# EAST YORKSHIRE SOLAR FARM

**East Yorkshire Solar Farm**
**EN010143**

## Environmental Statement

**Volume 1, Chapter 2: The Scheme**
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## 2.1 Introduction

2.1.1 This chapter provides a description of the Scheme and its location. The physical characteristics of the Scheme are described and the key activities that would be undertaken during construction, operation (including maintenance), and decommissioning are set out. The description contained within this chapter informs each of the technical assessments provided in **Chapters 6** to **16** of this **Environmental Statement (ES), ES Volume 1 [EN010143/APP/6.1]**.

2.1.2 This chapter is supported by the following Figures in **ES Volume 3 [EN010143/APP/6.3]**:

a. **Figure 2-1: Environmental and Planning Constraints**;

b. **Figure 2-2: Public Rights of Way [PRoW]**;

c. **Figure 2-3: Indicative Site Layout**; and

d. **Figure 2-4: Location of temporary construction compounds and indicative HDD [Horizontal Directional Drill] areas**.

As well as **Plate 2-1** to **Plate 2-16** which are embedded as images within this chapter.

2.1.3 This chapter is supported by the following Appendix in **ES Volume 2 [EN010143/APP/6.2]**.

a. **Appendix 2-1: Grazing Feasibility Study**.

## 2.2 The Order limits

2.2.1 The Order limits are shown on **Figure 1-2, ES Volume 3 [EN010143/APP/6.3]** and represent the maximum extent of land to be acquired or used for the construction, operation (including maintenance), and decommissioning of the Scheme. This allows for consideration of the potential environmental effects of the full range of options under consideration, to ensure that the likely significant effects of each of the component options has been scoped into the assessment.

2.2.2 The Order limits straddle the boundary between East Riding of Yorkshire Council and North Yorkshire Council. The Solar PV Site, Ecology Mitigation Area and Interconnecting Cable Corridor are solely located within the administrative area of East Riding of Yorkshire Council. The Grid Connection Corridor and Site Accesses are located within the administrative areas of East Riding of Yorkshire Council and North Yorkshire Council.

2.2.3 In this chapter the following definitions are used to describe the different areas and elements within the Order limits. These are illustrated in **Figure 1-3, ES Volume 3 [EN010143/APP/6.3]**:

a. The Site – the collective term for all land within the Order limits (the Solar PV Site, Ecology Mitigation Area, Interconnecting Cable Corridor, Grid Connection Corridor, and Site Accesses) (1,276.5 hectares [ha] in total);

b. Solar PV (photovoltaic) Site – the total area covered by all the Solar PV Areas (966.4 ha in total);

   i. Solar PV Areas – areas of land within which the following solar infrastructure is located: solar PV panels and associated solar PV infrastructure, including two Grid Connection Substations. The Solar PV Areas also incorporate areas of habitat creation/enhancement and landscaping (**Figure 2-3, ES Volume 3 and the Framework Landscape and Ecological Management Plan (LEMP) [EN010143/APP/7.14]**);

c. Ecology Mitigation Area – area of land in the north-east of the Site to be managed to provide good quality habitat for overwintering and migratory bird species, mitigating the loss of habitat elsewhere in the Site considered to be functionally linked to the international designated sites of the Lower Derwent Valley Special Protection Area (SPA)/Ramsar and Humber Estuary SPA/Ramsar. No solar PV infrastructure will be located within the Ecology Mitigation Area (107.9 ha in total), and it comprises:

   i. Golden Plover Mitigation Zone – 28.75 ha near to River Foulness to be managed as wet grassland habitat; and

   ii. Goose Mitigation Zone – 79.09 ha to remain in the current arable rotation with amendments to improve habitat quality such as increased retention of stubble

d. Interconnecting Cable Corridor – the area outside of the Solar PV Site and Grid Connection Corridor within which the 33 kilovolt (kV) cables (Interconnecting Cables) linking the Solar PV Areas to the 33 kV/132 kV Grid Connection Substations will be installed;

e. Grid Connection Corridor – the area outside of the Solar PV Site within which the 132 kV Grid Connection Cables (and between Solar PV Areas 3b and 1c some 33 kV Interconnecting Cables) will be installed; and

f. Site Accesses – land required to facilitate access to the Site, such as new access routes or measures to provide better visibility splays.

## 2.3 Existing Conditions Within and Surrounding the Site

2.3.1 The key environmental and land use constraints within and around the Site are shown on **Figure 2-1**, **ES Volume 3 [EN010143/APP/6.3]**.

2.3.2 There is an extensive network of Public Rights of Way (PRoW) within the Site (including the Solar PV Site) and across the surrounding area, as shown on **Figure 2-2, ES Volume 3 [EN010143/APP/6.3]**. The PRoW located within or adjacent to the Site are detailed in **Chapter 12: Socio-Economics and Land Use, ES Volume 1 [EN010143/APP/6.1]** and are described within **the Framework Public Rights of Way Management Plan (PRoWMP) [EN010143/APP/7.13]**.

2.3.3 There are no national trails within the Site. National Cycle Route 65, which runs from Hornsea to Middlesborough and forms part of the Trans Pennine Trail (east) cycle route between Selby and Hornsea, intersects the Grid Connection Corridor to the north of the River Ouse crossing point, however there will be no direct impact (temporary closure or diversion) to this route as this section of cable will be installed via HDD, as further explained in and secured by the **Framework Public Rights of Way Management Plan [EN010143/APP/7.13]**.

2.3.4 The ‘Howden 20’ is a 20-mile (c. 32 km) named ‘challenge walk’. This circular recreational route passes along PRoW through and near to the Site at various locations, as shown on **Figure 2-2** and **Figure 2-3, ES Volume 3 [EN010143/APP/6.3]**. It is noted that on some websites, and as marked on the Ordnance Survey (OS) mapping, the route of the Howden 20 is shown as cutting across the eastern side of Solar PV Area 2f in an approximate south to north direction from Featherbed Lane (PRoW EASTB17). A site walkover (and as observable on Google Maps Streetview) established that there is no visible/accessible path across the field at that point and no break in the boundary hedges to the north or south which would allow access to a path at location. Additionally, the PRoW data received from East Riding of Yorkshire Council does not show a PRoW at that position and it was confirmed with the Council’s PRoW Team at a meeting on 28 February 2023 that this route does not exist. Therefore, on **Figure 2-2** and **Figure 2-3**, **ES Volume 3 [EN010143/APP/6.3]** the Howden 20 is shown to the west of Solar PV Area 2f along the line of PRoW SPALF18. Similarly, there are sections of the Howden 20 for which more than one route is identified by different sources, for example to the west of Gribthorpe. In these cases, the Scheme has identified the route used in **Figure 2-2** and **Figure 2-3, ES Volume 3 [EN010143/APP/6.3]** from observations during site visits. At the meeting on 28 February 2023 East Riding of Yorkshire Council confirmed that the routing of the Howden 20 is currently being reviewed.

2.3.5 There are no World Heritage Sites, Registered Battlefields, Registered Parks and Gardens, or Protected Wrecks within the Site or within the Study Area for Cultural Heritage (3 km from the Site). There are no designated heritage assets comprising scheduled monuments, Listed Buildings, and Conservation Areas within the Site, although these assets are present within the Study Area. There are records in the Historic Environment Record (HER) that are located wholly or partially within the Site. These HER records cover multiple historic periods and include records such as finds of Roman coins, late prehistoric/Roman crop marks and medieval field systems and earthworks, remains of post-medieval buildings, and more modern features such as the Hull to Selby Railway. Further information regarding Cultural Heritage and the heritage assets/HER records within the Site and Study Areas is provided in **Chapter 7: Cultural Heritage, ES Volume 1 [EN010143/APP/6.1]** and **Appendix 7-2, ES Volume 2 [EN010143/APP/6.2]**.

2.3.6 The watercourses within the Site are shown on **Figures 9-1** and **9-2**, **ES Volume 3 [EN010143/APP/6.3]**. More detailed information on watercourses and flood risk is included in **Chapter 9: Flood Risk, Drainage and Water Environment, ES Volume 1 [EN010143/APP/6.1]**. A **Flood Risk Assessment (FRA)** is presented in **Appendix 9-3, ES Volume 2 [EN010143/APP/6.2]**.

2.3.7 Further detail on the Site and the surrounding areas is provided in the technical **Chapters 6** to **16**, **ES Volume 1 [EN010143/APP/6.1]**.

2.3.8 Existing green energy generation schemes in the vicinity of the Site include the Anaerobic Digestion (AD) plant operated by R100 Energy. This facility, which converts food waste into biogas, is located off the B1228, north-east of Solar PV Area 2d. Spaldington Airfield Wind Farm lies to the east of the AD plant and west of Spaldington village, between Solar PV Areas 2b, 2d and 2e. It comprises five 2.3 MW turbines. A further single wind turbine of unknown generation capacity is located east of Solar PV Area 1c, off Tottering Lane.

2.3.9 Recreational facilities in the vicinity of the Site include the 18-hole Boothferry Golf Club located between Solar PV Areas 2d and 2e off Spaldington Lane. The Golf Club also incorporates Howden Footgolf and Golf comprising a driving range, two footgolf courses and a nine-hole ‘pay and play’ course. Breighton Airfield to the west of Solar PV Area 1a and north-west of Solar PV Area 2a houses the Real Aeroplane Company and the Real Aeroplane Club’s collection of unusual, classic and ex-military aircraft. The museum is open to members. The Real Aeroplane Club has a single grass runway and is open to members and flying visitors throughout the year.

2.3.10 Existing conditions within and around each of the five elements of the Site are summarised below.

## Solar PV Site

2.3.11 The Solar PV Site comprises 16 Solar PV Areas. For clarity of reporting, individual Solar PV Areas have been assigned an identification number (Solar PV Areas 1a-f, 2a-g and 3a-c). The numbering was assigned by placing the Solar PV Areas into three groups numbered from north to south, with individual Solar PV Areas given a letter from east to west, as shown in **Figure 1-3, ES Volume 3 [EN010143/APP/6.3]**. The numbering system therefore solely relates to geographical location.

2.3.12 The Solar PV Site is approximately centred on National Grid Reference (NGR) SE 756 330, as shown on **Figure 1-1, ES Volume 3 [EN010143/APP/6.3]**. The landscape features within the Solar PV Site consist predominately of agricultural fields mainly under arable production, with some areas of pasture, interspersed with individual trees, hedgerows, tree belts (linear) small woodland blocks and farm access tracks. The figures contained within **Chapters 6** to **16** in **ES Volume 3 [EN010143/APP/6.3]** show the location of existing baseline features in relation to the Solar PV Site.

2.3.13 The landscape features immediately surrounding the Solar PV Site comprise several small rural villages and hamlets and the market town of Howden. At the closest point, the boundary of the Solar PV Site is located 1.6 kilometres (km) north-west of new residential developments in the north of Howden and approximately 1.3 km east of the villages of Breighton and Wressle. The closest properties in the hamlets of Gribthorpe and Brind and the village of Spaldington are approximately 20 metres (m) from the Site, whilst the closest properties in the hamlet of Willitoft are approximately 120 m from the Site. Due to the provision of buffers, and land for landscaping and habitat enhancement, the actual distance of separation between residences and solar PV infrastructure will be greater than this, as shown in the indicative layout presented in **Figure 2-3, ES Volume 3 [EN010143/APP/6.3]**. The Site is also approximately 10 m from the closest properties in the village of

Newsholme; this part of the Site is a proposed Site Access point for use during the operational phase only (see paragraph 2.7.9) and solar PV infrastructure will be located over 400 m to the east of properties. The National Grid Drax Substation is located approximately 6.6 km south-west of the Solar PV Site (Solar PV Area 3c) at the closest point.

2.3.14 Johnson’s Farm lies within Solar PV Area 1e in the north-east of the Solar PV Site. This comprises two existing modern agricultural buildings (barns), as well as a derelict building (former farmhouse) and a row of dilapidated brick built open-fronted barns (as shown on **Figure 1-3, ES Volume 3 [EN010143/APP/6.3]** and **Plate 2-1**. The former farmhouse has an L-shaped footprint.

**Plate 2-1. Existing structures at Johnson’s Farm (Solar PV Area 1e)**

*Top: Existing agricultural buildings and derelict building; Bottom: Dilapidated barns to the west*

2.3.15 The Solar PV Site does not contain any statutory or non-statutory nature conservation designations. However, there are several woodlands located adjacent to the Solar PV Site and surrounding area, including deciduous woodland Priority Habitat, such as (but not limited to) west of Solar PV Area 2b, west of Solar PV Area 2g, and west of Solar PV Area 1a. Further details of the ecology of the Site, including the Solar PV Site, are reported in **Chapter 8: Ecology, ES Volume 1 [EN010143/APP/6.1]**. Lists of statutory and non-statutory designated sites within and in the vicinity of the Site are included in **Table 8-6** and **Table 8-7** of **Chapter 8: Ecology, ES Volume 1 [EN010143/APP/6.1]** and shown on **Figures 8-1** and **8-2**, **ES Volume 3 [E/010143/APP/6.3]**.

2.3.16 From published Environment Agency flood mapping, the majority of the Solar PV Site is located within Flood Zone 1 (lowest risk of flooding). Areas of Flood Zone 2 (medium risk) are predominantly located within the central area of the Solar PV Site within Solar PV Areas 2a, 2c, 2d, 3a and 3b (as illustrated in **Figure 9-4, ES Volume 3 [EN010143/APP/6.3]**). Limited areas of Flood Zone 3 (high risk) are found in relation to the River Foulness to the north-east of the Solar PV Site (Solar PV Area 1e) and in relation to Fleet Dyke (a tributary of the River Derwent) to the west of the Solar PV Site (Solar PV Area 2a).

2.3.17 To provide more site-specific data than provided by the published Environment Agency flood mapping, hydraulic modelling of the River Derwent and its tributaries has been undertaken. This considered the impacts of climate change to give worst case flood levels for the Site. As no base model is available for the River Foulness worst case flood levels in this part of the Site were based on Light Detection and Ranging (LiDAR) data and published Environment Agency Flood Zone extents, with the Flood Zone 2 extent used as a proxy for climate change. This methodology was agreed with both the Environment Agency and East Riding of Yorkshire Council (as the Lead Local Flood Authority). These data are presented in the **Flood Risk Assessment (FRA) (Appendix 9-3, ES Volume 2 [EN010143/APP/6.2])**.

2.3.18 Soil and Agricultural Land Classification (ALC) surveys were undertaken within the Solar PV Site in November 2022 to January 2023 and July 2023 to September 2023 (**Appendix 15-3, ES Volume 2 [EN010143/APP/6.2]**), and show the majority (approximately 90%) of land within the Solar PV Site to be moderate quality (Subgrade 3b). This is not classed as Best and Most Versatile1 (BMV). All land within Solar PV Area 1c (the Grid Connection Substations) is non-BMV Subgrade 3b. This is further discussed in (**Chapter 15: Soils and Agricultural Land, ES Volume 1 [EN010143/APP/6.1]**).

2.3.19 The figures contained within **Chapters 6** to **16** in **ES Volume 3 [EN010143/APP/6.3]** show the location of existing baseline features in relation to the Solar PV Site.

## Ecology Mitigation Area

2.3.20 The Ecology Mitigation Area comprises Ecology Mitigation Area 1g and Ecology Mitigation Area 1h.

2.3.21 The Ecology Mitigation Area is located in the north-east of the Site to the east of the village of Gribthorpe, at approximate central grid reference SE 770 356 (**Figure 1-3** and **Figure 2-3, ES Volume 3 [EN010143/APP/6.3]**). It is approximately 180 m south-east of the nearest residential property in Gribthorpe. The eastern boundary of the Ecology Mitigation Area is formed by the River Foulness and further residential properties in the hamlet of Arglam lie beyond the river (approximately 315 m east of the Ecology Mitigation Area at the closest point).

[1] Best and Most Versatile land is agricultural land of ALC grades 1, 2 and Subgrade 3a.

