alike.

Image 1: Typical example of solar PV array

5.4.10 The Proposed Development would comprise south-facing, fixed solar PV modules at an angle of between 8 and 25 degrees. The solar PV arrays would vary in height, the minimum height of the lowest part of the solar PV modules would be 0.4 m above ground level (AGL). The proposed maximum height of the top of the solar PV modules would be 3.8 m AGL. The only exception to this would be in the Penny Hill Wind Farm restriction area, where the height would not exceed 3 m. The maximum heights in areas of flood risk greater than 1 m will be determined following further discussions with the Environment Agency.

5.4.11 Solar PV modules would be bifacial, meaning both faces of the modules would have the capacity to absorb sunlight. The solar PV modules would be installed in rows, with a minimum of 3 m between each row.

Solar Mounting Infrastructure and Perimeter Fencing

5.4.12 The solar PV modules would be mounted on metal racks, known as mounting structures. These mounting structures would be galvanised or bare metal frames which would be pile driven or installed by helical screws to a maximum depth of 4 m below ground level (BGL). Where ground investigation surveys show the ground to be unsuitable for piles or screws, a concrete ballast may be used.

5.4.13 Perimeter fencing around the solar PV array would comprise wooden post and wire fencing, an example of which can be seen in **Image 1**. Fencing surrounding the solar PV array are anticipated to be a maximum of 2.2 m in height

Power Conversion Stations

5.4.14 Power conversion stations (PCS) comprise inverters, transformers, and switchgear. These components serve multiple purposes to manage the output generated by the solar PV modules, which are described below.

5.4.15 The components of the PCS would be housed together in a single enclosure and would be a muted colour which would be sensitive to the surrounding environment. These enclosures would be a maximum of 13 m long by 3 m wide with a maximum height of 3.5 m, excluding foundations and noise mitigation requirements to be installed as required. As with the solar PV array, in the Penny Hill Wind Farm restriction area, the height of that PCS would not exceed 3 m (see **Volume 2: Figure 5.1**).

5.4.16 PCS would be placed on a hardstanding foundation which would not typically exceed depths of 2 m BGL but could also include piling to depths of up to 4 m BGL. They would be located a minimum of 100 m from residential dwellings and 50 m from PRoWs, unless suitable acoustic screening is provided to reduce any potential effects to these noise sensitive receptors.

5.4.17 The PCS enclosures would be surrounded by a palisade fence which would be painted a colour which is sympathetic to the surrounding environment. The height of the fence would not exceed 3.5 m AGL. **Image 2** shows an example of a PCS similar to those expected as part of the Proposed Development.

Image 2: Example of a PCS

Inverters

5.4.18 Inverters convert DC electricity from the solar PV modules to AC, allowing export onto the grid system. The number of modules that can be connected to each inverter will be determined by the size of the inverters available in the market. Inverter technology is in continuous evolution. Two types of inverters are being considered for use within the Proposed Development:

- Central container inverters – these are bigger than string inverters so a fewer number of them are required.

- String inverters – these inverters are smaller than central inverters but carry less power so a higher number of them would need to be installed on the Site.

5.4.19 The decision on which is the most appropriate type of inverter will depend on technical and environmental aspects which will inform the detailed design.

Switchgear

5.4.20 Switchgear, which includes electrical disconnect switches, fuses, or circuit breakers, is used to control, protect, and isolate electrical equipment. It serves both to de-energise equipment for maintenance and to clear downstream faults. Typically, switchgear is located within or adjacent to the transformer housing.

Transformers

5.4.21 Transformers increase the voltage of the generated electricity generated by the Solar PV infrastructure for distribution to the on-site substation and further to connect to Brinsworth B.

5.4.22 **Table 5.1** provides a basis for preliminary assessment of the proposed solar and associated infrastructure.

Table 5.1: Outline Proposed Development Parameters for solar and associated infrastructure

Solar PV Modules	Outline Proposed Development Parameters
Colour	Solar PV modules would be black, blue, or dark grey in colour
Bifacial / Monofacial	Solar PV modules would be bifacial
Maximum height of highest elements of solar PV modules	3.8 m AGL
Minimum height of lowest elements of solar PV modules	0.4 m AGL
Angle of solar PV modules	8 to 25 degrees
Minimum distance between rows of solar PV modules	3 m
Solar PV Mounting	
Frame material	Galvanised metal or equivalent
Frame installation	Pile driven, helical screws or equivalent. Concrete ballast to be used where required by outcomes of ground investigation.
Maximum depth of frame installation	4 m BGL
Perimeter Fencing	
Fencing materials	Wooden post and wire fencing
Anticipated maximum heigh of fencing	2.2 m AGL

PCS	
Maximum dimensions of PCS enclosures	13 m long, by 3 m wide, by 3.5 m high, other than within Penny Hill restriction area in which they would not exceed 3 m high.
Maximum depth of PCS foundations	Up to 4 m BGL
Colour of PCS enclosures	Muted and sensitive with surroundings
Fencing	Colour-sensitive palisade fencing, with a maximum height of 3.5 m AGL.

Battery Energy Storage System

5.4.23 The Proposed Development would incorporate a related BESS, designed to offer peak power generation and grid balancing services to the electrical grid. Its primary function is to store excess electricity generated by the solar PV modules and release it when there is demand. The BESS could also draw additional energy from the electricity grid at times of low demand, and store it until times of high demand, to provide grid balancing services and support the minimisation of energy waste, which would assist in provision of a continuous power supply even during periods of low solar activity in the broader grid.