2.3.22 The Ecology Mitigation Area does not contain any statutory or non-statutory nature conservation designations. The landscape features within the Ecology Mitigation Area consist predominately of agricultural fields mainly under arable production, with some small areas of grassland, interspersed with individual trees, hedgerows and tree belts (linear). An access track forms the boundary between Ecology Mitigation Area 1g and 1h. The land closer to the River Foulness is in Flood Zone 3 and currently farmed at risk. As further described in **Chapter 7: Cultural Heritage, ES Volume 1 [EN010143/APP/6.1]**, there is a non-designated moated site (MHU3206) located in the south-west corner of Ecology Mitigation Area 1g. The above ground elements of this site are visible on aerial imaging.

2.3.23 The parts of Ecology Mitigation Area 1h in closest proximity to the River Foulness contain areas of Flood Zone 2 and Flood Zone 3 (as illustrated in **Figure 9-4, ES Volume 3 [EN010143/APP/6.3]**) and further discussed in the **FRA (Appendix 9-3, ES Volume 2 [EN010143/APP/6.2]**).

2.3.24 The Ecology Mitigation Area was subject to detailed soil and ALC survey in July 2023 to September 2023 (**Appendix 15-3, ES Volume 2 [EN010143/APP/6.2] and Figure 15-3, ES Volume 3 [EN010143/APP/6.3]**). This found the majority of agricultural land to be non-BMV moderate quality (Subgrade 3b) with areas of BMV Subgrade 3a to the north-east and west of Ecology Mitigation Area 1h.

2.3.25 There are no PRoW within the Ecology Mitigation Area.

2.3.26 The figures contained within **Chapters 6** to **16** in **ES Volume 3 [EN010143/APP/6.3]** show the location of existing baseline features in relation to the Ecology Mitigation Area; and the baseline conditions within the Ecology Mitigation Area are further described within the **Habitats Regulations Assessment Report [EN010143/APP/7.12]** which accompanies the DCO Application.

### Interconnecting Cable Corridor

2.3.27 The majority of Interconnecting Cables lie within the Solar PV Site and Grid Connection Corridor; however, approximately 23.5 ha of land is required for the installation of Interconnecting Cables only, which is shown shaded green in **Figure 1-3, ES Volume 3 [EN010143/APP/6.3]**. This land links some of the Solar PV Areas together.

2.3.28 The land within the Interconnecting Cable Corridor comprises a mix of agricultural land (as described for the Solar PV Site) and highway, including roads and roadside verges.

2.3.29 There are two non-statutory Local Wildlife Sites (LWS) within the Interconnecting Cable Corridor (Wressle Verge LWS and Tottering Lane, Gribthorpe LWS), which are both described as good quality established semi-natural verge. Tottering Lane, Gribthorpe LWS is approximately 1.5 km in length, and lies within the Interconnecting Cable Corridor between Solar PV Area 1a and Solar PV Areas 1b and 1e. Wressle Verge LWS is 3.3 km in length and lies within the Interconnecting Cable and Grid Connection Corridors between Solar PV Areas 3a and 3b, running south-east to north-west along both sides of Brind Lane and then south-west along both sides of Wood Lane. Further information is provided in **Chapter 8: Ecology, ES Volume 1 [EN010143/APP/6.1].**

2.3.30 The agricultural land within the Interconnecting Cable Corridor is covered by the Cranfield University Predictive ALC data (**Appendix 15-2, ES Volume 2 [EN010143/APP/6.2]** and **Figure 15-2, ES Volume 3 [EN010143/APP/6.3]**), which shows the majority of agricultural land is non-BMV moderate quality (Subgrade 3b).

### Grid Connection Corridor

2.3.31 The Grid Connection Corridor is shown in **Figure 1-3, ES Volume 3 [EN010143/APP/6.3]**. It is an approximate 100 m wide corridor, which widens and narrows as required to accommodate the works required for the installation of the Grid Connection Cables (and between Solar PV Areas 3b and 1c some Interconnecting Cables). The land within the Grid Connection Corridor totals approximately 168.9 ha. The figures contained within **Chapters 6** to **16** in **ES Volume 3 [EN010143/APP/6.3]** show the location of existing baseline features in relation to the Grid Connection Corridor.

2.3.32 The landscape features within the Grid Connection Corridor consist predominately of agricultural fields mainly under arable production, with some areas of pasture, interspersed with individual trees, hedgerows, tree belts (linear) small woodland blocks and farm access tracks.

2.3.33 As shown on **Figure 1-3** and **Figure 2-3, ES Volume 3 [EN010143/APP/6.3]**, the Grid Connection Corridor passes approximately 170 m south of Wressle at the closest point. It is adjacent to Hagthorpe Hall and Brackenholme Cottages. The village of Hemingbrough is approximately 1.1 km north of the Corridor and the village of Barmby on the Marsh is approximately 80 m south of the Corridor (across the River Derwent) at the closest points. The Grid Connection Corridor crosses the River Ouse approximately 290 m west of Long Drax and is approximately 400 m north/north-west of the village of Drax.

2.3.34 The Grid Connection Corridor includes several roads and roadside verges to allow the option of routeing within the highway. As shown in **Figure 2-3, ES Volume 3 [EN010143/APP/6.3]**, the Hull to Selby Railway lies within the Grid Connection Corridor.

2.3.35 As shown in **Figure 2-3** and **Figure 9-2, ES Volume 3 [EN010143/APP/6.3]**, the Grid Connection Corridor contains a number of watercourses, including the Rivers Ouse and Derwent.

2.3.36 The Cranfield University Predictive ALC data (**Appendix 15-2, ES Volume 2 [EN010143/APP/6.2]**) indicates that the north of the Grid Connection Corridor is predominantly non-BMV Subgrade 3b with patches of Grade 2. The middle section of the Grid Connection Corridor associated with the Rivers Derwent and Ouse is a combination of Grades 1, 2 and Subgrade 3a BMV land, and land to the south of the Grid Connection Corridor around Drax is predominantly Subgrade 3b with some Grade 2. Due to the east to west orientation and extent of the bands of Grade 1 and Grade 2 land it is not possible for the Grid Connection Corridor (with an approximate north-east to south-west orientation) to avoid routing through some BMV land, although the cables will be buried and at sufficient depth for the land to remain in arable use after installation. The distribution of ALC gradings within the Grid Connection Corridor are shown on **Figure 15-2, ES Volume 3 [EN010143/APP/6.3]**.

2.3.37 As shown on **Figure 8-1, ES Volume 3 [EN010143/APP/6.3]** the Grid Connection Corridor crosses and lies adjacent to the nationally and internationally designated River Derwent SAC/SSSI. The Grid Connection Corridor also intersects with the northern part of the SAC/SSSI to the east of Babthorpe as further described in **Chapter 8: Ecology, ES Volume 1 [EN010143/APP/6.1]**. Additionally, Wressle Verge LWS (as described in paragraph 2.3.29) lies in the Grid Connection Corridor between Solar PV Areas 3a and 3b, running south-east to north-west along both sides of Brind Lane and then south-west along both sides of Wood Lane. Further information is provided in **Chapter 8**.

2.3.38 There are two woodland blocks within the Grid Connection Corridor east of the National Grid Drax Substation. The first of these woodland blocks is primarily located south of Carr Lane, with a smaller section north of the lane at its junction with New Road. The second is located to the south of Wren Hall Lane (**Figure 1-2, Figure 10-33** and **Figure 10-33A , ES Volume 3 [EN010143/APP/6.3]**). North Yorkshire Council has confirmed that this woodland provides screening for existing developments such as the National Grid Drax Substation and Drax Power Station and for other planned development in the area.

2.3.39 From published Environment Agency flood mapping, the northern section of the Grid Connection Corridor is located mainly within Flood Zone 1 and Flood Zone 2, with the Flood Zone 2 area coincident with the central areas of the Solar PV Site (**Figure 9-4, ES Volume 3 [EN010143/APP/6.3]**). The southern section of the Grid Connection Corridor is predominantly in Flood Zone 3 (associated with the Rivers Ouse and Derwent), with a small section in Flood Zone 2 around Babthorpe. Further information on flood risk in relation to the Grid Connection Corridor is presented in **the Flood Risk Assessment (Appendix 9-3, ES Volume 2 [EN010143/APP/6.2]**).

## Site Accesses

2.3.40 Approximately 9.8 ha of land within the Site is illustrated on **Figure 1-3 ES Volume 3 [EN010143/APP/6.3]** as Site Accesses. These are areas of land, predominantly along or adjacent to the highway, which are required to facilitate access to the Solar PV Site and the Interconnecting and Grid Connection Corridors, such as new access routes, measures to provide better visibility splays. Where Site Accesses are identified outside of the public highway, these generally follow the line of existing farm accesses, such as the new access into Solar PV Area 3c from Rowlandhall Lane, or existing private roads such as those within Drax Power Station.

2.3.41 The Site Access into Solar PV Area 3b is located within Wressle Verge LWS. There are three Site Accesses within Tottering Lane, Gribthorpe LWS, one into Solar PV Area 1a and two into Solar PV Area 1b. The LWS sites are described in paragraph 2.3.29.

2.3.42 The Site Access at the junction of the B1228 and the A163 east of Bubwith, is not connected to another element of the Site. It is required to facilitate abnormal indivisible load (AIL) manoeuvres from the A163 onto the B1228 to allow the delivery/removal of the transformers into/from the Grid Connection Substations at Solar PV Area 1c (AIL movements are further described in paragraph 2.6.58 and in the **Transport Assessment** (**Appendix 13-4: ES Volume 2 [EN010143/APP/6.2]**).

2.3.43 There are two locations where Site Accesses include part of a residential or a non-agricultural commercial landholding. These are Highfield Garage at the junction of the B1228 and the A163 (described above) and a residential property at the junction of the B1228 and Wood Lane to the north of Solar PV Area 2c. These locations are included within the Order limits to facilitate the AIL movements to/from the Grid Connection Substations. In both cases the land is required due to predicted overrun from the main highway while the AIL vehicles are turning. Carriageway widening is not required at these locations. At the Highfield Garage there will be overrun on to the hardstanding of the garage forecourt, at the residential property there will be potential overrun onto grassed area between the road and the garden which is within the ownership of the property. Access to these areas of land would be temporary in nature as there are up to ten AIL movements for delivery (during construction) and removal (at decommissioning) of the transformers. AIL movements during the operational phase are not anticipated due to the delivery of spare transformer phases during the construction phase. The Scheme will seek to minimise any harm caused by vehicle overrun but if any damage is caused this will be made good to the satisfaction of the landowner. See also **Chapter 13: Transport and Access, ES Volume 1 [EN010143/APP/6.1].** Impacts to the viability of the garage business due to the AIL movements are assessed in **Chapter 12: Socio-economics and Land Use, ES Volume 1 [EN010143/APP/6.1].**

2.3.44 The figures contained within **Chapters 6** to **16** in ES **Volume 3 [EN010143/APP/6.3]** show the location of existing baseline features in relation to the Site Accesses.

## 2.4 Description of the Scheme

### Overview of the Scheme

2.4.1 The Scheme will comprise the construction, operation (including maintenance), and decommissioning of a solar photovoltaic (PV) electricity generating facility with a total capacity exceeding 50 megawatts (MW) and export connection to the national grid, at National Grid's Drax Substation.

2.4.2 The design life of the Scheme is 40 years, with decommissioning to commence 40 years after final commissioning (currently anticipated to be 2027 to 2067).

### The Rochdale Envelope

2.4.3 The design of the Scheme is an iterative process, based on preliminary environmental assessments and consultation with statutory and non-statutory consultees, including the public. **Chapter 3: Alternatives and Design Evolution, ES Volume 1 [EN010143/APP/6.1]** describes this process further, including options that have been considered and discounted or amendments made to the Scheme design to date. Several of the design aspects and features of the Scheme cannot be confirmed until the tendering process for the design and construction of the Scheme has been completed. For example, the enclosure or building sizes may vary, depending on the contractor selected and their specific configuration and selection of plant.

2.4.4 The Environmental Impact Assessment (EIA) has therefore been undertaken adopting the principles set out in the Planning Inspectorate's Advice Note 9: Using the 'Rochdale Envelope' (Advice Note 9) (Ref. 2-1) which provides guidance regarding the degree of flexibility that may be considered appropriate within an application for development consent under the Planning Act 2008 (Ref. 2-2). The advice note acknowledges that there may be aspects of the Scheme design that are not yet fixed, and therefore, it is necessary for the EIA to assess likely worst-case variations to ensure that all likely significant environmental effects of the Scheme will be assessed.

2.4.5 Aspects of the Scheme that require design flexibility for the EIA being carried out include, but are not limited to:

a. The arrangement of the solar PV panels and panel type/specification, including solar PV panels heights. Maximum parameters are therefore assessed.

b. Exact cable routing – the Interconnecting Cable Corridor and Grid Connection Corridor present the area in which the cabling will be laid, albeit the cabling will not require all the assigned areas. There is also flexibility for the three proposed cable routing options in relation to avoiding impacting on the River Derwent SAC/SSSI.

c. The arrangement of supporting infrastructure such as inverters, transformers and switchgear.

2.4.6 It is necessary that there is some flexibility built into the design of the Scheme for the DCO application submission, in order that the detailed design of the Scheme can be informed by environmental and technical considerations, post-consent work and take advantage of innovation in technology. Where such flexibility or optionality is required, this is explained in section 2.6 below.

2.4.7 It is therefore necessary for the technical assessments to assess an 'envelope' within which the works be delivered. As such, the application and EIA has been based on maximum and, if relevant, minimum parameters. To remain in accordance with the EIA Regulations, the parameters have remained as limited as possible to ensure that the 'likely significant effects' are identified, rather than unrealistically amplified effects, which could be deemed to be unlikely. These parameters have been considered in detail by technical authors in this ES to ensure the realistic worst-case effects of the Scheme have been assessed for each potential receptor. This is of particular importance to maintain flexibility due to the rapid pace of change in solar PV technology.

### Principal Infrastructure

2.4.8 The Scheme will consist of the principal infrastructure described below. To ensure that the likely significant environmental effects of the Scheme are no worse than those assessed in the EIA and the effect of the Scheme has been properly assessed, the DCO Application will secure the Solar PV Site, Ecology Mitigation Area, the Grid Connection Corridor, the Interconnecting Cable Corridor, the Site Accesses and the parameters within which the Scheme must be constructed and operated. The parameters set out below are therefore the basis upon which the Scheme has been assessed at ES stage. The principal Scheme components are:

a. Solar PV Panels;

b. Solar PV panel mounting structures (collectively referred to as 'tables' or 'strings'. Groupings of solar PV tables are referred to as 'arrays');

c. Field Stations (areas of hardstanding within the Solar PV Site that will house electrical infrastructure);

d. Electrical infrastructure at Field Stations:

   i. Transformers;

   ii. Centralised inverters (noting that string inverters, if used, will be located at the arrays); and

   iii. Switchgear, protection and control equipment.

e. String inverters as standalone within the array (parallel to or at end of frames), if central inverters are not used;

f. On-site cabling within the Solar PV Site – less than 1.0 kV, typically above ground locally between the Solar PV Panels and inverters and underground elsewhere;

g. Interconnecting Cables – 33 kV underground cabling between the Solar PV Areas which transmit electricity from the Field Stations to one of the two Grid Connection Substations;

h. Two (33 kV/132 kV) Grid Connection Substations;

i. Grid Connection Cables (two 132 kV export circuits) connecting the Grid Connection Substations to the National Grid Drax Substation;

j. Underground link boxes (approximately 17 in total) – approximately every 900 m of Grid Connection Cable routing;

k. Operations and maintenance hub with welfare facilities (Solar PV Area 1e);

l. Fencing and security measures (e.g., lighting and CCTV);

m. Accesses including tracks and visibility splays;

n. Construction and decommissioning laydown areas; and

o. Landscaping and biodiversity enhancement.

2.4.9 The terminology 'solar PV panels' is used throughout this ES, as this is the term in common usage; however, the technical term for panels is 'modules' and these two names can be used interchangeably.

2.4.10 The Scheme will deliver the Grid Connection Cable into an existing spare bay of the National Grid Drax Substation. All works to the National Grid Drax Substation to accommodate the Scheme connection would be undertaken by National Grid and are beyond the scope of the Scheme's DCO Application. The work undertaken by National Grid will include the installation of a transformer and associated infrastructure which will convert the 132 kV electricity supplied by the Scheme to 400 kV to facilitate the efficient transmission of power onto the electricity transmission network. All infrastructure within the National Grid Drax Substation would remain under

National Grid's control. The works within the National Grid Drax Substation are considered in the cumulative assessments presented in each of the technical chapters (**Chapters 6** to **16**) of this **ES [EN010143/APP/6.1]**, where relevant.

## Design Parameters

2.4.11 **Table 2-1** sets out the design parameters that have been assessed within this ES. Each scheme component is described in more detail in section 2.5 below. Each technical chapter within the ES sets out the relevant design parameters likely to result in the maximum effects. Each technical topic has assessed the design considered to be the likely worst-case scenario for that discipline to determine the significance of effects.

2.4.12 An **Outline Design Principles Statement (ODP Statement) [EN010143/APP/7.4]** has been prepared to accompany the DCO Application. It provides the principles for the detailed design of the Scheme and is secured by a requirement in the **Draft DCO [EN010143/APP/3.1]**. When the detailed design for the Scheme is submitted for approval to the relevant planning authorities, those details must be in accordance with the design principles set out in the ODP Statement. This ensures there can be confidence that the environmental effects (of the detailed design) would be the same as or no worse than those assessed and reported in the ES.

2.4.13 The Scheme will not result in changes to current ground levels across the majority of Site. The creation of compensatory flood storage to the edge of Flood Zone 3 extent in Solar PV Areas 1e and 2a will require localised lowering of current ground levels, no greater than the depth of topsoil. This is to compensate for the loss of land within the floodplain due to the legs of the Solar PV Mounting Structures. This is further discussed in the **FRA (Appendix 9-3, ES Volume 2 [EN010143/APP/6.3]).**The maximum heights of solar PV panels, and other infrastructure such as Field Stations, and Grid Connection Substations are presented in **Table 2-1** and further discussed in this chapter, are the maximum levels above current ground level.

2.4.14 Within the Solar PV Site, no solar PV infrastructure except solar PV arrays will be installed within areas of highest risk of flooding (Flood Zone 3). Flood risk design requirements have been determined through the modelling and calculations undertaken to inform the **FRA (Appendix 9-3, ES Volume 2 [EN010143/APP/6.3])**. Further details of the flood modelling are presented in **Chapter 9: Flood Risk, Drainage and Water Environment, ES Volume 1 [EN010143/APP/6.1**]. The Grid Connection Substations in Solar PV Area 1c as shown on the site layout plan (**Figure 2-3, ES Volume 3 [EN010143/APP/6.3]**) are located in Flood Zone 1.

**Table 2-1. Details of the design parameters used for the EIA**

| Scheme Component | Parameter Type | Applicable Design Principle |
|---|---|---|
| Solar PV Panels | PV Panel type (monofacial/bifacial) | Comprises two layers of toughened, low reflectivity glass with a series of PV cells, wiring, etc. sandwiched between. The panel components are typically framed by an anodised aluminium frame.<br>Can be monofacial or bifacial. The latter have a clear backing which allows the solar cells to absorb light on the underside/rear of the panel to increase the energy generation. |
| | Generating capacity | Each panel is expected to have a watt-peak capacity of between 400-1000 watts, depending on the technology available at the time of procurement. |
| | Dimensions | Individual panels are typically between 2.0 and 2.5 m in length and 1.0 to 1.4 m in width. |
| | Orientation | The Solar PV Panels will be secured on single axis trackers that are orientated north-south The panels will track from east to west during the course of the day tracking the sun’s movement. This allows for optimal power generation throughout the day. |
| | Arrangement | The Solar PV Panels may be arranged in landscape or portrait orientation and as single or double. For example the panels shown in **Plate 2-2** are single panels in portrait orientation, whereas the panels visible in **Plate 2-11** are double panels in portrait orientation. |
| PV Mounting Structures | Materials | These are the structures (metal rack) which the Solar PV Panels are mounted onto. The poles and cross members are typically made of galvanised steel. |
| | Method of installation | The poles are directly driven directly into the ground. There is no requirement for the excavation of foundations or disturbance to the surrounding land surface (soils). Indicative installation depth of 3.0 m to 5.0 m depending upon ground conditions and subject to archaeological and geotechnical surveys. The specification for the mounting structure |

| Scheme Component | Parameter Type | Applicable Design Principle |
|---|---|---|
| | | installation, including depth of installation is subject to detailed engineering calculations to ensure that the panels remain stable and secure even in extreme weather conditions. |
| Solar PV Tables | The solar PV mounting structures are arranged into solar PV tables. | |
| | Indicative slope and orientation of the solar PV tables from the horizontal. | The solar PV tables will be east-west single axis tracking. The indicative tracker system parameters (subject to detailed design) are as follows:<br>• Tracker tilt range: +/-60 degrees from horizontal to the east and west (except in areas of Flood Zone 3 where this will be bespoke and set to ensure a 300 mm freeboard above 1-in-100 year plus climate change flood levels is maintained at all times);<br>• Maximum height (at maximum tilt): up to 3.5 m above ground level (AGL);<br>• Maximum height when panels are horizontal (e.g., night-time storage position): 2.3 m AGL.<br>• Minimum clearance above ground at maximum (+/-60 degrees) tilt: 1.0 m (except in areas of Flood Zone 3 where minimum clearance is determined in relation to flood risk requirements).<br>The movement of the panels is discussed in paragraphs 2.5.5 and 2.5.6 and illustrated in **Plate 2-2**. |
| | Maximum height of solar PV panel above ground level (AGL) | The maximum height of the solar PV panels will be up to 3.5 m. For the majority of the day the height will be lower than this as the panels will track the position of the sun.<br>Maximum panel height will also be lower in areas of Flood Zone 3 as panels will not be set to maximum tilt (see below). |

| Scheme Component | Parameter Type | Applicable Design Principle |
|---|---|---|
| | Minimum height of the flood sensitive equipment AGL[2] | The solar PV panels are capable of being fully active during flood conditions and pivoting to their full extent. The minimum height of the lowest part of the Solar PV Panels will be 1.0 m AGL except in zones of higher flood risk (Flood Zone 3) where this will be bespoke to the flood levels (achieved by permanently limiting the degree of tilt for the individual tables to ensure that a 300 mm freeboard above the modelled design flood event (1% AEP plus climate change) is maintained at all times regardless of whether there is a flood event occurring or not.<br>Additionally, if required, the modules can be stopped and set at their horizontal position, which provides an increased ground clearance of approximately 2.3 m. |
| | Indicative solar PV panel colour | The solar PV panels will be dark blue, grey, or black in colour. The toughened glass covering the PV cells will be of low reflectivity. |
| Solar PV Site | Location | **Figure 1-1 and Figure 1-3, ES Volume 3 [EN010143/APP/6.3]**.<br>The area of the Solar PV Site is approximately 966.4 ha. |
| | Indicative separation distance between rows of PV Tables | Typical spacing between rows (inner spacing) is 4.0 m. The typical pitch distance (distance between the leading edges of panels in parallel rows) is 6.3 m.<br>The inner spacing between rows and pitch distance are dependent upon the local ground topography and whether there is a Field Station located between the rows of solar PV tables. The distances quoted above are therefore indicative. |

[2] To minimise the impact of flooding on the Scheme, the Applicant also will sign up to the Environment Agency's Flood Alert system so that in the event of identified flood conditions within the Solar PV Areas, the solar PV panels can be moved into their night-time storage position of 2.3m above ground level. In period of heavy rainfall, or in the event of flood alerts, the operations team will closely monitor levels across the Site and trigger the night-time position for specific solar PV tables in those part of the Site.

| Scheme Component | Parameter Type | Applicable Design Principle |
|---|---|---|
| Field Stations (including Field Station Units and/or Field Substations, or separate transformers, switchgear and centralised inverters) | Type | Field Stations are areas of hardstanding that will house inverters, transformers, and switchgear. These will be distributed throughout the Solar PV Site.  In general, Field Stations will be located at least 250 m from residential properties. The exception to this is a specific exclusion area for a sensitive receptor in Spaldington. This exclusion area is defined in the **Outline Design Principles Statement [EN010143/APP/7.4]**. Indicative Field Station locations are shown on **Figure 2-3, ES Volume 3 [EN010143/APP/6.3]**.<br>There are currently three options for the delivery of the inverters, transformers and switchgear at the Field Stations:<br>One arrangement is for the transformer, inverter and switchgear to be enclosed in a single containerised unit referred to as a ‘Field Station Unit’.<br>Another option is for the transformers and switchgear to be packaged together in containerised units (referred to as ‘Field Substations’), with the inverters provided separately as string type.<br>The three elements (transformers, inverters and switchgear) may also each be provided as separate standalone units. With inverters provided as either string-type or centralised. |
| | Indicative number of Field Stations | Multiple Field Stations will be distributed throughout the Solar PV Site. The exact number is subject to detailed design studies; however, based upon the current design an indicative number of up to 45 Field Stations has been identified.<br>Based upon the current design a need for a total of up to 100 sets of transformers, inverters and switchgear has been identified. Each Field Station will therefore house up to four Field Station Units/ Field Substations; or if transformers, switchgear and inverters are provided separately, each Field Station will contain up to four transformers and up to four sets of switchgear. If centralised inverters are used, then up to four inverter containers will also be located at each Field Station. |

| Scheme Component | Parameter Type | Applicable Design Principle |
|---|---|---|
| | | (If string-type inverters are used, they will be either mounted parallel to the array or more likely at the end of the array frame, i.e. not within the Field Stations). |
| | Indicative dimensions | The area of hardstanding comprising the Field Station will be slightly larger than the footprint of the electrical infrastructure contained in it.<br>The maximum dimensions of the individual containerised Field Station Units/ Field Substations are up to 12.5 m by 2.5 m footprint and up to 3.5 m height. As explained above each Field Station may contain up to four of these.<br>When the Field Station components are procured independently, their collective square footage may be larger due to spacing between the items (the individual footprints are listed below). Again, the area of hardstanding (Field Station) will be slightly larger than the footprint of the electrical infrastructure/components contained in it. As explained above each Field Station may contain up to four of each of individual transformers, switchgear and centralised inverters. |
| | Flood Risk | Where Field Stations are located in Flood Zone 2 (**Figure 9-4, ES Volume 3 [EN010143/APP/6.3]**) infrastructure (e.g. Field Station Units/Field Substations/individual components) will be raised to mitigate against surface water flood risk. The height to which these are to be raised is bespoke based upon the predicted flood levels in the location (see **FRA (Appendix 9-3, ES Volume 2**) and will provide a 300 mm freeboard above the 1-in-100 year plus climate change flood level. |
| | Colour | The external finish of infrastructure within Field Stations is typically in keeping with the prevailing surrounding environment, often with a grey or green painted finish. External finish varies between manufacturers and colour would be confirmed during detailed design. |
| | Surfacing | The Field Stations will be hard standing comprising crushed stone/compacted gravel over geotextile. |

| Scheme Component | Parameter Type | Applicable Design Principle |
|---|---|---|
| | Indicative foundations (for example for Field Station Units/ Field Substations | Typically, concrete foundations (blocks or plinths), although other types of foundations (e.g., ground screws, reinforced concrete piles, or compacted stone/gravel) may be used depending on the local geology or land quality. |
| | **Inverters -** these convert the direct current electricity produced by the Solar PV Panels into alternating current. | |
| | Type of inverter | Inverters may be pre-assembled with transformers and switchgear in a single Field Station Unit.<br>If other arrangements are followed, centralised inverters will be grouped together (most likely at the Field Stations) There would be approximately 80 to 100 centralised inverters required, subject to detailed design.<br>If String inverters are used, these will be either mounted parallel to the array or more likely at the end of the array frame. One single string inverter unit could be utilised, e.g., for every 10 to 12 solar PV tables. |
| | Indicative dimensions of standalone inverters | When provided as a standalone unit, centralised inverters are typically housed in containers with an approximate maximum footprint of up to 12.5 m by 2.5 m and a height of up to 3.5 m.<br>For string inverters, the maximum parameters are anticipated to be 1.5 m length by 0.5 m depth by 1.0 m in height. String inverters are either mounted parallel to the array or more likely at the end of each frame.<br>In areas of flood risk inverter height will be bespoke based upon flood risk requirements for the area and will provide a 300 mm freeboard above the 1-in-100 year plus climate change flood level. This will be fully described at detailed design, should string inverters be used. |
| | Colour | Centralised inverters are typically externally finished in keeping with the prevailing surrounding environment, often with a grey or green painted finish. External finish varies between manufacturers and colour would not be |

| Scheme Component | Parameter Type | Applicable Design Principle |
|---|---|---|
| | | confirmed until detailed design. String inverters would likely be grey coloured. |
| | **Transformers** at Field Stations are required to step up the voltage of the electricity generated across the Solar PV Site from low voltage (less than 1.0 kV) produced by the inverters to medium voltage (33 kV). These may be provided within containerised Field Station Units (or Field Substations where the inverter is separate) or as separate standalone units: | |
| | Type of transformer | Field Station transformers are required to increase the voltage from less than 1.0 kV to 33 kV. These transformers may be provided in one of three ways:<br>• Pre-assembled with inverters and switchgear in a single Field Station Unit.<br>• Provided as containerised Field Substations which house both the transformers and switch gear (the inverters being separate as standalone string arrangements); or<br>• Transformers, inverters and switchgear each provided as separate standalone units. |
| | Indicative dimensions of transformers | Both the Field Station Units and Field Substation options of transformer provision would be within shipping-type containers, the dimensions of which are described above in this Table.<br>If standalone transformers are to be used these will be external (not in cabins or enclosures). They will have an anticipated maximum footprint of up to 4.0 m by 4.0 m and with a maximum height of up to 3.5 m. To comply with British Standard (BS) EN 62271-1:2017 (Ref. 2 5), standalone transformers will be surrounded by a secure wire mesh fence. This fence is likely to be up to 2.4 m in height. |
| | Colour | Typically, externally finished in keeping with the prevailing surrounding environment, often with a grey or green painted finish. External finish varies |

| Scheme Component | Parameter Type | Applicable Design Principle |
|---|---|---|
| | | between manufacturers and colour would not be confirmed until detailed design. |
| | **Switchgear** - combination of electrical disconnect switches, fuses or circuit breakers used to control, protect and isolate electrical equipment. Switchgear is used to protect and isolate/de-energise equipment to allow work to be conducted safely and to clear faults downstream. | |
| | Type of switchgear | Field Station switchgear may be provided in one of three ways:<br>• Switchgear, inverters and transformers pre-assembled within containerised Field Station Units;<br>• Transformers and switch gear housed together in containerised Field Substations (the inverters being separate as standalone string arrangements); or<br>• Transformers, inverters and switchgear each provided as separate standalone units. |
| | Indicative dimensions of switchgear | Both the Field Station Units and Field Substation options of switchgear provision would be within shipping-type containers, the dimensions of which are described above in this Table.<br>If standalone switchgear is to be used these will be housed in a cabin with maximum dimensions of 6.0 m by 2.5 m in plan and up to 3.5 m in height. |
| | Colour | Typically, externally finished in keeping with the prevailing surrounding environment, often with a green or grey painted finish. External finish varies between manufacturers and colour would not be confirmed until detailed design. |
| Solar PV Site Perimeter Fencing | Type | Stock proof mesh-type security fence with wooden posts. |
| | Installation | Fence posts will be directly driven into the ground using a standard post driver. There will be no excavation of foundations or ‘concreting in’ of posts. The average/typical distance between fence posts will be 5 m but will vary |