5.4.24 The storage components can be placed on open skids or housed together in enclosed containers (see **Image 3** and **Table 5.2**). The exact count of individual battery storage enclosures would depend on the power capacity level and energy storage duration that the Proposed Development necessitates. It also depends on the output capacity available per unit at the time of procurement and is currently under investigation.

5.4.25 Various designs for the BESS will be examined as part of the iterative design process. The maximum parameters for the compound layouts will be specified in the Application to present and evaluate a reasonable worst-case scenario in the ES.

5.4.26 The BESS would be located adjacent to Primary Substations, which is described later in this section. There are currently two options for the location of the BESS, both within W2, as shown in **Volume 3, Appendix 5.1 Indicative Operation Masterplan**. These options will henceforth be referred to as:

- W2 P2: located immediately south of the M1 to the east of Upper Whiston, centred at National Grid Reference (NGR) SK 464891; and
- W2 P3: located to the southeast of W2, centred at NGR SK 491863.

5.4.27 It is important to note that it is likely only one of these locations would be constructed as part of the Proposed Development. The final location for the BESS would be determined by a combination of engineering and environmental assessment, and consultation with stakeholders and communities, and will be confirmed in the ES. The area currently identified for the BESS option not carried forward to submission would be instead dedicated for solar PV infrastructure and assessed as such in the ES.

5.4.28 The battery storage units within the BESS are housed on skids or in many cases in containers, an example of which can be seen in **Image 3**. The precise housing method and dimensions will be determined as part of the design and supplier selection process post DCO consent. The exact dimensions are yet to be determined but will depend on the capacity of the technology to be used. The maximum height of these containers would be no greater than 3.5 m AGL excluding foundations. BESS units would be a muted colour, sensitive to the surrounding environment.

Image 3: Example of a BESS unit

5.4.29 Each battery container would require a cooling system. This system could be either air-cooled or liquid-cooled which have a similar external appearance. An air-cooled system would be external to the containerised unit, either mounted on top or attached to the side, and would include a fan powered by auxiliary power. Alternatively, liquid cooling may be used. The worst case will be assessed across various technical chapters.

5.4.30 The BESS units would be located on foundations of hardstanding, which would not typically exceed depths of 2 m BGL. Pile foundations could exceed 2 m depth BGL should they be required following ground investigation. The dimensions and quantities will depend on the number, size and weight of the BESS units chosen at detailed design stage.

5.4.31 Ancillary buildings would be included within the BESS compound. The dimensions of ancillary buildings combined would be a maximum of 40 m length by 40 m width, with a maximum height of 8 m AGL. These buildings would be a muted colour, sensitive to the surrounding environment.

5.4.32 The BESS compound would be surrounded by a palisade fence which would be a maximum of 4 m AGL. Should acoustic fencing be required following technical assessment and modelling, this would be a maximum of 5 m AGL. Fencing would be muted in colour, and sensitive with the surrounding environment.

5.4.33 The BESS will be designed in accordance with the latest guidance to minimise risk during operation. As battery technology develops, the detailed design of the BESS will be updated to ensure compliance with the relevant safety standards at the time of construction. An outline design of the BESS will be provided as part of the Application, and will be assessed within the ES.

5.4.34 An outline Battery Safety Management Plan (oBSMP) will be prepared and submitted alongside the Application. The oBSMP will provide the outline requirements of the BESS in the event of a fire. It will outline the safety design measures, including details on:

- Suppression and detection methods;
- Thermal management systems;
- Ventilation and deflagration;
- Emergency response and guidance;
- Post-incident recovery;
- Drainage strategy; and
- Fire suppression systems including sources of water for the purpose of firefighting.

5.4.35 The BESS site would have two points of access during operation to ensure access in the event of a fire. Local Fire and Rescue services will be consulted as part of the DCO process, to support BESS safety requirements incorporation, and to assist local services in remaining aware of the safety systems being proposed and can respond to potential incidents effectively.

5.4.36 The Proposed Development would likely connect to mains water network for any unlikely fire event, subject to further discussions with relevant water authority. Should this option not be available, then the Proposed Development would include holding tanks with appropriate volume needed for managing any risks of fire.

5.4.37 All water supply points, and any potential fire hydrant locations would be clearly identified with appropriate signage and shown on the BESS layout plans. The delivery rate of water is anticipated be a minimum of approximately 1,900 litres/min for 2 hours, subject to discussion with the local Fire Rescue Service.

5.4.38 It is anticipated that the water needed for cleaning panels during the Operation and Maintenance Phase would be delivered to the Site by trucks. Further details will be provided in the ES and the oCEMP, following consultation with the relevant authorities.

5.4.39 The basis for preliminary assessment of the works proposed for proposed BESS are summarised in **Table 5.2**.

Table 5.2: Outline Proposed Development Parameters for BESS

BESS	Outline Proposed Development Parameters
Maximum height of BESS units	3.5 m AGL excluding foundations
Maximum height of ancillary buildings within BESS enclosure	8 m AGL excluding foundations
Maximum footprint of ancillary buildings within the BESS enclosure	40 m length by 40 m width.
Maximum depth of BESS foundations	2 m BGL, unless pile foundations are required which could exceed 2 m.

BESS	Outline Proposed Development Parameters
Maximum height of fencing surrounding BESS enclosure	4 m AGL. Should acoustic fencing be required, this would not exceed 5 m AGL.
Colour of BESS infrastructure	BESS units, ancillary buildings and fencing would be muted in colour, sensitive to the surrounding environment.

Substations

Primary Substation

5.4.40 The Proposed Development would include a primary substation that would act as a combiner point for the output cables from the three solar areas. W1 through to W3 into a single cable connection to connect the Proposed Development to the grid connection point described in **Volume 1, Chapter 1: Introduction**.

5.4.41 There are currently 3 options for the location of the primary substation, all located in W2, as illustrated in **Volume 3, Appendix 5.1 Indicative Operation Masterplan**. These will henceforth be referred to as:

- W2 P1: located to the west of W2, adjacent to the National Grid Brinsworth Substation. W2 P1 is not located adjacent to a proposed BESS Location, and is centred at NGR SK 435895;
- W2 P2: located immediately south of the M1 to the east of Upper Whiston, centred at NGR SK 464891;
- W2 P3: located to the southeast of W2, centred at NGR SK 491863; and.
- W2 P4: (also an option for satellite substation) located to the southeast of W2, approximately 1.1 km north of Todwick, and centred at NGR SK 493858

5.4.42 It should be noted that only one of the above options for a primary substation would be necessary for the construction of the Proposed Development. Should W2 P2 or W2 P3 not be taken to construction, these could be incorporated into the area for solar PV infrastructure for the Application and assessed accordingly. However, W2 P1 has been identified as unsuitable for solar development and so would not be incorporated into the area for solar PV infrastructure if not selected for the primary substation in the final design of the Proposed Development.

5.4.43 The final location for the primary substation to be identified for the Application would be determined by a combination of engineering and environmental assessment (including noise), and consultation with stakeholders and communities. The primary substation would have a maximum footprint of 170 m by 100 m, and a maximum height of 13.5 m AGL. The substation would also require lightning rods, which would be constructed to a maximum height of 20 m AGL. Ancillary buildings within the substation compound would have a maximum footprint of 40x40 m and a maximum height of 8 m AGL excluding foundations. An example of a typical substation similar to the proposed primary substation is shown in **Image 4**.

Image 4: Example of a 400kV substation

5.4.44 Substations, and associated infrastructure within the substation compound would be located on concrete foundations with a maximum depth of 2 m BGL, unless pile foundations are required, which would exceed 2 m BGL.

5.4.45 The substation compound would be enclosed by perimeter fencing. This would be a palisade fence, measuring up to 3 m AGL, with an additional 1 m of electrified fence, totalling a maximum of 4 m AGL. The perimeter fence would be a muted colour, sympathetic with the surrounding environment.

Satellite Substations

5.4.46 In addition to the primary substation, satellite substations would be necessary to collect the Medium Voltage (MV) cables from the Low Voltage (LV)/MV transformers and would contain transformers to increase the voltage to 400 kV to match the grid connection agreement voltage. The satellite substation may also contain buildings for substation control and operation, welfare facilities and storage areas for equipment for the operation and maintenance of the solar infrastructure.

5.4.47 The Proposed Development would require two satellite substations to collect MV cables, one in W1 and one in W2. These have been considered separately below.

Whitestone 1

5.4.48 At this stage of design, there are three options proposed for satellite substations in W1, shown in **Volume 3, Appendix 5.1: Indicative Operation Masterplan**. These options are:

- W1 S1: Located in the centre of W1, immediately west of Park Lane, centred at NGR SK 502966;
- W1 S2: Located in the centre of W1, immediately south of W1 S1, centred at NGR SK 503962; and
- W1 S3: Located approximately 410 m south of Clifton, centred at NGR SK 520957.

5.4.49 Only one of these options is proposed to be brought forward for construction of the Proposed Development, which will be identified for the Application. For any of the above options not brought forward to construction, they would be incorporated into the area for solar PV infrastructure and assessed accordingly in the ES. The final location for the satellite substations would be determined by a combination of engineering and environmental assessment, and consultation with stakeholders and communities.

Whitestone 2

5.4.50 There are currently two options for the proposed satellite substations in W2, shown in **Volume 3, Appendix 5.1: Indicative Operation Masterplan**. Thes options are:

- W2 S1: Located immediately west of the M1, to the south of W2, centred at NGR SK 477868; and
- W2 P3: (also an option for primary substation) located to the southeast of W2, centred at NGR SK 491863.

5.4.51 As with the options in W1, only one of the proposed options is necessary for the Proposed Development, which will be identified for the Application. The option not taken to construction as a substation would be incorporated into the area for solar PV infrastructure and assessed accordingly in the ES. The final location for the satellite substations would be determined by a combination of engineering and environmental assessment, and consultation with stakeholders and communities.

Satellite Substation Design

5.4.52 The maximum footprint for satellite substation compounds would be 130 m by 90 m, and the maximum height would be 13.5 m AGL. The substation would also require lightning rods, which would be constructed to a maximum height of 20 m AGL. Ancillary buildings within the substation compound would have footprints that combined have a maximum total of 50 m by 35 m height of 8 m AGL.