| Scheme Component | Parameter Type | Applicable Design Principle |
|---|---|---|
| | | between 3 m and 7 m to best avoid Root Protection Zones (RPZ) etc. and fit the shape of the field. |
| | Height | The perimeter fencing will be at a maximum height of 2.2 m |
| Solar PV Site Internal Fencing (e.g. where required to create rotational grazing plots). | Type | Stock proof fence mesh-type security fence with wooden posts. |
| | Installation | Fence posts will be directly driven into the ground using a standard post driver. There will be no excavation of foundations or ‘concreting in’ of posts. |
| | Height | The internal fencing will be at a typical height of 1.0 m |
| Security System | Type | Pole mounted internal facing closed circuit television (CCTV) systems will be deployed around the perimeter of the operational areas of the Solar PV Site. The CCTV cameras will have fixed, inward-facing viewsheds and will be aligned to capture only the perimeter fence and the area inside the fence, thereby not capturing publicly accessible areas. The CCTV will use thermal imaging and Infrared (IR) lighting to provide night vision functionality meaning that no visible lighting will be needed for security. |
| | Mounting | The CCTV cameras will be mounted on wooden posts approximately 2.5 m high. The posts will be positioned at every change in direction to the fence, and the anticipated spacing is every 50 m along straight sections. |
| | Installation | The wooden mounting posts will be directly driven into the ground using a standard post driver. There will be no excavation of foundations or ‘concreting in’ of posts. The power supply and communication (fibre optic) cables to the cameras will be underground. |
| On-site Electrical Cabling | Type | Required to connect the Solar PV Panels to inverters and the inverters to the transformers. These low voltage cables are all less than 1.0 kV alternating current (AC) or 1,500 V direct current (DC).<br>Fibre optic and/or Cat 5/6 network data (communications) cables will also be installed, typically alongside electrical cables in order to allow for the |

| Scheme Component | Parameter Type | Applicable Design Principle |
|---|---|---|
| | | monitoring during operation, such as the collection of solar data from pyranometers (specialist sensors which measure the level of solar irradiance). |
| | Placement | Cabling between Solar PV Panels and inverters is typically above ground level (along a row of racks fixed to the mounting structure or fixed to other parts of nearby components) and then underground if required (between racks and into the inverter's input). All other on-site cabling will be routed underground. |
| | Indicative cable trench dimensions for Onsite Electrical Cabling | Trench dimension will vary depending on the number of cables or ducts they contain but would typically be up to 0.8 m in width and between 0.6 and 0.8 m in depth, as shown in **Plate 2 5.** |
| Interconnecting Cables | Type | Medium Voltage (MV) 33 kV cables, which transfer electricity between the transformers/switchgears at the Field Stations and one of the two 33 kV/132 kV Grid Connection Substations located within Solar PV Area 1c. Multiple Field Stations may be on one 33 kV cable circuit, daisy chained or looped.<br>These cables will start within the Solar PV Areas (on-site) and extend between the Solar PV Areas (off-site) connecting them to one of the two Grid Connection Substations, as required. All Interconnecting Cables will be buried within underground trenches. |
| | Indicative cable trench dimensions for Interconnecting Cables | Trench width is wholly dependent on the number of circuits to be laid in it, and is expected to be between 0.8 m and 2.0 m. Maximum trench width is 2.0 m.<br>Outside of the Solar PV Site, where cables are laid in agricultural land trench depth is typically 1.2 m to 1.4 m to ensure cables are installed below typical plough depth and will not interfere with normal agricultural operations. Where cables are laid in the highway (tarmac) trench depth varies depending on road/subsoil conditions, but is generally between 0.6 m to 1.4 m. |

| Scheme Component | Parameter Type | Applicable Design Principle |
|---|---|---|
| | | Trenches internal to the Solar PV Site can be shallower (as there will be no ploughing during the operation of the solar farm and cables can be removed on decommissioning) with typical trench depths of 0.8 m.<br>Trench depths may increase at crossings, for example at or on the approach to open trenched watercourse crossings, or if utilities or if obstacles such as buried utilities are encountered in which case trenches would be deeper to avoid the obstacle by set clearance limits.<br>Where practicable, to minimise the amount of trenching and level of ground disturbance required, the Interconnecting Cables will be installed within or adjacent to the trenches for the 132 kV Grid Connection Cables.<br>Cables will be laid a minimum of 10 m from the façade of any residential dwelling (**Outline Design Principles Statement [EN010143/APP/7.4]**). |
| | Indicative working width for Interconnecting Cables | Maximum working corridor width of 30 m (to contain all soil, spoil, and vehicle movements). The working width may be narrowed to a minimum of 5.0 m where required for example to minimise vegetation removal or at open cut watercourse crossings.<br>There is no requirement for a stoned haul road to be created within the Interconnecting Cable Corridor. Track matting may be used if ground conditions dictate. |
| | Fencing | Fencing of the working width of the Interconnecting Cables is not anticipated to be required but will be provided if needed.<br>Any open trenches will be fenced, if to be left unattended. Heras-type security fencing to be used. |
| Grid Connection Substations | Description | The Grid Connection Substations receive the electricity from Field Stations and step up the voltage from 33 kV to 132 kV ready to be exported to National Grid Drax Substation via the 132 kV Grid Connection Cables. The energy generated by the Scheme will be approximately split between the two Grid Connection Substations. |

| Scheme Component | Parameter Type | Applicable Design Principle |
|---|---|---|
| | Location | There will be two Grid Connection Substations located together within Solar PV Area 1c which will receive electricity generated in the Solar PV Site. See **Figure 2-3, ES Volume 3 [EN010143/APP/6.3]**. |
| | Electrical infrastructure | The electrical infrastructure comprising cable sealing ends (where the export cables will terminate into the infrastructure), busbars/conductors, isolator/disconnectors and circuit breakers (for electrical safety), voltage transformers (for measuring supply) and the transformer will be outside (i.e., not contained within a building) and will comprise separate infrastructure and conductors as illustrated in **Plate 2-6.** |
| | Indicative dimensions | The footprint for each of the Grid Connection Substation compounds is estimated to be up to 60 m by 100 m and collectively, the footprint of both compounds plus the shared operations building and access roads is estimated to be 160 m by 100 m (as illustrated in **Plate 2-7).** This footprint will include the required electrical infrastructure, the switchrooms, operations building, car parking and all other associated infrastructure/auxiliary equipment. For the purposes of this ES all land within this footprint is considered to be 'developed'/hard standing.<br>The electrical infrastructure (transformer, lines and structures) will be outside (i.e., not contained within a building) and will comprise separate infrastructure and lines. The maximum structure height will be up to 6.0 m, although the majority of the infrastructure and lines will be lower than this. |
| | Fencing | The Grid Connection Substations will be securely fenced with barbed galvanised palisade security fencing, likely green in colour, which may have additional barbed wire above. A typical arrangement is shown on **Plate 2-6**. The fencing and wire would be at a maximum height of 2.4 m. There would be a perimeter fence around both Grid Connection Substation compounds, with a secure gated access point off Tottering Lane. Additional internal fencing would be erected around each of the Grid Connection Substation |

| Scheme Component | Parameter Type | Applicable Design Principle |
|---|---|---|
| | | compounds to allow works to be undertaken in one Substation without having to shut down the other. See **Plate 2-7** |
| | Security | A Centrally located CCTV system mounted up to 5.0 m will likely be installed within the Grid Connection Substation compounds covering a 360° view of the Grid Connection Substations. Alternatively, a pole mounted internal facing CCTV system may be deployed around the perimeter of the Grid Connection Substations. The perimeter CCTV cameras will have fixed, inward-facing viewsheds and will be aligned to capture only the perimeter fence and the area inside the fence.<br>The CCTV will use thermal imaging and IR lighting to provide night vision functionality meaning that no visible lighting will be needed for security. |
| Switchrooms and Operations Building | Each of the Grid Connection Substations would have a switchroom with a typical footprint of 40 m by 10 m and a maximum height of 3.5 m. It is anticipated that there would be a shared operations building located between the two Grid Connection Substation compounds, and this would have a typical footprint of 40 m by 12.0 m and be a maximum of 3.5 m in height, as shown in **Plate 2-7**. | |
| Offices, welfare and storage | Location | The existing derelict brick farmhouse building at Johnson's Farm in the north-east of the Solar PV Site (Solar PV Area 1e) will be demolished and new office accommodation and welfare facilities constructed in a similar style on the same footprint. This will be undertaken early in the construction process so that the facilities are available for construction and operation.<br>The two existing modern agricultural buildings (barns) will be used for storage. Additionally, the dilapidated single storey brick barn in the west of the Johnson's Farm site will be demolished. This may be rebuilt in a similar style on the same footprint for use as storage.<br>During construction temporary portable welfare facilities will be provided within each Solar PV Area (or group of Areas where they can be accessed internally). |

| Scheme Component | Parameter Type | Applicable Design Principle |
|---|---|---|
| | | During operation temporary portable welfare facilities will be provided at the further reaching sites on an *ad hoc* basis (e.g., if required by maintenance crews).<br>Permanent welfare facilities will also be provided at the Grid Connection Substations. |
| | Dimensions | Temporary welfare facilities - single storey portable welfare facility units will be approximately 9.6 m by 3.5 m and a maximum of 3.1 m high. For the double storey unit (for use at Johnson's Farm only) the maximum height will be 5.7 m. This allows for the deployment of the adjustable legs to ensure the units are level. Typically, these units do not require foundations, but if necessary, they can be placed on track matting or on a levelling layer of hardcore. The double storey unit will be positioned on existing hard standing at Johnson's Farm. Mobile welfare facilities (vehicles/vans) may also be used.<br>Permanent welfare facilities - The office accommodation and welfare facilities at Johnson's Farm will occupy a footprint and will be to a height of no greater than those of the existing farmhouse. This is an L-shaped structure which has a width of 4.6 m increasing to 8.6 m at the corner, and a maximum length of 10.3 m with the corner being 4.0 m. The maximum height of the structure (to the roofline at the gable) is 6.1 m and the minimum height is 4.9 m. The permanent welfare facilities at the Grid Connection Substations will most likely be located within the shared operations building.<br>Storage – the single storey brick barn which is to be demolished has approximate dimensions of 24.0 m by 4.4 m. The modern barns have approximate dimensions of 24.5 m by 23.0 m. |
| | Water supply and foul drainage | Johnson's Farm is connected to the mains water supply, and this will service both the temporary and permanent welfare facilities at this location. A septic tank will be installed to manage foul water from the permanent facility. |

| Scheme Component | Parameter Type | Applicable Design Principle |
|---|---|---|
| | | At temporary welfare facilities other than Johnson's Farm, water will be transported to Site by road from an existing nearby licenced water abstraction source and stored on site in Intermediate Bulk Containers (IBC), or similar.<br>Temporary welfare facilities (at Johnson's Farm and elsewhere on site) will store foul/wastewater for collection/emptying by specialist licenced contractors.<br>Water supply to the permanent welfare facilities at the Grid Connection Substations will be transported to Site by road from an existing nearby licenced water abstraction source and stored on site in Intermediate Bulk Containers (IBC), or similar. A septic tank will be installed to manage foul water. |
| | Security | The Operations and Maintenance Hub will be manned throughout the day, night-time security will be provided by CCTV. Cameras area expected to be mounted on buildings and will use thermal imaging and IR lighting to provide night vision functionality meaning that no visible lighting will be needed for security. |
| Grid Connection Cables | Type | It is anticipated that the connection between the two Grid Connection Substations in Solar PV Area 1c and the National Grid Drax Substation will be of a single core 132 kV construction. There will be two circuits, one running to each of the two Grid Connection Substations in Solar PV Area 1c. Each circuit will comprise three 132 kV single core AC cables plus associated cabling such as a bare copper earth cable and fibre optic cable. |
| | Indicative cable trench dimensions for Grid Connection Cables | The cable trench linking the Grid Connection Substations in Solar PV Area 1c to the National Grid's Drax Substation will be approximately 1.5 m wide and will contain a dual circuit with one circuit from each Grid Connection Substation. |

| Scheme Component | Parameter Type | Applicable Design Principle |
| --- | --- | --- |
| | | Grid Connection Cables will be installed to a minimum depth of 0.9 m (to top of cable). To accommodate this, trench depth is therefore typically 1.2 m to 1.4 m.<br>This minimum depth of installation also ensures that within agricultural land the Grid Connection Cables are installed below typical plough depth and will not interfere with typical farming operations. The Grid Connection Cables may be retained post-decommissioning (see paragraph 2.8.7), therefore although there will be no ploughing within the Solar PV Site during the operation of the solar farm, ploughing (arable agriculture) will likely be reinstated above these cables. Trench depth may vary depending upon factors such as ground conditions and what is encountered on the route, e.g., need to go deeper beneath any cables/utilities that are crossed. Utility surveys will inform positioning.<br>Cables will be laid a minimum of 10 m from the façade of any residential dwelling (**Outline Design Principles Statement [EN010143/APP/7.4]**). |
| | Indicative working width for Grid Connection Cables | The Site allows for spatial flexibility in the routing of the Grid Connection Cables. The typical working area for installation of the Grid Connection Cables is anticipated to be a 30 m wide corridor. This may be widened in places to accommodate required operations and narrowed in others, for example to minimise removal of hedgerows or at open cut watercourse crossings. The minimum width is anticipated to be 5.0 m.<br>The working width includes the trench, soil and spoil storage, working area and haul road with passing places where required. As is typical for cable installation projects, the haul road will be up to a maximum of 5 m wide and will run directly on the subsoil surface with temporary track matting used where required; it will not be stoned. |
| | Fencing | The working width of the Grid Connection Corridor will be demarcated by temporary (Heras style) fencing where required. |

| Scheme Component | Parameter Type | Applicable Design Principle |
|---|---|---|
| | **Link boxes** (underground pits and above ground covers) - inspection pits which are required at points where different sections of the Grid Connection Cable are joined. The covers of the pits are the only above ground infrastructure to be created within the Grid Connection Corridor. | |
| | Indicative dimensions | Maximum below ground dimensions for link boxes (inspection pits) are approximately 2.0 m by 2.0 m and less than 2.0 m deep.<br>Above ground features will comprise manhole covers (and marking post) measuring approximately 2.0 m by 2.0 m. |
| | Indicative location and distribution | Located on the edges of fields to minimise disruption to agriculture, link boxes will occur approximately every 900 m along the cable routing, including within the Solar PV Site.  It is estimated that approximately 17 link boxes will be required. |
| National Grid Connection | Point of connection | The Scheme will deliver the Grid Connection Cable to the point of connection in an existing spare bay of the National Grid Drax Substation where a new transformer and associated infrastructure will be installed by National Grid. The National Grid transformer and associated infrastructure will convert the 132 kV electricity supplied by the Scheme to 400 kV so the power can be transmitted to the electricity transmission network. All infrastructure within the National Grid Drax Substation would remain under National Grid’s control and do not form part of the Scheme’s DCO Application. |

## 2.5 Components of the Proposed Scheme

2.5.1 **Table 2-1** above describes the design parameters of the Scheme. Further details of the role or functions of the Scheme components are presented below.

### Solar PV Infrastructure

#### Solar PV panels

2.5.2 Solar PV panels convert sunlight into electrical current (as direct current, DC). Solar PV panels can be monofacial and bifacial. Monofacial panels generate energy only from the top side facing the sun and have an opaque backing; this type is historically the most commonly installed in the UK. Bifacial panels are designed to let some sunlight through and have a transparent backing. The solar cells of bifacial panels are also able to absorb energy from the rear of the cell and any reflected light increasing the energy production compared to the monofacial type. The type of panels for the Scheme will be selected closer to the construction stage; however, this will not affect the maximum parameters that have been assessed in the EIA. There are no atmospheric emissions from this infrastructure.

2.5.3 Various factors inform the number and arrangement of panels in each table, and it is likely some flexibility will be required to accommodate future technology developments at the detailed design stage, as referenced in section 2.4.

2.5.4 The Applicant does not propose a limit on the power output in the DCO Application, as the environmental effects associated with the Scheme are determined by the relevant design parameters and not capacity.

#### Panel Mounting Structures

2.5.5 The Scheme would utilise a single-axis tracker system, which tilts the solar panel around a horizontal north-south axis thus tracking the sun's movement from east to west, as illustrated in **Plate 2-2** below. It is noted that the images show a solar PV scheme in Australia and are indicative, as the Scheme may use two panels in landscape orientation as opposed to one in portrait as shown in **Plate 2-2**.