5.4.53 Satellite substation compounds, and associated infrastructure within the substation compound would be located on concrete foundations with a maximum depth of 2 m BGL, unless pile foundations are required, which would exceed 2 m BGL.

5.4.54 The satellite substation compounds would be enclosed by perimeter fencing. This would be a palisade fence, measuring up to 3 m AGL, with an additional 1 m of electrified fence, totalling a maximum of 4 m AGL. The perimeter fence would be a muted colour, sympathetic with the surrounding environment.

5.4.55 The basis for preliminary assessment of the works proposed for primary and satellite substations are summarised in **Table 5.3**.

Table 5.3: Outline Proposed Development Parameters for on-site substations

Substation Compound Infrastructure	Outline Proposed Development Parameters
Maximum Primary Substation footprint	170 m by 100 m
Maximum Satellite Substation footprint	130 m by 90 m
Maximum height of primary and satellite substations	13.5 m AGL
Maximum footprint of ancillary buildings	50 m by 35 m
Maximum height of ancillary buildings within substation compounds	13.5 m AGL
Maximum height of lightning rods within substation compounds	20 m AGL
Fencing	Substation compounds would be enclosed by a palisade fence measuring up to 3 m AGL, with an additional 1 m of electrified fencing. Fences would be a muted colour, sensitive to the surrounding environment.
Maximum depth of substation foundations	2 m BGL, unless pile foundations are required, which would extend below 2 m BGL

Cable Corridor Options

5.4.56 The point of connection (POC) for the Proposed Development into the National Grid would be Brinsworth B, located to the east of Long Lane, Rotherham at approximately NGR SK 444895. National Grid are currently undergoing consultation on plans for the development of this new substation[5]. It should be noted that Brinsworth B is not part of the Proposed Development and is being taken forwards by National Grid in a separate planning application. To ensure the Proposed Development can connect into the National Grid, the location of Brinsworth B has been included in the Proposed Order Limits.

5.4.57 Whitestone 1, 2, and 3 would be interconnected and connected to the grid by high voltage underground cables. The voltage of these cables is not yet confirmed but could be up to 400 kV. At this stage in the design process, the exact route of these underground cables is unknown, corridors have therefore been identified within which the cables would run. These corridors serve as boundaries for environmental surveys, which will inform the ultimate routing of the cables. The Cable Corridor Options detailed in this Draft ES are therefore wider than would be required for the laying of the cables. A description of the Cable Corridor Options is

[5] National Grid (2024) Project Summar Document: Substation Near Brinsworth. Available at https://www.nationalgrid.com/electricity-transmission/document/155231/download [accessed 18/03/2025]

given in **Volume 1, Chapter 3: The Site and Surrounding Area**. These corridors will be refined as part of the design, consultation and EIA process and will be assessed within the ES.

5.4.58 Due to the different voltages and operational requirements for each route that would be installed, the expected construction corridor widths differ for each Cable Corridor Option. The anticipated maximum construction corridor width and easements are displayed in **Table 5.4**.

5.4.59 It is noted however that as discussed in paragraph 5.4.60 below, the entire maximum construction width would not be trenched. Soil removal would be limited only to necessary areas, and reinstated following construction. The maximum construction width is needed to accommodate all components of construction, including access roads, storing of soil deposits, and locations for vehicle movements. It is therefore anticipated that a 75 m corridor would be required to accommodate these activities.

5.4.60 For the purposes of this Draft ES, preliminary assessments have assessed the maximum construction width as the maximum width needed to accommodate all construction activities required for cable installation.

Table 5.4: Anticipated maximum Cable Corridor Option construction widths

Cable Corridor Option	Anticipated Maximum Construction Width	Anticipated Maximum Easement
CR1a / CR1b / CR1c	75 m	10 m
CR 2a / CR 2b	75 m	25 m
CR 2c	75 m	15 m
CR 2d / CR 2e	75 m	25 m
CR 2f / CR 2g	75 m or 120 m depending on cable voltage	10 m or 60 m depending on cable voltage
CR 2h	75 m	50 m
CR 3a / CR 3b	75 m	35 m
CR 3c / CR 3d	75 m	20 m

5.4.61 All medium and high voltage cabling to be installed as part of the Proposed Development would likely be laid below ground according to British Standards and regulations. The construction method for installation of the export cable would typically be open cut trench and trenchless methods in some locations.

5.4.62 In the first instance, the open cut trench method would be used, however, the use of any trenchless method would be dependent on the type of crossing. When open cut trenching is not possible, a trenchless method would be used to minimise the disruption and impact on various crossing points, such as roads, railways, paths, existing infrastructure and environmentally protected areas.

5.4.63 The open cut trenching method can install cables via direct burying or ducting.

5.4.64 The direct buried method typically requires longer sections (up to 500 m) of trenching to be exposed at a time to allow for the cable to be rolled/laid into the trench before backfilling.

5.4.65 Ducting of cables utilises shorter sections of exposed trenching at a time where the ducts are typically installed and backfilled in 20 to 40 m sections, which is substantially shorter than the sections required for direct burying. Following this, the cables are installed by being pulled through the ducts. It is anticipated that ducting would be the preferred method for the Proposed Development due to shorter sections of trench being exposed at a time.