2.5.6 A tracker system involves attaching the solar PV panels to a motorised table that can move in relation to the sun. This allows for optimal power generation throughout the day. The panels are up to 3.5 m height when at their highest angle at dawn and dusk, gradually lowering throughout the morning until they reach a horizontal tilt when the sun is overhead, and then increasing in tilt in the afternoon. They are positioned horizontally overnight.

2.5.7 The indicative tracker system parameters (subject to detailed design) are presented in **Table 2-1**.

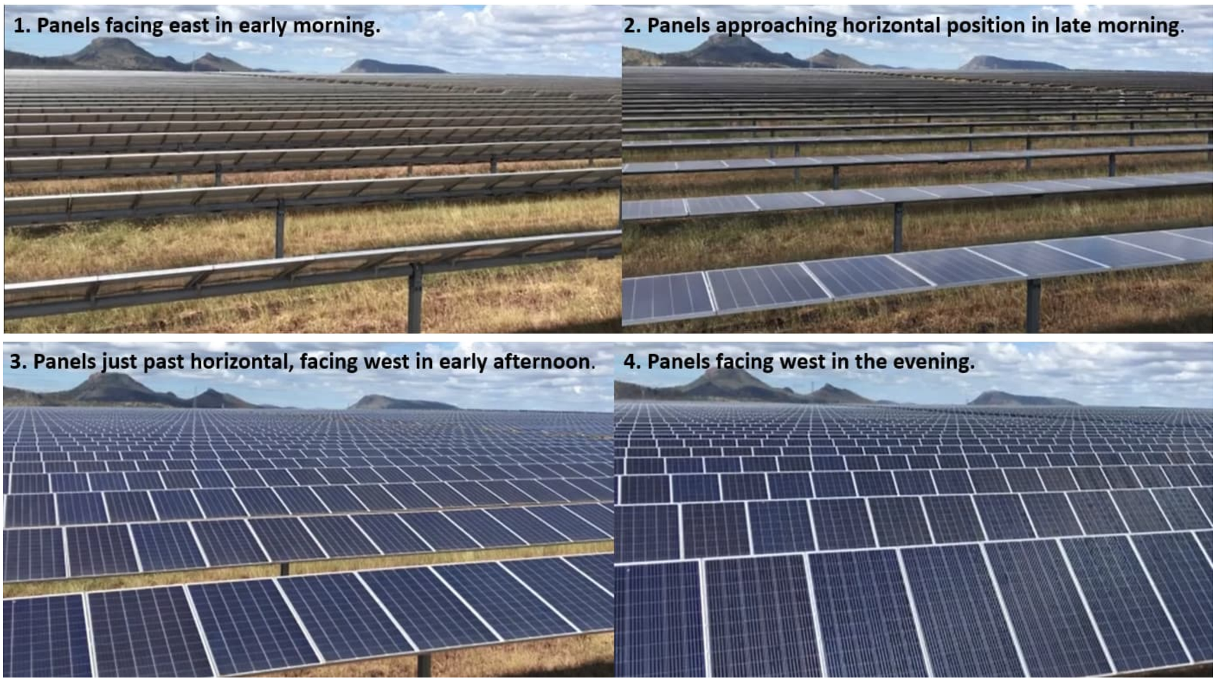


**Plate 2-2. East-west single axis tracker system, finished array**

### Supporting Infrastructure: Inverters, Transformers and Switchgear

2.5.8 The supporting infrastructure is located within the Field Stations and comprises inverters, transformers, and switchgear. Should the inverters be string inverters, these would instead be located within the arrays and not at Field Stations. There are no atmospheric emissions from this infrastructure that require further assessment. As further discussed in Chapter 6: Climate Change although the greenhouse gas SF6 will most likely be used in the switchgear at Field Stations these are 'sealed for life' solutions with no emissions predicted.

2.5.9 The design parameters of Field Stations and supporting infrastructure are further described in **Table 2-1**. Indicative Field Station locations are shown on **Figure 2-3, ES Volume 3 [EN010143/APP/6.3]**. The three options for the configuration of the supporting infrastructure are described in **Table 2-1**. As the Scheme design develops at the detailed design stage, the configuration of the supporting infrastructure will be confirmed based upon environmental and technical factors. Within this ES, a reasonable worst-case scenario has been assessed in each relevant technical assessment chapter.

2.5.10 Inverters are required to convert the direct current (DC) electricity collected by the Solar PV Panels into alternating current (AC), which allows the electricity generated to be exported to the National Grid. Inverters are sized to deal with the level of voltage and current produced by the Solar PV Panels to which they are connected. **Plate 2-3** shows a typical arrangement for string inverters. **Plate 2-4** shows a pair of typical outdoor (standalone) central inverters.

**Plate 2-3. Typical string inverter installed next to Solar PV Panels**

**Plate 2-4. Pair of Typical Outdoor (Standalone) Central Inverters**

2.5.11 Transformers are required to step up the voltage of the electricity generated across the Solar PV Site from low voltage (less than 1.0 kV) produced by the inverters to medium voltage (33 kV) so that it can be transported (via the Interconnecting Cables) to the Grid Connection Substations in Solar PV Area 1c. (The role of the transformers at the Grid Connection Substations is discussed separately see paragraph 2.5.24).

2.5.12 If standalone transformers are to be used these will be external (not in cabins or enclosures). and will be surrounded by a secure wire mesh fence of up to 2.4 m in height (see **Table 2-1**). Other arrangements are discussed below.

2.5.13 Switchgears are the combination of electrical disconnect switches, fuses or circuit breakers used to control, protect and isolate electrical equipment. Switchgear is used to protect and isolate/de-energise equipment to allow work to be conducted safely and to clear faults downstream. If standalone switchgear is to be used these will be housed in a cabin (see **Table 2-1**). Other arrangements are discussed below.

### Field Station Units

2.5.14 Field Station Units are single enclosures that comprise the inverters, a transformer, and switchgear in a single containerised unit. An indicative unit is shown in **Plate 2-5** below.

2.5.15 Within the Field Station Units, the DC electricity collected by the Solar PV Panels is converted into AC (inverters). The voltage is increased from less than 1.0 kV to 33 kV (transformers) and then exits through the switchgear into the Interconnecting Cables (33 kV) connecting to one of the two Grid Connection Substations.

### Field Substations

2.5.16 Where transformers and switchgear are packaged together in containerised units without the inverters in the same container, this is referred to as a ‘Field Substation’. Low voltage (less than 1.0 kV) electricity from string inverters is fed into the Field Substations where it passes through transformers which increase the voltage from less than 1.0 kV to 33 kV and exits through switchgear into the Interconnecting Cables to one of the two Grid Connection Substations in Solar PV Area 1c.

2.5.17 An indicative example is shown in **Plate 2-5** below.

**Plate 2-5. Example of a Field Station Unit or Field Substation**

### Separate delivery of transformers, inverters and switchgear

2.5.18 Transformers, inverters and switchgear may also each be provided as separate standalone units. With inverters provided as either string-type or centralised.

## On-site and Off-site Cabling

2.5.19 Overhead cabling was considered within the **Scoping Report** (**Appendix 1-1, ES Volume 2 [EN010143/APP/6.2]**); however, this has been removed from the Scheme.

2.5.20 On-site low voltage Electrical Cabling is required to connect the solar PV panels through various components finally connecting to the switchgear at the Field Substations. Additional low voltage auxiliary cabling is also needed within the Solar PV Site to supply the CCTV and monitoring equipment. This will be underground.

2.5.21 The medium voltage (33 kV) Interconnecting Cables are then required to transfer electricity between the transformers/switchgears at the Field Stations and the Grid Connection Substations. These cables will be located within Solar PV Areas (on-site) and shall extend between (off-site) the Solar PV Areas connecting them to one of the two Grid Connection Substations, as required.

2.5.22 The high voltage (132 kV) Grid Connection Cables are then required to transfer electricity between the Grid Connection Substations and the new Super Grid Transformer at the National Grid Drax Substation.

2.5.23 Fibre optic and/or Cat 5/6 data cables will also be installed, typically alongside electrical cables to allow for monitoring during operation, such as the collection of solar data from pyranometers (specialist sensors which measure the level of solar irradiance).

### Grid Connection Substations

2.5.24 Two Grid Connection Substations will receive the electricity from the Field Stations and step up the voltage from 33 kV to 132 kV ready to be exported to the National Grid Drax Substation via the Grid Connection Cables. The energy generated by the Scheme will be approximately split between the two Grid Connection Substations. The Grid Connection Substations will be located in Solar PV Area 1c as shown in **Figure 2-3, ES Volume 3 [EN010143/APP/6.3]** and the design parameters are described in **Table 2-1**.

2.5.25 For the purposes of the ES, all land within this footprint of the Grid Connection Substations is assumed to be ‘developed’/hard standing. An example of a typical Grid Connection Substation is shown in **Plate 2-6** and an indicative layout is shown in **Plate 2-7**.

2.5.26 The Grid Connection Substations will be securely fenced as described in **Table 2-1**, with each Grid Connection Substation compound fenced separately with an outer perimeter fence enclosing both. A typical arrangement is shown on **Plate 2-6**.

**Plate 2-6. Example Grid Connection Substation showing infrastructure and fencing**

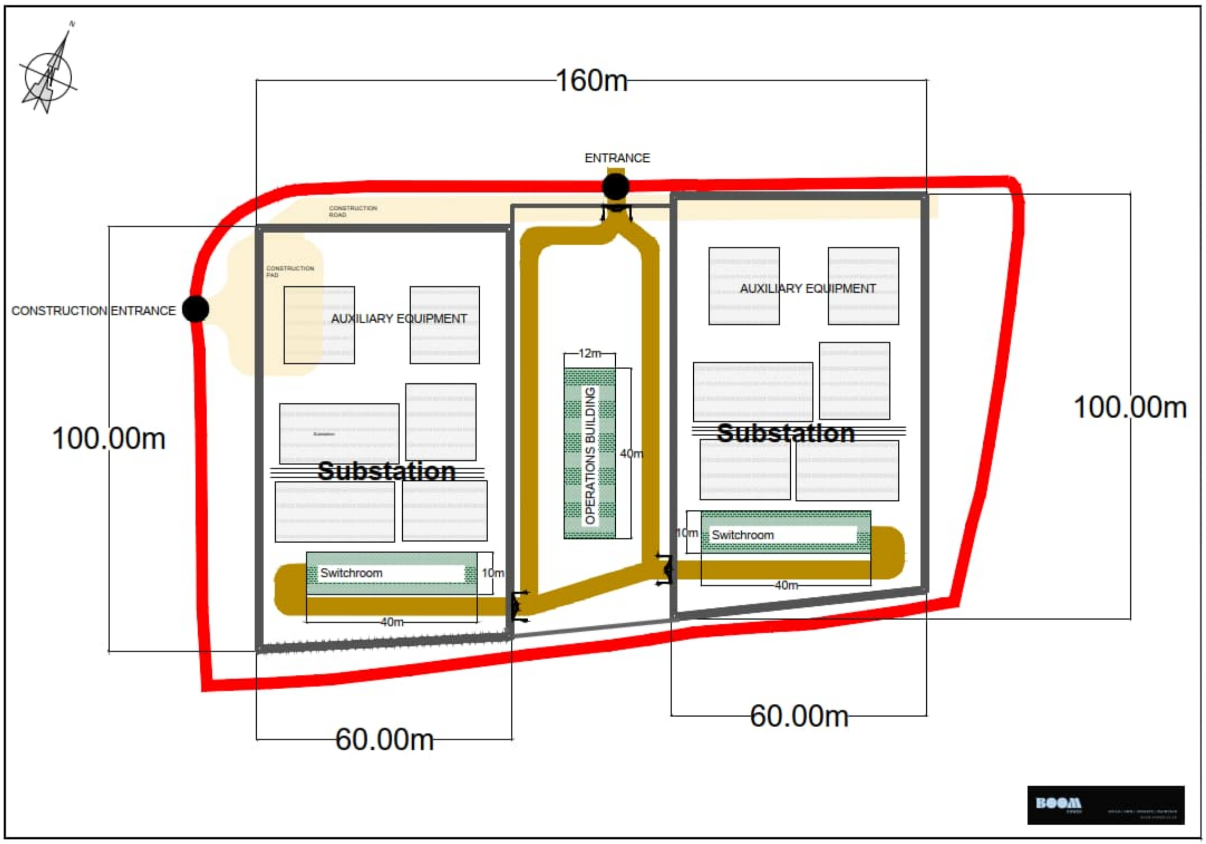


**Plate 2-7. Indicative layout for the Grid Connection Substations**

## Operations and Maintenance Hub

2.5.27 An operations, maintenance and storage area will be established within the Solar PV Site at Johnson's Farm (Solar PV Area 1e) to provide welfare, office accommodation, and facilities for maintenance and storage throughout the operational life of the Scheme. The location of Johnson's Farm and Solar PV Area 1e are shown in **Figure 2-3, ES Volume 3 [EN010143/APP/6.3]**. The specifications are presented in **Table 2-1**. **Plate 2-1** illustrates the existing structures.

## 2.6 Construction

### Construction Programme

2.6.1 Subject to being granted consent and following a final investment decision, the earliest construction could start is in 2025. Construction of the Grid Connection Cables is anticipated to require 12 months, whereas construction of the solar farm will require an estimated 24 months, with operation therefore anticipated to commence in 2027. The construction period could be of longer duration however these timings have been used within the ES where they allow for worst-case assumptions in the technical assessments presented in **Chapters 6** to **16**, **ES Volume 1 [EN010143/APP/6.1]**, for example by maximising predicted daily traffic flows and the amount of construction activity occurring at any given time. An exception to this is where the use of a short-duration construction period may over-estimate the number of jobs during peak construction; however, as explained in **Chapter 12: Socio-economics and Land Use, ES Volume 1 [EN010143/APP/6.1]**, the overall amount of construction activity over the construction period and therefore the associated employment and spending benefits of the Scheme overall would remain unchanged. The chapters each provide clarification of whether delaying or extending the construction period (and knock-on changes to the decommissioning date) would lead to changes in the outcome of the assessment provided.

### Construction Activities

2.6.2 The types of construction activities that are likely to be required include (not necessarily in order):

a. Site preparation and civil engineering works to include:
   i. Installation of fencing;
   ii. Import of construction materials, plant and equipment to the Site;
   iii. The establishment of construction compound(s);
   iv. The establishment of the Operation and Maintenance Hub;
   v. Upgrading of existing site tracks/access roads and construction of new tracks;
   vi. The upgrade or construction of crossing points (bridging structures) over drainage ditches (it is noted that no new culverts will be created as a result of the Scheme);
   vii. Marking out the location of the infrastructure;
b. Solar PV facility construction to include:
   i. Import of components to the Site;
   ii. Erection of Solar PV panel mounting structures;

iii. Mounting of solar PV panels;

iv. Installation of electric cabling;

v. Installation of transformer cabins;

vi. Construction of the substation compound;

vii. Habitat creation and landscaping;

c. Cable installation:

i. The establishment of mobilisation areas and haul roads;

ii. Temporary construction compounds for the Interconnecting Cable Corridor (as shown on **Figure 2-4, ES Volume 3 [EN010143/APP/6.3]**);

iii. Temporary construction compounds for the Grid Connection Corridor (as shown on **Figure 2-4, ES Volume 3 [EN010143/APP/6.3]**);

iv. Stripping of topsoil in sections;

v. Trenching in sections;

vi. Appropriate storage and capping of soil;

vii. Appropriate construction drainage with pumping where necessary;

viii. Sectionalised approach of duct installation;

ix. Excavation and installation of jointing and link box pits;

x. Cable joint and link box installation;

xi. Cable pulling;

xii. Implementation of crossing methodologies for watercourses, infrastructure (including roads and rail), and sensitive habitats (e.g., HDD, cable bridging, etc.);

xiii. Testing and commissioning;

xiv. Site reinstatement, including topsoil reinstatement and repair and reinstatement of existing field drainage; and

xv. Habitat creation.