5.4.66 For the open cut trench sections of the grid connection route, a typical working width corridor of 75 m is anticipated. This area would include the open cut trench for laying of the 33 kV or 400 kV cables (direct burying or ducting), temporary haul road (for vehicles, plant and access to joint bays), temporary drainage ditch and a laydown area for the storage of topsoil following excavation of the cable trench.

5.4.67 The temporary haul road would be a maximum of 5 m wide for typical straight sections and temporary track matting would be used where required. Turning bays and passing places would be provided in appropriate locations, and exceed 5 m in width. Drainage requirements cut/fill to create a safe road may at time extent the road extents past 5 m, but this is expected to be minimal.

5.4.68 Topsoil and subsoil would be stored in separate bunds to avoid mixing. Guidance on indicative stripping depths states 300 mm for topsoil and 700 mm for subsoil removal. However, soil horizons should be stripped on-site according to their individual compositions. The building and storage of soil storage bunds should follow the guidance provided in Sheets B and C of The Institute of Quarrying Good Practice Guide for Handling Soils in Mineral Workings.

5.4.69 There are different viable trenchless methods that can be used for the export cable installation. The selection of a trenchless method would be dependent on the type of crossing, alignment, required length of crossing, ground conditions and depth. The method would be appropriately selected on a crossing-by-crossing basis and would likely be one of the following:

- Horizontal Directional Drilling (HDD);
- Tunnel Boring Machine (TBM) Tunnelling: (Microtunnelling/Pipe Jacking; and/or Conventional Tunnelling Method (CTM)).

5.4.70 Trenchless crossings require launch and reception pits, which would be sited outside the avoidance areas where possible. The exact locations of the start and end points of the different construction methods (open cut trench and trenchless) for the cables will be determined at detailed design stage. Therefore, the approach to the EIA is to commit to 'Open Trench Avoidance Areas' where the method would be likely be trenchless. These areas are still being defined, and will be provided in the ES.

5.4.71 In addition, at the grid connection corridor access locations, there would be temporary construction lay-down areas which are typically up to 50m x 50m that would be used to support the cable installations. The laydown area footprint would take into consideration topography, drainage, and any heritage and environmental constraints

5.4.72 The laydown areas would allow construction vehicles to turn off public roads and park safely. Activities at the laydown areas would include receipt of deliveries, unloading, provision of welfare, and storage of plant and construction materials. The areas would likely include portacabins, welfare and power generators, and would be secured using Heras fencing and security cameras. In the construction phase, parking would be available at these locations for the workforce. Upon completion of construction, the laydown areas would be removed and the land reinstated.

5.4.73 Where feasible, the higher voltage cables would share trenches with the lower voltage cables along the same routes across the Proposed Development.

5.4.74 All cables installed via trenching would be installed to a with a minimum clearance to ground level of 0.6 m to a maximum clearance of 1.2 m. The exception to this is where crossings (road networks / environmental constraints / other utilities) are required, where cables may be installed outside these clearance limits.

5.4.75 Cables would cross existing utilities at 90 degrees to the infrastructure where reasonable. In line with National Grid Guidance[6], cables would be installed at least 0.6 m above or below existing utilities infrastructure where reasonable. Trenchless crossing methods would be used where other methods are not possible for the installation of cables crossing watercourses. Cables installed using trenchless methods would be installed at least 5 m beneath main watercourses and at least 1.5 m below minor watercourses.

5.4.76 There are currently several options for cables interconnecting areas of the Proposed Development, as shown in **Volume 3, Appendix 5.2: Indicative Construction Masterplan**. These Cable Corridor Options are described in further detail below, divided by connection area. Further details of the environmental context of these Cable Corridor Options are presented in **Volume 1, Chapter 3: The Site and Surrounding Area**.

W1 interconnection and connection to W2

5.4.77 There are currently two options for the W1 to W2 connection, and one option to connect W1 which are:

- CR 1a: connecting to the east of W1, running west of the M18, to connect to the north of W2;
- CR 1b: connects to the south of W1, crosses the M18 and runs between Hellaby industrial estate and Maltby, and crosses back under the M18 to connect back to the north of W2; and
- CR 1c: connecting the main body of W1 with the eastern section of W1.

5.4.78 As only one connection corridor is required to be taken to construction for the Proposed Development, meaning only one of either CR 1a and CR1b is needed. The final cable route would be constructed in conjunction with CR 1c, which would connect both areas of W1 to W2. The final routes would be determined by a combination of engineering and environmental assessment, and consultation with stakeholders and local communities.

W2 interconnection and connection to the National Grid

5.4.79 Whitestone 2 is divided into several individual areas, which require interconnecting cables. Additionally, a Cable Corridor Option has been identified to connect the Proposed Development to the POC Brinsworth B. The various options are described below:

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[6] National Grid (2007) *Specification for safe working in the vicinity of national grid high pressure gas pipelines and associated installations – requirements for third parties. T/SP/SSW/22.*

- CR 2a: one of two options to connect the northernmost part of W2 to the main body of W2. CR 2a runs from the northern area of W2, north of Morthen, and crosses the M1 into the northern part of the main body of W2, around W2 P2 (see description of BESS and Substations);
- CR 2b: is the second of the two options to connect the same parcels as CR 2a. CR 2b follows the west/north of the M1, running south of Morthen to cross the M1 and connect to the main body of W2;
- CR 2c: connects to W2 at W2 P2 (see description of BESS and substations), crosses the M1 and runs west to W2 P1 (see description of BESS and Substations);
- CR 2d: connects the western area of W2 to the main body of W2 (west of the M1);
- CR 2e: a short corridor connecting the western areas of W2, adjacent to Burnt Wood;
- CR 2f: the northern of two options for corridors connecting the areas of W2 either side of the M1, following Penny Hill Lane;
- CR 2g; the southern option for corridors connecting the areas of W2 either side of the M1; and
- CR 2h: connects the southeast of W2 with the rest of W2, running north of Todwick.

5.4.80 Where there are multiple options for the same route, CR 2a and CR2b, and CR 2f and CR 2g, only one route would be taken forward to construction for each pair of options. The final routes would be determined by a combination of engineering and environmental assessment, and consultation with stakeholders and local communities.

W3 interconnection and connection to W2

5.4.81 W3 is split between three distinct areas which would require interconnecting cables. Additionally, two Cable Corridor Options have been identified to connect W3 to W2, and consequently to Brinsworth B.

- CR 3a: connects to the northeast of W3, running between Kiventon Park and Kiveton Park Industrial Estate, to connect with the southeast of W2;
- CR 3b: connects to the east of W3, running east of Kiveton Park Industrial Estate to connect to the southeast of W2;
- CR 3c: connects the eastern parcels of W3; and
- CR3d: connects the southern parcels of W3.

5.4.82 As CR 3a and CR3b connect the same areas, only one would be carried forward for the final design of the Proposed Development. The final routes would be determined by a combination of engineering and environmental assessment, and consultation with stakeholders and local communities.

5.4.83 The basis for preliminary assessment of the works proposed for Cable Corridor Options are summarised in **Table 5.5**.

Table 5.5: Outline Proposed Development Parameters for Cable Corridor Options

Grid Connection Corridor	Outline Proposed Development Parameters
Clearance to ground level of cable installation	Cables would be installed to a minimum clearance of 0.6 m BGL and a maximum clearance of 1.2 m BGL. Where crossings of roads / environmental constraints / other utilities are required, installed depths may exceed these limits.

Ancillary Works

5.4.84 Ancillary works for the Proposed Development would include low voltage cabling, on-site access tracks, drainage works, fencing and closed-circuit television (CCTV), and ancillary buildings.

5.4.85 Low voltage cabling is required between the solar PV modules and transformers. Higher rated voltage cables are required between the transformers, switch gear and the substation. At this stage the precise method of cabling is unknown. The majority of cabling (low voltage cables) between the solar PV modules and the inverters are likely to be above ground level and fixed to the mounting structures.

5.4.86 As a minimum, access would be required into each area (W1-W3). An outline Construction Traffic Management Plan (oCTMP) for each phase of the Proposed Development will be submitted as part of the Application to minimise traffic disruption and impact, and then would be secured by the requirements of the DCO.

5.4.87 Access tracks would measure between 3.5 m and 8 m wide and would be constructed using crushed hard core. A minimum of the first 50 m of the track joining the public highway would comprise a tarmac (or similar) surface.

5.4.88 Daytime and infrared CCTV systems, mounted on poles and facing internally, would be installed around the perimeter of the operational areas of the Site. CCTV cameras would be installed on poles with a maximum height of 4 m AGL. The CCTV cameras would have fixed viewing angles and would be positioned to face along the fence. Any landscaping and biodiversity works would be designed to avoid compromising the effectiveness of the CCTV or security fencing.

5.4.89 Lighting is not required within the solar arrays. However, it would be installed in the primary and satellite substation compounds and the BESS location(s) and would be used only as needed for maintenance and security purposes. All lighting would be motion-activated and directed into the compounds, avoiding hedgerows, tree lines, woodland blocks, watercourses, ponds, and other areas to minimise impact on nocturnal or crepuscular fauna and potential sensitive residential receptors where possible.

5.4.90 The basis for preliminary assessment of the works proposed for ancillary works are summarised in **Table 5.6**.

Table 5.6: Outline Proposed Development Parameters for ancillary works

Ancillary Works	Outline Proposed Development Parameters
Access Tracks	Access tracks made of crushed hard core would measure 3.5 m to 8 m in width. At least the first 50 m of track joining the public highway would comprise a tarmac (or similar) surface.
CCTV	CCTV would be installed along fence lines to a maximum height of 4 m AGL.

Temporary Construction Compounds

5.4.91 Temporary construction compounds refers to the temporary areas used for primary construction compounds and secondary compounds or laydown areas. These would facilitate the phased installation of the Proposed Development. The extent of temporary construction compounds can be seen in **Volume 3, Appendix 5.2: Indicative Construction Masterplan**.

5.4.92 Once construction is nearing completion, these construction compounds and laydown areas would be removed, and the area would be incorporated into solar and associated infrastructure.

Primary Construction Compounds

5.4.93 Primary compounds would be set up for the temporary storing of materials, plant, and equipment during the construction phase. These compounds would also house staff welfare facilities, parking areas for construction workforce, waste storage, and wheel washing areas. Adequate lighting would be installed to ensure safety and security.

5.4.94 It should be noted that the locations identified are indicative, and subject to change based on design iteration and further assessment. In W2, there are four options for primary construction compound locations, two either side of the M1. Only one option from either side of the M1 would be necessary for the construction of the Proposed Development, totalling two primary construction compounds in W2.