2.6.3 It is anticipated that construction activities will be carried out in a sequential manner with construction teams responsible for specific type of works moving from one Solar PV Area to the next. In this case it is anticipated that the works would start with fencing, followed by frame installation, then Solar PV Panel installation, then cabling and connection. It may be possible to generate power from some Solar PV Areas whilst others are being built, providing the associated Grid Connection Substation and cabling is in place, subject to testing and commissioning.

### Site Preparation and Civil Engineering Works

#### *Establishment of the Operation and Maintenance Hub*

2.6.4 The redevelopment of Johnson's Farm (Solar PV Area 1e, **Figure 2-3, ES Volume 3 [EN010143/APP/6.3]**) into the office and staff welfare facilities for the operational solar farm will be prioritised within the programme of works, commencing prior to or at the start of main construction works, so that these facilities are available as soon as practicable (likely during the construction phase of the Scheme). Until these facilities are available, temporary portacabin-type offices and welfare will be installed at Johnson's Farm. As a worst-case these are assumed to be double stacked, noting that elsewhere within the Site temporary welfare facilities will be single storey only. Further details are provided in **Table 2-1**.

2.6.5 No construction works to the two existing modern agricultural buildings (barns) are anticipated as these are in a good state of repair and suitable for use as a storage and maintenance area. As set out in **Table 2-1** the existing derelict brick farmhouse will be demolished and new office accommodation and welfare facilities constructed in a similar style on the same footprint and not exceeding the height of the original structure.

2.6.6 Additionally, the dilapidated single storey brick barn in the west of the Johnson's Farm site will be demolished as the structure is unsafe. This may be rebuilt in a similar style on the same footprint for use as storage.

2.6.7 The current condition of the buildings at Johnson's Farm is shown in **Plate 2-1**.

***Establishment of the Perimeter Fencing and Security***

2.6.8 At the start of construction works within each Solar PV Area a perimeter security fence will be installed. This will enclose the operational areas of the Solar PV Site creating a secure working area for construction operations. The fence will be a stock proof mesh-type security fence with wooden posts up to 2.2 m in height, such as illustrated in **Plate 2-8**.

2.6.9 The average/typical distance between fence posts will be 5 m but will vary between 3 m and 7 m to best avoid Root Protect Zones (RPZ) etc. and fit the shape of the field. There may be cases where the mesh of the fence over-sails an RPZ, but there is no direct/physical impact to the RPZ due to the positioning of the fenceposts.

2.6.10 The fencing will also be installed to observe the agreed buffer distances from ecological receptors (watercourses, trees, hedges etc.) as set out in **Chapter 8: Ecology, ES Volume 1 [EN010143/APP/6.1]**, and where these are not required the fence will be a minimum distance of 5 m from the field edge. There will be a further 5 m boundary from perimeter fence to the Solar PV Panels.

2.6.11 Within the larger fields (within the perimeter fence) further mesh stockproof fencing (approximately 1.0 m high) may be installed in some areas to create rotational grazing plots. This is further discussed in section 2.7 and illustrated in **Plate 2-9**.

2.6.12 The gap along the base of the fencing and the size of the mesh will allow the passage of small mammals. Foxes and Badgers typically dig under such fencing for free access, however larger gaps will be created beneath the fence at strategic locations to facilitate access. The perimeter fencing will exclude deer from operational areas; however, they will be able to freely move along the external buffers of the Solar PV Areas (as seen below in **Plate 2-8**), PRoW and Permissive Paths, and in areas outside the perimeter fencing.

**Plate 2-8. Example of perimeter fencing**

**Plate 2-9. Example of mesh stockproof fencing which may be installed to further separate areas within the perimeter fencing**

2.6.13 Fence posts will be directly driven into the ground using a standard post installer machine as shown on **Plate 2-10**. There will be no excavation of foundations or ‘concreting in’ of posts. The fencing has been designed so that the posts are spaced so that they do not interfere with RPZs.

2.6.14 PRoW that cross the Solar PV Site will be preserved with the fence installed either side of them. Where PRoW cross or are adjacent to Solar PV Areas the fencing will be erected from the inside without impacting the PRoW or preventing its use. Fencing is the first stage of construction and with this in place construction activities can operate whilst allowing the PRoW remain in use throughout construction operation and decommissioning. Management of PRoW, such as the need for manned crossing points where access tracks cross PRoW, is further discussed in the **Framework Public Rights of Way Management Plan (PRoWMP) [EN010143/APP/7.13]**.

2.6.15 The design of the Scheme allows for the provision of Permissive Paths, within the Solar PV Site. These would not be available until the end of the construction period due to their proximity to Johnson’s Farm. Permissive Paths are therefore discussed in in section 2.7: Operation.

2.6.16 Post mounted internal facing closed circuit television (CCTV) systems will be installed around the perimeter of the operational areas of the Solar PV Site. As the cabling for the CCTV typically shares trenches with the onsite cabling linking the Solar PV Panels to the Field Stations, installation of the permanent CCTV will take place nearing completion of the works within each Solar PV Area.

2.6.17 The perimeter CCTV system would be mounted on wooden posts approximately 2.5 m high. These CCTV cameras would have fixed, inward-facing viewsheds and will be aligned to capture only the Scheme fence and the area inside the fence, thereby not capturing publicly accessible areas. The poles will be positioned at every change in direction to the fence, and the anticipated spacing is every 50 m along straight sections. The CCTV will use thermal imaging and Infrared (IR) lighting to provide night vision functionality meaning that no visible lighting will be needed for security.

2.6.18 **Plate 2-8** shows a CCTV camera mounted to a metal post with foundations, although this design will not be used in the Scheme the image provides a good indication of the height of the post, location in relation to the fence and the size of camera.

2.6.19 Temporary CCTV will be installed at strategic locations during construction (until the permanent system is installed) – for example to monitor construction compounds and accesses into the Solar PV Site. The temporary system will also be mounted at approximately 2.5 m.

**Plate 2-10. Tracked post driver to illustrate type of plant likely to be used to install fence and posts and the Solar PV Mounting Structures**

*Source: Image taken by Màrtainn MacDhòmhnaill (Ref. 2-13)*

### *Establishment of Construction Compounds*

2.6.20 **Figure 2-4**, **ES Volume 3 [EN010143/APP/6.3]** shows the locations of the five temporary construction compounds that will be created during construction of the Scheme. The temporary construction compounds will comprise parking, storage, staff welfare (toilets, canteen, drying/changing rooms) and waste management. In addition to these main compounds, mobile welfare units and toilet facilities (groundhog type units) will be deployed throughout the Site at mobile compound areas where required.

2.6.21 In the Solar PV Site, the main Construction Compounds will be created and 'built-out' as the solar installation progresses and will be located in Solar PV Areas 1a, 2d and 3c (Construction Compounds A, B and C respectively). Two Construction Compounds, primarily for the storage of cable, will also be established within the Grid Connection Corridor; one located on the western side of the River Derwent crossing (Construction Compound D) and the other south of the River Ouse crossing (Construction Compound E).

2.6.22 To establish the compounds, topsoils in the compound footprint will be stripped and stored in line with the Soil Management Plan (SMP), based on the **Framework SMP [EN010143/APP/7.10]** submitted with the DCO Application. The hardstanding would then be formed of compacted stone (Type 1 aggregate) over appropriate geotextile.

2.6.23 Construction compounds will be fenced with temporary (Heras style) fencing where required. Trees within compound locations will be fenced off and protected as exclusion zones.

2.6.24 During the construction phase additional infrared cameras and motion sensors will be installed at construction compounds. Lighting of compounds is discussed in paragraphs 2.6.60 to 2.6.64. Security and lighting arrangements are also covered in the **Framework CEMP [EN010143/APP/7.7]**.

### *Creation of access tracks within the Solar PV Site*

2.6.25 To reduce site traffic on local roads, it is proposed to utilise internal routes through the Solar PV Areas where practicable as the primary route for deliveries and staff movements. The Scheme will utilise existing hard-surfaced tracks within the Solar PV Site where practicable, and construct additional access tracks where further connectivity is required. Where necessary, upgrades to existing tracks through widening and resurfacing will be undertaken.

2.6.26 It is proposed that new or upgraded internal access tracks will be 6 m in width, and passing places will be 20 m in length and installed at strategic locations to ensure safe passage of construction vehicles. The internal tracks will enable free-flowing movement within the site whilst removing construction traffic from local roads.

2.6.27 Tracks will be compacted stone (Type 1 aggregate) over appropriate geotextile with gradient slopes (where required). An example access track within a solar PV facility during construction is shown on **Plate 2-11**.

2.6.28 Access tracks will be routed to avoid sensitive receptors and have been designed to minimise vegetation removal as far as practicable.

### *BMV land*

2.6.29 Where practicable, the design of the Scheme avoids the siting of Field Stations (and other elements requiring foundations or hardstanding to be created for example new access tracks) on BMV agricultural land. However, the extent of BMV land within some parts of the Solar PV Site (e.g., Solar PV Area 3c) (**Figure 15-2, ES Volume 3 [EN010143/APP/6.2]**) means that some BMV land will be used. Where it is not possible to avoid siting Field Stations on BMV land, the use of ground screw foundations will be considered at detailed design as this 'no dig' solution eliminates the need for the stripping of soil resources minimising disturbance.

**Plate 2-11. Typical crushed stone access track laid on hardcore and geotextile (photo during construction phase and prior to landscaping)**

### *Solar PV Panel Construction*

2.6.30 The most common installation solution on existing UK solar farms is to drive the poles directly into the ground without the need for the excavation of foundations or disturbance to the surrounding land surface (soils), this installation method is also proposed to be used for the Scheme.

2.6.31 The poles will be driven into the ground using the same/similar type of equipment used to install the post for the perimeter fence posts (**Plate 2-10**).

2.6.32 For tracker systems, frames are typically driven between 3.0 and 5.0 m into the ground depending on local geology, and subject to archaeological and geotechnical surveys. The specification for the mounting structure installation, including depth of installation is subject to detailed engineering calculations to ensure that the panels remain stable and secure even in extreme weather conditions. These will be undertaken as part of detailed design.

**Plate 2-12. Construction staff mounting solar PV panels by hand**

*Source: MetroWest Daily News article on the Westborough Solar Array, Massachusetts (Ref. 2-14).*

### Construction of Electrical Infrastructure

#### *Cable Installation*

2.6.33 The design parameters for the installation of On-site, Interconnecting and Grid Connection Cables including but not limited to, working width, cable types and depth of trenching are presented in **Table 2-1**. **Plate 2-13** illustrates cabling to a Field Station thereby representing the busiest trench on site with respect to the number/volume of cables being installed within it. The concrete block foundations of the Field Station Unit or Field Substation into which these cables are being routed is also shown in the plate.

2.6.34 Cables will typically be installed using an open trench method, except in locations where design, engineering or environmental constraints require a trenchless methodology to be employed. With open cut/open trench installation the cables are either laid directly into trenches or into ducting (that will be installed into the trench with the cables pulled through later). Where practicable, to minimise the amount of trenching and level of ground disturbance required, where the Interconnecting Cables overlap with the Grid Connection Corridor these will be installed within or adjacent to the trenches for the 132 kV Grid Connection Cables.

**Plate 2-13. Example underground cable installation beneath a 33 kV Field Substation awaiting delivery**

### *Horizontal Directional Drilling*

2.6.35 Horizontal Directional Drilling (HDD) is a trenchless method of cable installation which allows the cables to be installed beneath obstacles/sensitive receptors without having a direct impact on them.

2.6.36 Eight potential HDD locations have been identified and are illustrated on **Figure 2-4, ES Volume 3 [EN010143/APP/6.3]**. These are:

a. HDD 1 – Featherbed drain and associated PRoW, tree belts etc – boundary between 2f and 2g (HDD Confirmed);

b. HDD2 – The Hull to Selby railway (HDD Confirmed);

c. HDD 3 – River Derwent (HDD Confirmed);

d. HDD 4 – A63/ Access track (HDD Preferred option[3]);

e. HDD 5 – Unnamed drain (identified by Scheme as Watercourse DE53) (HDD Confirmed);

f. HDD 6 – River Ouse (HDD Confirmed);

g. HDD 7 – Crossing of the Drax cooling discharge pipe in New Road near Drax (HDD or carefully excavated – worst case to be assessed); and

h. HDD 8 – Entry to Drax Substation (HDD or Open cut – worst case to be assessed).

2.6.37 There is only one location where a temporary track crossing will be installed over these features, which is HDD 5 Watercourse DE53. A temporary clear span bridge (for example a Bailey Bridge) will be installed.

[3] HDD 4 is the preferred option for cable routeing at the A63 however, two further options for cable routeing in this area are presented in **Chapter 3: Alternatives and Design Evolution, ES Volume 1 [EN010143/APP/6.1]**.

2.6.38 Two locations where the Interconnecting Cables will require trenchless (HDD) installation methods have been identified. These are the crossings of Featherbed Drain and its associated tree belts and hedgerows (the boundary of Solar PV Areas 2f and 2g) (HDD 1) and the crossing of the Hull to Selby Railway (between the boundaries of Solar PV Areas 3b and 3c) (HDD 2).

2.6.39 Seven locations along the Grid Connection Corridor have been identified as requiring or potentially requiring trenchless methods of cable installation. These are the crossings of the Hull to Selby Railway (HDD 2); the Rivers Ouse and Derwent (and their associated designated ecological sites) (HDD 3 and HDD 6); the crossing under the A63 (HDD 4); Watercourse DE53 (HDD 5); the cooling discharge pipe on New Road (HDD 7); and the entrance into the Drax Substation (HDD 8). The precise locations of the crossing points within the Site will be determined at detailed design stage post-consent, however **Figure 2-4, ES Volume 3 [EN010143/APP/6.3]** illustrates indicative HDD locations.

### Testing and Commissioning

2.6.40 Commissioning of the Scheme will include testing and commissioning of the process equipment. Commissioning of the solar PV infrastructure will involve mechanical and visual inspection, electrical and equipment testing, and commencement of electricity supply into the grid. Individual sub-systems will be commissioned separately, with each having its own procedures and prerequisite lines, and it may be necessary to commission these elements separately or at the same time, depending on the end technology utilised at the time of construction.

2.6.41 This process will take place prior to operation of the Scheme.

## Construction Staff

2.6.42 Based on the Applicant’s experience of other similar sized solar farm projects, it is currently estimated that the Scheme will generate an average of 356 gross direct Full Time Equivalent (FTE) jobs on-site per day during the construction period, which is assumed to be equivalent to 356 FTE jobs per annum. The size of the workforce is based on activities required and will fluctuate during the period, therefore, being both higher and lower than average at times.

2.6.43 The peak construction workforce (in 2025, when construction activities are likely to include construction of the Grid Connection Substations, Grid Connection and Interconnecting Cabling, and building of solar PV infrastructure in some of the early plots) is estimated to be 400 FTE staff per day, based on the assumed 24 month construction period. Should the construction period be extended, this has been accounted for in relevant assessments such as **Chapter 12: Socio-economics and Land Use, ES Volume 1 [EN010143/APP/6.1]**.

## Construction Hours of Work

2.6.44 The core working hours are defined as:

a. Monday to Friday 07.00 to 19.00 (daylight hours permitting);

b. Saturday 07.00 to 13.00 (daylight hours permitting); and

c. No Sunday or Bank Holiday working unless crucial to construction (e.g., HDD which must be a continuous activity etc.) or in an emergency.

2.6.45 Emergency working may extend beyond the times quoted above.

2.6.46 Working hours may be shortened if working would necessitate artificial lighting and therefore the working day will be shorter in the months with reduced daylight hours. It is not possible to avoid working in the winter period due to the length of construction programme. However, cabling and groundworks will be prioritised during the drier summer months where practicable.

2.6.47 As an exceptional activity HDD may require 24-hour working, particularly to cross the railway to limit disruption to rail services and the relevant Local Planning Authority will be notified in advance of any proposed 24 hour working or working otherwise proposed outside of the core working hours identified above.

2.6.48 Additionally, quiet non-intrusive works such as the installation of Solar PV Panels may take place over longer periods during the high summer and other quiet non-intrusive works such as electrical testing, commissioning and inspection may take place over longer periods throughout the year.

## Construction Traffic and Site Access

2.6.49 Construction traffic and site access is assessed in **Chapter 13: Transport and Access, ES Volume 1 [EN010143/APP/6.1]**.

2.6.50 A **Framework Construction Traffic Management Plan (CTMP)** is presented at **Appendix 13-5, ES Volume 2 [EN010143/APP/6.2]**. This will be updated to a detailed CTMP post-consent and prior to start of construction (secured through the DCO). The aim of the CTMP is to minimise the impact of construction traffic on local communities by managing traffic using the local highway network, and where required/possible implementing mitigation. The Framework CTMP defines information such as the routes that construction traffic must take, any timing restrictions in relation to the use of certain routes, and the penalties to contractors if the CTMP is not adhered to.

2.6.51 Vehicle swept path analysis has been conducted on Heavy Good Vehicle (HGV) routes where pinch points have been noted using the largest vehicle assumed to utilise the roads (maximum legal articulated vehicle). Abnormal Indivisible Loads (AIL) vehicles have also been analysed along these routes to ensure safe journeys along the road network. The vehicle swept paths also demonstrate that construction vehicles will be able to turn in/out of the proposed site accesses.

2.6.52 All HGV (trucks and lorries) will travel along the public highway to one of Construction Compounds A, B, D or E (routing is presented in the **Framework Construction Traffic Management Plan, Appendix 13-5, ES Volume 2 [EN010143/APP/6.2]**). From here materials will be transferred to smaller tractor-trailers similar to the agricultural vehicles currently using the road network, for onward transport to point of need. Trailers are anticipated to be approximately 12 m in length.

2.6.53 There would be no HGV movements into Construction Compound C, only tractor-trailers (to and from Construction Compound B) using the access created off Rowlandhall Lane.

2.6.54 To reduce site traffic on local roads, it is proposed to utilise internal routes through the Solar PV Areas where practicable as the primary route for deliveries and staff movements.

2.6.55 Each HGV would generate two tractor trailer movements. At peak construction there is anticipated to be up to 25 HGVs and 50 tractor/trailer movements anticipated to be travelling to and from the Site daily. This will decrease over time.

2.6.56 Where practicable accesses into the Site have utilised existing agricultural accesses although some will require widening and works to increase visibility splays. The iterative design process has used ecological and arboricultural survey data to ensure that access points are located to minimise impacts to trees and hedges as far as is practicable. This has ensured that there are no impacts on veteran trees generated by vehicle movements, and although there may be localised removal of hedgerows this has been reduced as far as practicable. Detailed assessment work has also been carried out to reduce the amount of hedgerow removal required due to visibility splays. Impacts to hedgerows are further discussed in **Chapter 8: Ecology, ES Volume 1 [EN010143/APP/6.1]** and in **Chapter 7: Cultural Heritage, ES Volume 1 [EN010143/APP/6.1]** in relation to historically important hedgerows. An **Arboricultural Impact Assessment** is presented as **Appendix 10-5, ES Volume 2 [EN010143/APP/6.2].**

2.6.57 Proposed entry points to the Site (accesses) from the public highway are further discussed in **Chapter 13: Transport and Access, ES Volume1 [EN010143/APP/6.1]**. Those used during the construction phase are shown in **Figure 2-3, ES Volume 3 [EN010143/APP/6.3]** and those used during operation are shown in **Figure 2-4, ES Volume 3 [EN010143/APP/6.3]**.

2.6.58 There will be up to ten AIL movements for delivery of the 33 kV/132 kV transformers to the Grid Connection Substations in Solar PV Area 1c. Two transformers are needed, one at each Grid Connection Substation and each transformer can be delivered as three separate pieces (phases). Additionally, each transformer has an overarching bar requiring a separate AIL delivery. Although transformer failure is a very rare occurrence, two spare phases will be delivered during the construction phase and stored on site to minimise the potential for further AIL movements being required during operation.

2.6.59 The current estimate is that 400 Full Time Equivalent (FTE) staff will be on site per day at the peak of construction and the assessment presented in **Chapter 13: Transport and Access, ES Volume 1 [EN010143/APP/6.1]** considers that workers will travel in a private car or use shuttle minibus services which will be provided to transfer staff to/ from key settlements where workers would be expected to originate, whereas in reality there would also be an element of car sharing or use of public transport. Indicative information on the origins of construction worker traffic (i.e., where construction workers are likely to travel to and from) is also presented in the

**Transport Assessment (Appendix 13-4, ES Volume 2 [EN010143/APP/6.2]**).

## Lighting

2.6.60 The lighting strategy for the construction phase will be set out in the detailed Construction Environmental Management Plan (CEMP). A **Framework CEMP [EN010143/APP/7.7]** (including details of lighting design) is provided as part of the DCO Application.

2.6.61 Lighting will be directional with care to minimise potential for light spillage beyond the Site particularly towards houses, live traffic, and habitats, and will be designed with reference to the Institute of Lighting Professionals (ILP) Guidance Notes (in particular GN-8/23: Bats and Artificial Lighting at Night (Ref. 2-6) which was produced in collaboration with the Bat Conservation Trust (BCT), and GN-1: Reduction of Obtrusive Light (Ref. 2-7) in so far as it is reasonably practicable.

2.6.62 This includes the implementation of measures such as:

a. Lights installed will be of the minimum brightness and/or power rating capable of performing the desired function;

b. Light fittings will be used that reduce the amount of light emitted above the horizontal (reduce upward lighting);

c. Light fittings will be positioned correctly, inward facing and directed downwards;

d. Direction of lights will seek to avoid spillage onto neighbouring properties, habitats, highway or waterway; and

e. Passive Infra-Red (PIR) controlled lights (motion sensors) will be used except where temporary focussed task specific lighting is required.

2.6.63 Construction works will generally be limited to daylight hours only, with focussed task specific lighting provided where this is not practicable, for example unless directed by authorities or areas requiring road closures or at the HDD locations requiring night-time working. Within construction compounds task specific and fixed ‘general’ lighting may be required in months with reduced daylight hours (early mornings and up to 19:00 for general workforce) to meet safety requirements. Additionally, lighting would be used by the roving security teams during their regular checks and ‘emergency’ visits (if an alert is triggered).

2.6.64 Outside of core working hours PIR controlled lights (motion sensors) will be used at construction compounds and at welfare areas. The CCTV will also use Infrared (IR) lighting to provide night vision functionality meaning that no visible lighting will be needed for the security system.

## Waste

2.6.65 Solid waste materials generated during construction will be segregated and stored onsite in containers (covered skips) prior to transport to an approved, licensed third-party landfill and recycling facilities. This will primarily comprise packaging associated with the electrical items. During construction the removal of waste is estimated to require to an average of 1 load per day which has been accounted for in the estimated 25 HGV deliveries/departures a day (at peak construction).

2.6.66 Management of waste during construction is further described in the **Framework Site Waste Management Plan (Appendix 16-4, ES Volume 2 [EN010143/APP/6.2]).**

### Fuel

2.6.67 Fuel for machinery and generators will be delivered to site by a fuel bowser as required and stored in integrally bunded above ground fuel storage tanks (Cubes) which comply with the Oil Storage Regulations (Ref. 2-15). The fuel storage tank will be sheltered, secured from unauthorised access, and equipped with the integral bund will be capable of holding 110% of the volume of the tank (i.e., it will have 10% more capacity than needed). Spill kits will be carried by all plant and will be available at the fuelling point and other strategic locations of the construction site to allow for prompt clean up. All construction workers will be trained in pollution prevention and spill kit use. Oil storage areas will not be created in areas susceptible to flooding.

### Water

2.6.68 An estimated 35,000 m3 of potable water will be required during construction to support welfare facilities on-site and other uses, with an approximate 1,800 m3 per month during peak months. The water required for the Johnson’s Farm operation and maintenance hub in Solar PV Area 1e will be taken from the existing mains water connection. During construction it is envisaged that a temporary potable water supply will be provided to other parts of the Site; water will be transported to Site by road from an existing nearby licenced water abstraction source and stored on site in Intermediate Bulk Containers (IBC), or similar.

2.6.69 During construction, self-contained portable welfare units which store foul/wastewater for collection/emptying by specialist licenced contractors will be used. The permanent welfare facilities at Johnson’s Farm will be available later in the construction period. These will be serviced by a septic tank.

### Utilities

2.6.70 It is known that there are existing utilities located within the Site, such as Northern Gas Network (NGN) pipelines and National Grid Electricity Transmission (NGET) overhead cables, that require Protective Provisions during the construction (and decommissioning) phase of the Scheme and will be agreed as set out in the **Draft DCO [EN010143/APP/3.1]**.

2.6.71 The Applicant is currently in correspondence with asset owners with regards to protecting utility assets. Prior to construction works commencing, the exact locations of utility assets will be identified by the appointed contractor and agreed easements will be adhered to. The Applicant has committed to measures such as the avoidance of the placement of solar PV panels directly above or within the easements of utilities infrastructure as illustrated in **Figure 2-3, ES Volume 3 [EN010143/APP/6.3]**.

## Construction Environmental Management Plan

2.6.72 A **Framework CEMP [EN010143/APP/7.7]** is provided as part of the DCO Application. This describes the framework of mitigation measures identified from the environmental assessments to date. The Framework CEMP will be used as the basis for the contractor to prepare a detailed CEMP prior to construction once all details of the Scheme are known. The detailed CEMP will be a live document updated throughout the construction period as required, e.g., to reflect changes in legislation or contact details. The aim of the CEMP is to eliminate or reduce nuisance and environmental impacts from issues such as:

a. Use of land for temporary laydown areas, accommodation, etc.;
b. Construction traffic (including parking and access requirements) and changes to access and temporary road or footpath closure (if required);
c. Noise and vibration;
d. Utilities diversion;
e. Dust generation;
f. Handling of soil resources;
g. Spillages of oil and other chemicals;
h. Run off and drainage; and
i. Waste generation.

2.6.73 The detailed CEMP will be produced by the appointed construction contractor and agreed with East Riding of Yorkshire Council and North Yorkshire Council following grant of the DCO and prior to the start of construction. It will identify the procedures to be adhered to and managed by the Contractor throughout construction and will clearly define roles and responsibilities. Production of the detailed CEMP will be secured through a Requirement attached to the DCO.

2.6.74 Contracts with companies involved in the construction works will incorporate environmental control, health and safety regulations, and current guidance and will ensure that construction activities are sustainable and that all contractors involved with the construction stages are committed to agreed best practice and meet all relevant environmental legislation including (as applicable): Control of Pollution Act 1974 (Ref. 2-16), Environment Act 1995 (Ref. 2-9), Hazardous Waste (England and Wales) Regulations 2005 (Ref. 2-17) and the Waste (England and Wales) Regulations 2011 (Ref. 2-18).

2.6.75 Records will be kept and updated regularly, ensuring that all waste transferred or disposed of has been correctly processed with evidence of signed Waste Transfer Notes (WTNs) that will be kept on-site for inspection whenever requested. Furthermore, all construction works will adhere to the Construction (Design and Management) Regulations 2015 (CDM) (Ref. 2-19).

## Site Reinstatement, Biodiversity and Landscaping

2.6.76 The working widths of the Grid Connection Cable and the Interconnecting Cable routes and any associated temporary accesses and construction compounds (where they occur outside of the Solar PV Site) will be reinstated as soon as practicable following completion of construction activities, with the land being returned to its previous use. Accesses into the Site installed during the construction phase (either new accesses or modified/extended existing accesses) will remain in place throughout the operational phase. Accesses to the Grid Connection Corridor alone, may be modified/reduced in footprint to suit the operational phase, the layout being subject to agreement with the relevant Highways Authority.

2.6.77 Measures such as those outlined in Defra's 'Code of practice for the sustainable use of soils on construction sites' (Ref. 2-20) will ensure that the soils are appropriately managed allowing their quality and function to be retained upon reinstatement and that any agricultural land it restored to the same quality (ALC grade) as prior to construction.

2.6.78 As described previously, the majority of the Ecology Mitigation Area (Goose Mitigation Zone) would remain in arable rotation, amended to deliver higher quality habitat for overwintering bird species. The remaining land (Golden Plover Mitigation Zone) will be seeded as wet grassland habitat. This grassland will be created and functional in advance of construction, where practical, so that any displaced (bird) populations have alternative areas of habitats available during construction. Additionally, as further described in the **Habitats Regulations Assessment (HRA) [EN010143/APP/7.12]** a network of 'blind' linear foot drains ('wader scrapes') will be created within the Golden Plover Mitigation Zone to maintain shallow water levels and maximise edge habitat. This will likely be done in advance of grass seeding. The foot drains would be created using excavators or rotary ditchers. The foot drains would be excavated within the topsoil horizon only (i.e., no subsoil material will be excavated) and therefore would be approximately 30 cm in depth. The topsoil will be scraped back and the excavated soil redistributed across the surrounding land. The foot drains would be 1 to 2 m in width to ensure a gently sloping edge profile that provides ideal conditions for tipulid populations (the preferred food source of Golden plover). There would be no outfalls and areas of downward sloping ground to the River Foulness in the eastern section of the Golden Plover Mitigation Zone would be avoided, to minimise any potential for surface runoff to the river. Areas of peat soils would also be avoided.

2.6.79 The amount of land required to deliver effective mitigation for each of Golden plover and Pink-footed goose is 15 ha (30 ha total). The land within the both the Golden Plover Mitigation Zone (28.75 ha) and the Goose Mitigation Zone (79.09 ha) is appreciatively greater than the 15 ha required. This ensures that a minimum of 15 ha of suitable habitat/foraging resource is available to each species at all times within each overwintering period. This allows for periodic flooding and differences in the arable rotation/cropping regime between fields. See the **HRA [EN010143/APP/7.12]** for further details.

2.6.80 Within the Solar PV Site, following construction, a programme of site reinstatement and habitat creation will take place. The Scheme has been designed to integrate with and enhance the local green infrastructure network, improving ecological and recreational connectivity across the Solar PV Site. **Plate 2-14** shows and example of typical grassland planting in a solar farm site.

2.6.81 The proposed planting design (as outlined in the **Framework Landscape** and **Ecological Management Plan (LEMP) [EN010143/APP/7.14]**) responds to the local landscape by allowing views to remain open, where tall screening would not be appropriate. New planting includes, but not be limited to:

a. 8.2 km of new native hedgerows and new native hedges with trees;

b. 17.9 km of enhancement of existing hedgerow and hedges with trees with native species;

c. 8.1 ha of native woodland planting and shrub planting with trees and woodland edge planting ;

d. 1.95 ha of native traditional orchard;

e. 797.9 ha of new semi-improved grassland (under solar PV panels);

f. 91.9 ha of species-rich grassland (around field edges etc.);

g. 20.5 ha of species-rich grassland (areas of habitat enhancement outside panel/infrastructure areas);

h. 3.5 ha of new flower rich grassland; and

i. 47.4 ha of new species rich wet grassland (in Solar PV Area 1e and the Golden Plover Mitigation Zone).

2.6.82 The design has sought to retain/avoid most receptors, although the above will be required to minimise landscape, visual and heritage impacts; the hedgerows, woodland, and tree belts will be embedded mitigation within the Scheme design to avoid or minimise significant effects. Species will be appropriate to the particular requirements of the geographical area, but also take account of climate change and potential pest and pathogen threats. Where practicable, woodland will include varied heights, spacing and species mix to maximise habitat diversity. Scrub, woodland edge, and associated mosaic habitats will be created, some of which may be allowed to develop through natural regeneration. New species rich grassland will be created and functional in advance of construction, where practical, so that any displaced (bird) populations have alternative areas of habitats available during construction. These areas of species rich grassland habitat are separate to the grassland areas under the panels; areas are shown in **the Landscape Masterplan** within the **Framework LEMP [EN010143/APP/7.14].**

2.6.83 Embedded mitigation measures for the construction phase are set out in the **Framework CEMP [EN010143/APP/7.7]**, including but not limited to measures such as construction and exclusion zones in relation to retained vegetation, ensuring a tidy and neat working area, covering stockpiles and storing topsoil in accordance with best practice measures.