5.4.95 Primary construction compounds would have a maximum footprint of 200 m by 200 m.

Secondary Construction Compounds

5.4.96 To support the primary construction compounds, secondary construction compounds areas would be required for the temporary storage of infrastructure before it is installed as part of the Proposed Development.

5.4.97 Not all potential locations for secondary construction compounds would be used for the construction of the Proposed Development. Secondary construction compounds would measure a maximum of 100 m by 100 m.

5.4.98 The basis for preliminary assessment of the works proposed for temporary construction compounds are summarised in **Table 5.7**.

Table 5.7: Outline Proposed Development Parameters for temporary construction compounds

Temporary Construction Compounds	Outline Proposed Development Parameters
Primary construction compounds	Primary compounds would have a maximum footprint of 200 m by 200 m
Secondary construction compounds	There would be up to ten construction laydown areas required, each with a maximum footprint of 100 m by 100 m.

Highway Works

5.4.99 The indicative primary access points to the Proposed Development are shown in **Volume 3, Appendix 5.1: Indicative Operation Masterplan**, representing the extent of highway works.

5.4.100 Site access and routing strategies will be discussed in consultation with the Highways Authorities and local authorities, and set out in the outline Construction Environmental Management Plan to be submitted alongside the ES.

5.4.101 Abnormal loads, such as transformers, would be required across the Site. The routing and access points for these will be determined through the design process and in consultation with the appropriate statutory consultees. They will then be confirmed and assessed within the technical assessments of the ES.

Landscaping and Biodiversity mitigation / enhancement

5.4.102 Landscaping and biodiversity mitigation / enhancement comprises all landscaping, habitat enhancement, and biodiversity works to be undertaken as part of the Proposed Development. At this stage of design, approximately 484 ha has been identified for landscaping and biodiversity mitigation / enhancement, as shown in **Volume 3, Appendix 5.3: Indicative Mitigation Masterplan**.

5.4.103 The Impact Assessment for the government's policy on Biodiversity Net Gain (BNG) identifies 10% as the lowest level of biodiversity gain that the Department for Environment, Food, and Rural Affairs (DEFRA) could confidently expect to mitigate a development's role in biodiversity loss. The 10% level provides a small margin of gain to account for uncertainties and variation in application delivery and success.

5.4.104 Although BNG is not mandatory for NSIPs, it is expected that BNG requirements will apply to NSIPs from May 2026 onwards. As Whitestone Net Zero Ltd's (the Applicant's) programme currently envisages an application submission in 2026, the Proposed Development will incorporate BNG using methodology prescribed in the DEFRA Statutory Biodiversity Metric. The BNG will be derived from an integrated landscape and biodiversity led strategy which would seek to mitigate any potential effects on landscape and visual impacts whilst also incorporating ecological enhancements and BNG.

5.4.105 It is anticipated that the Proposed Development would include management of existing planting, new native planting, hedgerow enhancement, and planting of suitable seed mixes amongst the solar PV arrays. Indigenous planting would also be used to provide natural screening of the Proposed Development. Further details of these measures and commitments for aftercare will be discussed in the outline Landscape and Biodiversity Management Plan (oLBMP) to be submitted alongside the ES.

5.5 Construction Phase

5.5.1 The construction phase is expected to span approximately 24 to 36 months. While the exact timeline would depend on various factors, including the submission and determination of the development consent, the current plan is to commence construction in 2027 and conclude by 2029. However, it should be noted that the construction works would be phased across the Site, so it is unlikely for one area to be undergoing construction for a continuous 24 to 36 months. The earliest date of operation would be 2029, in line with the connection date for the Proposed Development.

5.5.2 Construction hours would be between 0700hrs and 1900hrs Monday to Friday, 0700hrs to 1300hrs on Saturdays, and no working on Sundays or bank holidays. Exceptions to this may be required for trenchless crossings or for time sensitive construction activities such as concrete pouring.

5.5.3 Further details of indicative construction activities and their expected duration are set out in **Table 5.8**.

Table 5.8: Indicative construction activities and their durations

Construction Activity	Expected Duration
Site Establishment including construction of Site access points	3 months
General Deliveries: Import and export of materials from Site.	Ongoing throughout 26 months
Establishment of Site compounds including: • Installation of surfacing for material storage and parking • Installation of welfare buildings and Site offices • Establishment of secondary compounds which would be used to store materials and welfare to limit movement of internal traffic.	4 months
Site Tracks	6 months
Installation of geotextiles	14 months
Preparation of substation platform(s)	6 months
Cabling Works	6 months
Pouring of substation concrete	2 months
Substation HV Deliveries	3 months
Internal HV Works & Buildings	3 months
Solar Array Works	16 months
Installation of cabling & cabling sand	16 months
Battery Platform	6 months
Battery Foundations	4 months
Battery Cabling	4 months

Construction Activity	Expected Duration
Landscaping and habitat enhancement, including fencing	Ongoing throughout 26 months
Commissioning including testing elements following the completion of key construction elements	5 months
Final Connection	1 month
Staff Movements	Ongoing throughout the anticipated 2 year programme

5.5.4 It is anticipated that the main construction and decommissioning access points to the solar PV arrays would be off the public road network with connections to the M1 and M18 primarily. Swept path analysis will be undertaken to determine if land take or road widening is required along the access routes for abnormal load deliveries. It is anticipated that abnormal loads would be required for the transformers for the on-site substations. An oCTMP will be submitted alongside the ES, including details of construction traffic logistics.

5.5.5 All construction and decommissioning access will be confirmed as the Proposed Development's design progresses and in consultation with the relevant Highways Authorities and National Highways, as appropriate.

5.5.6 The Application will be accompanied by an outline Construction Environmental Management Plan (oCEMP). This plan will outline the mitigation measures to be implemented during the construction phase, which would then be developed into a detailed CEMP before construction begins. The primary objective of the oCEMP is to set out measures compliant with environmental regulations to minimise environmental impacts. Environmental management plans will be prescribed relating to:

- Use of land for temporary laydown areas, accommodation, etc;
- Construction traffic (including parking and access requirements) and changes to access and temporary road or footpath closures (if required);
- Control measures to protect and manage retained planting, habitats, land restoration and enhancement;
- Control measures for water management (surface water and groundwater) to prevent pollution;
- Noise and vibration measures to control noise and vibration levels to protect wildlife and communities;
- Utilities diversion;
- Control measures to manage dust generation and emissions from construction activities;
- Soil handling, removal, storage and waste generation;
- Emergency response and contingency plans relating to spills or extreme weather conditions;
- Communication strategies to keep communities and stakeholders informed throughout the construction process; and

- Mechanisms for monitoring and reporting on the above.

5.5.7 The CEMP, which will accord with the principles of the oCEMP, would be developed by the designated Construction Contractor after the DCO has been granted. Approval for the CEMP would be sought from the appropriate LPA before construction begins, as stipulated by the requirements of the DCO. This plan would specify the procedures that the Construction Contractor must follow and oversee throughout the construction process. Construction Contractors of the Proposed Development would be required to incorporate environmental control, health and safety regulations, and current legislative and best practice guidance into the CEMP.

5.5.8 During construction, there may be a requirement to temporarily close PRoWs, with temporary diversions provided. These closures and diversions would be managed via an outline Public Rights of Way Management Plan (oPRoWMP), which will be submitted alongside the ES.

5.6 Operation and Maintenance Phase

5.6.1 The Application is seeking consent for an operational period of 60 years for the Proposed Development, after which it would be decommissioned. During the Operation phase, onsite activities are expected to be limited to landscape and ecological management, infrastructure maintenance, replacement of any failed equipment, and monitoring and inspection activities.

5.6.2 Due to general wear and tear, and expected lifespan of components of the Proposed Development, it is anticipated that some elements would need to be replaced during the Operation Phase. Preliminary technical assessments of **Volume 1, Chapters 7-16** have been undertaken under the assumption of component lifespans set out in **Table 5.9**.

Table 5.9: Indicative lifespan of components of the Proposed Development

Proposed Development Component	Expected Lifespan
Solar PV modules	25-35 years
Inverters	10-20 years
Solar mounting structures	Replacement not anticipated
Above ground, low-voltage cabling	25-30 years
Transformers	Replacement not anticipated
Monitoring and control systems	10-20 years
Batteries	5-15 years
Meteorological sensors	5-15 years
Substation equipment	Replacement not anticipated
Communication equipment	10-20 years

5.6.3 Estimates, type, and quantities of waste generated during the Operation phase of the Proposed Development, including the replacement of the above components will be presented in the outline Site Waste Management Plan (oSWMP) which will be submitted alongside the ES

5.6.4 An outline Operation Environment Management Plan (oOEMP) will be produced for submission alongside the Application to include measures which control elements of expected maintenance works during the Operation Phase.

5.7 Decommissioning Phase

5.7.1 The Proposed Development is expected to be operational for 60 years, and, after which time the Proposed Development would be decommissioned. Technical assessments of the potential impacts of decommissioning are presented in **Volume 1, Chapters 6-17**.

5.7.2 Decommissioning is likely to involve the dismantling and recycling of the PV arrays with associated vehicle movements. Components of the Proposed Development such as mitigation planting, Site accesses would be left in place subject to landowner agreement. These activities would be managed through appropriate environmental management plans and industry best practices and are not expected to result in any adverse environmental impacts.

5.7.3 Decommissioning is expected to take between 12 and 24 months and would be undertaken in phases. The effects of decommissioning are usually similar to, or of a lesser magnitude than, construction effects and will be considered in the relevant sections of the ES. The specific method of decommissioning the Proposed Development at the end of its operational life is uncertain at present as the engineering approaches to decommissioning will evolve over the operational life of the Proposed Development. Assumptions will therefore be made where appropriate.

5.7.4 An oDEMP will accompany the Application, which will describe the framework of mitigation measures as identified in the ES to be followed and carried forward into a DEMP, which accords with the principles of the oDEMP, prior to decommissioning.

5.7.5 Approval for the DEMP will be sought from the appropriate LPA before decommissioning begins, as stipulated by the requirements of the DCO. This plan will specify the procedures that the appointed contractor must follow and oversee throughout the decommissioning process. Contractors associated with the decommissioning of the Proposed Development would be required to incorporate environmental control, health and safety regulations, and current legislative and best practice guidance applicable at the time of decommissioning.

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solar farm

Contact

Whitestone Net Zero Ltd

info@whitestonesolarfarm.co.uk

0800 0194 576