2.6.84 Within the Solar PV Site, landscaping, biodiversity enhancements and habitat management works will be undertaken to deliver a level of Biodiversity Net Gain (BNG) in line with the requirements of the Environment Act 2021 (Ref. 2-9), Draft NPS EN-1 (2023) (Ref. 2-4), the National Planning Policy Framework (Ref. 2-10), and local planning policy (10 % increase). Details of landscaping, biodiversity and habitat management are presented in the **Framework Landscape and Ecological Management Plan (LEMP) [EN010143/APP/7.14].** Locations of landscaping, biodiversity and habitat management are shown on **Figure 2-3, ES Volume 3 [EN010143/APP/6.3]** and in the Indicative Landscape Masterplan accompanying the **Framework LEMP**.

2.6.85 The **Biodiversity Net Gain (BNG) Assessment [EN010143/APP/7.11]** quantifies the overall effect of the Scheme upon the Site's biodiversity value by comparing the Site's current (baseline) habitat value with that of the Scheme. Calculations consider the level of proposed habitat loss, retention, enhancement and/or creation delivered by the Scheme and are measured using Natural England's Biodiversity Metric 4.0.

2.6.86 Based on the current plans for the Site, the Scheme is predicted to result in a net gain of 80.42% for area-based habitat units, a net gain of 3.89% for hedgerow units, and a net gain of 10.84% for watercourse units (**BNG Assessment Report [EN010143/APP/7.11]**). This is likely to underestimate the actual BNG that will be achieved by the Scheme, as the assessment has been carried out based on maximum design principles, including maximum footprint of infrastructure and maximum clearance of vegetation for construction. The Applicant therefore commits to achieving a minimum 10% BNG for all units and will demonstrate this via an updated BNG assessment prior to construction. Overall, the Scheme is considered to deliver a substantial beneficial effect for biodiversity in the medium to long term as a result of the BNG (**Chapter 8: Ecology, ES Volume 1 [EN010143/APP/6.1]**).

2.6.87 Recent research by the Lancaster University has provided evidence that solar farms can enhance biodiversity on farmland through an increase in wildlife, especially pollinators, which has benefits for neighbouring land in arable production (Ref. 2-12).

**Plate 2-14. Landscaped Solar PV Facility**

### Public Rights of Way

2.6.88 The PRoW within the Site and within a 500 m radius are shown in **Figure 2-2, ES Volume 3 [EN010143/APP/6.3]**. The **Framework PRoW Management Plan [EN010143/APP/7.13**] describes how PRoW will be managed during construction.

2.6.89 PRoW that cross the Solar PV Site will be preserved with the fence installed either side of them. Where PRoW cross or are adjacent to Solar Areas the fencing will be erected from the inside without impacting the PRoW or preventing its use.

2.6.90 Fencing is the first stage of construction and with this in place construction activities can operate whilst allowing the PRoW to remain in use throughout construction operation and decommissioning. The PRoW will also be buffered from the perimeter fencing, with fencing being installed a minimum distance of 20 m either side of the centre of the PRoW where solar infrastructure lies to both sides (creating a 40 m wide corridor between the fence lines), or 15 m if solar infrastructure is to one side only. As described above there will be a further 5 m from the perimeter fence to the Solar PV panels.

2.6.91 There will be no requirement for permanent or temporary PRoW closures during construction. However, a limited number of temporary PRoW diversions within the Solar PV Site, Grid Connection Corridor and Interconnecting Cable Corridor will be required during the construction period. These are fully described in the **Framework PRoW Management Plan (PRoWMP) [EN010143/APP/7.13]**. Additionally, several PRoW within the Solar PV Site, Grid Connection Corridor, Interconnecting Cable Corridor, and Site Accesses will require management to ensure user safety and accessibility. The management measures and the PRoW to which they apply are fully described in the **Framework PRoWMP**. Management measures include, but are not limited to:

a. Maximising visibility between construction vehicles and other users (i.e., pedestrians, cyclists, equestrian);

b. Implementing traffic management (e.g., advanced signage to advise other users of the works); and

c. Use of manned controls where the Scheme crosses PRoW (i.e., marshals or banksmen), with a default priority that construction traffic will give-way to other users.

2.6.92 The crossing of Featherbed Lane (boundary between Solar Areas 2f and 2g) by the Interconnecting Cables is to be trenchless (HDD 1), so there will be no disturbance to this section of PRoW.

2.6.93 Along the Grid Connection Corridor, the PRoW associated with the crossing points of the Rivers Ouse and Derwent will be via HDD (HDD 3 and 6), and no temporary track crossing will be installed over these features. Consequently, there will be no impediment to the use of these PRoW. Furthermore, PRoW running parallel to the River Derwent are not within the Site and will be avoided.

## 2.7 Operation

### Operation and Maintenance Activities

2.7.1 During the operational phase, activity on the Solar PV Site would be restricted principally to vegetation management, equipment maintenance and servicing, the potential for sheep grazing, ad hoc replacement of any components that fail or reach the end of their lifespan, periodic fence inspection, and monitoring to ensure the continued effective operation of the Scheme.

2.7.2 Along the routes of the Grid Connection and Interconnecting Cables, operational activity will consist of routine inspections (schedule to be determined) and any reactive maintenance such as where a cable has been damaged.

2.7.3 A **Framework Operational Environmental Management Plan (OEMP) [EN010143/APP/7.8]** has been prepared as part of the DCO Application. This sets out the general environmental principles to be followed in the operation of the Scheme. The Framework OEMP will be used as the basis for a detailed OEMP to be prepared prior to commencement of operation. The detailed OEMP will be a live document updated throughout the operational period as required, e.g., to reflect changes in legislation or contact details. It will identify the procedures to be adhered to and managed by the operator throughout the operational lifetime of the Scheme and will clearly define roles and responsibilities. Production of the detailed OEMP will be secured through a Requirement in the DCO.

### Operational Staffing

2.7.4 It is anticipated that there will be three permanent staff employed during the operational phase, who will be based at the operations and maintenance hub at Johnson’s Farm (Solar PV Area 1e). Additional staffing/visitors such as maintenance workers and deliveries will be ad hoc as needed. It is assumed that this will equate to four days of additional worker time per month.

### Operational Traffic and Access

2.7.5 There should be no requirement for HGV or AIL movements during the operation of the solar farm; it is expected that deliveries will be by light goods vehicle (LGV) or car.

2.7.6 AIL movements during the operational phase are not anticipated due to the delivery of spare transformer phases during the construction phase (see paragraph 2.6.58).

2.7.7 A small number of private vehicles for the three permanent staff and ad hoc maintenance workers and visitors will also use the local road network along with light goods maintenance and delivery vehicles when required.

2.7.8 It is anticipated that any components which are removed (replaced) will be transported to the Scheme’s storage facilities (at Johnson’s Farm), by transit van or similar or LGV. Once a sufficient volume of waste has been accumulated to make a ‘load’ for transport off-site, it is anticipated that these movements will also be undertaken by LGV (i.e., not HGV).

2.7.9 Accesses into the site installed during the construction phase (either new accesses or modified/extended existing accesses) will remain in place during the operational phase. The site access off Rowlandhall Lane into Solar PV Area 3c will only be used at construction and decommissioning. During the operational phase of the Scheme access to Solar PV Area 3c will use the access through Newsholme village (this access will not be used at construction or decommissioning). Use of the Newsholme village access during operation will largely be restricted to access by site staff and maintenance workers with vehicles using this route being no larger than a van or LGV. The access can accommodate tractor-trailers, but use by this size of vehicle would be very infrequent, likely restricted to panel cleaning operations which would be undertaken every two years as a worst case. Tractor access would also be required for grass cutting within the Solar PV Site if grazing is not undertaken (see also paragraph 2.7.40).

2.7.10 On the Grid Connection Corridor alone, some accesses may have been modified/reduced in footprint at the end of the construction period.

## Lighting

2.7.11 The lighting strategy for the operational phase is set out in the detailed **Operational Environmental Management Plan (OEMP). A Framework OEMP [EN010143/APP/7.8]** includes details on lighting design and is provided as part of the DCO Application. The general principles of the lighting design are set out in paragraphs 2.6.61 and 2.6.62.

2.7.12 During operation, the Solar PV Areas will not require artificial lighting other than during temporary periods of maintenance/repair. All routine maintenance activities, except panel cleaning, will be scheduled for daylight hours as far as is practicable, and therefore it is anticipated that focussed task specific lighting should only be required in the event of emergency works/equipment failure requiring night-time working or panel cleaning operations.

2.7.13 As further described in paragraph 2.7.30, as a worst-case, it is estimated that the Solar PV Panels would be cleaned every two years. The panels would be cleaned at night when they are cool and not tracking. The current preferred solution for cleaning operations would be lit by tractor mounted lighting which is akin to that used during night-time arable harvesting operations which are currently undertaken within the Site.

2.7.14 Containerised units at the Field Stations may also contain internal artificial lighting (to be manually activated when needed), but light spillage would be minimal (through doorway when open).

2.7.15 It is anticipated that the compound for the two Grid Connection Substations will have inward facing PIR controlled security lighting installed at each corner of the compound. As for the Solar PV Areas, all routine maintenance activities will be scheduled for daylight hours as far as is practicable, and focussed task specific lighting should only be required in the event of emergency works/equipment failure requiring night-time working.

2.7.16 It is anticipated that there will be internal lighting within the control buildings for the Grid Connection Substations, but that light spillage from these would be minimal (through open doorway only), outside task specific and fixed 'general' lighting may be required in months with reduced daylight hours (early mornings and evenings) to meet safety requirements. Outside of core working hours PIR controlled lights (motion sensors) will be used.

2.7.17 At the operations and maintenance hub at Johnson's Farm task specific and fixed 'general' lighting may be required in months with reduced daylight hours (early mornings and evenings) to meet safety requirements. Outside of core working hours PIR controlled lights (motion sensors) will be used. The buildings will be fitted with internal lighting, but light spillage would be minimal (through open doorway and the windows of the offices only.

2.7.18 The lighting design requirements will be captured in the **Outline Design Principles Statement [EN010143/APP/7.4]** and are the same as for the construction phase as set out in paragraphs 2.6.61 and 2.6.62.

### Waste

2.7.19 Solid waste materials generated during operation will primarily be general (household type) waste from the offices. However, there will also be a limited volume of packaging waste associated with the delivery of spare components. All general and packaging type waste will be segregated and stored on-site in containers (bins or covered skips) prior to transport to an approved, licensed third party landfill and recycling facilities.

2.7.20 Additionally, any waste components (e.g., faulty or damaged solar PV panels, cables/connectors and frames) will be securely stored at Johnson’s Farm until such time as the volume of waste is sufficient to allow transport to an approved, licensed third-party waste and recycling facility.

2.7.21 Section 2.9 summarises the anticipated design life (40 years) and replacement frequency (ad hoc) for the main elements of the Scheme (e.g., solar PV panels) this information is based upon other similar Solar NSIP schemes.

2.7.22 It is noted that using current UK-based recycling technology 90% of the glass and 95% of the semiconductor materials can be extracted from waste solar PV panels for use in new solar PV panels.

### Water

2.7.23 During operation self-contained portable welfare units which store foul/wastewater for collection/emptying by specialist licenced contractors will be deployed on an ad hoc basis (e.g., if required by maintenance crews) at the further reaching sites where the use of the facilities at Johnson’s Farm is not feasible.

2.7.24 The water supply for the operations and maintenance hub at Johnson’s Farm will come from the mains supply and disposal will be to septic tank emptied by specialist licenced contractor.

### Surface Water Drainage

2.7.25 If during the construction of any of part of the Scheme there is any interruption to existing schemes of land drainage, then new sections of drainage will be constructed.

2.7.26 A **Framework Surface Water Drainage Strategy** is presented as **Appendix 9.4, ES Volume 2 [EN010143/APP/6.2]**. As agreed with the Ouse and Humber Drainage Board the **Framework Surface Water Drainage Strategy** only considers the Grid Connection Substations (Solar PV Area 1c). A detailed strategy will be provided post-consent following the detailed design of the Grid Connection Substations and informed by infiltration testing, as secured through the DCO.

2.7.27 The calculations presented in the Framework Surface Water Drainage Strategy are based on a 1 in 100-year storm event. To prevent runoff to surrounding land or risk to proposed infrastructure, storm runoff will be collected and attenuated within two storage areas and discharged at no higher than the greenfield runoff rate.

2.7.28 Storms larger than the design event will be allowed to leave the site in all directions and ultimately drain to three possible drains being, Willitoft Drain, Fleet Dike Two and Londesborough Drain. This represents an improvement to the current site runoff because there will be no flow from the site until the attenuation is full. Only the later stages of extreme rainfall will give rise to surface flow leaving the site.

### Cleaning of Panels

2.7.29 In the UK climate, Solar PV Panels are largely self-cleaning and deterioration in PV system output due to dust or dirt is generally low. The requirement for, and the frequency of, cleaning of the Solar PV Panels due to the build-up of dust and dirt varies depending upon site-specific conditions. For example, the presence of fine dust emitters such as quarries, agricultural operations (harvesting), coastal salt water, and the volume and proximity of nearby woodland all impact the level of dust deposition. However, the main factor influencing cleaning requirements in the UK is lichen growth which again is influenced by site-specific and climatic factors.

2.7.30 As stated above, the deterioration in output due to dust or dirt is generally low and therefore the requirement for cleaning due to loss of output is balanced against cost of the cleaning operation. Some sites are capable of operating without the need to be cleaned, whereas some sites require cleaning every two years (annual cleaning is considered not to be cost effective). The cleaning requirements for the Scheme can only be accurately determined once operational; therefore, to present a worst-case for the assessments presented in this ES, a two-year cleaning cycle is assumed.

2.7.31 Panel cleaning technology is evolving, and new technology may mean that by the time the Scheme is constructed, clip-on cleaning solutions could prove to be the best solution (both environmentally and from a cost basis). However, this ES assumes that a tractor mounted system (currently the system typically used on UK solar farms) will be used. This also allows the water usage to be determined based on current schemes using this technology (**Chapter 9: Flood Risk, Drainage and Water Environment, ES Volume 1 [EN010143/APP/6.1]).**

2.7.32 A tractor mounted cleaning system uses a rotating ‘car-wash’ type brush, as shown in **Plate 2-15**. It is anticipated that water would be brought to Site in 1 $m^3$ (one tonne/1,000 litres (l)) intermediate bulk containers (IBC). Individual IBCs would be mounted on the rear of the tractor to provide water supply during cleaning. Based upon cleaning water usage on similar schemes it is estimated that the cleaning of each panel will require 250 millilitres (ml) of water and that, assuming cleaning of all panels is required, the total volume of cleaning water per cleaning cycle would be 206,000 litres (206 $m^3$).

2.7.33 Panels would be cleaned at night when they are cool, as applying cold water to warm panels can lead to thermal shock and the risk of micro-cracks to the panel surface. Cleaning operations typically commence at sunset (after the panels have stopped tracking and have returned to their night-time horizontal position) and finish prior to the panels recommencing tracking in the morning. As described in section 2.6 the cleaning operations would be lit by tractor mounted lighting which is akin to that used during night-time arable harvesting operations currently undertaken within the Site. As the use of cleaning products (chemicals) can damage panels and void manufacturer's warranties, no cleaning products would be used only water. If required, a water softener would be added to prevent wash-residue forming on the panels; this would be biodegradable and would have no impact to the environment.

2.7.34 Dry-cleaning would not be employed as the action of the dry brush and any dust present on the panel surface would likely result in the formation of micro-scratches. Such scratches would likely attract/harbour more dirt on the panel surface decreasing efficiency and potentially voiding manufacturer's warranties.

**Plate 2-15. Tractor-mounted cleaning system**

## Grazing

2.7.35 Grazing by sheep is the Applicant's preferred option for the management of the grassland created within the solar farm. The Applicant commissioned an independent sheep specialist in the UK livestock industry to undertake a grazing feasibility study (**Appendix 2-1: Grazing Feasibility Report, ES Volume 2 [EN010143/APP/6.2]**) for the Scheme. Although grazing is not typical in East Yorkshire, the study concluded that *"…land is suitable for grass and forage crops and if managed correctly, by providing good fencing and water supplies and good sheep husbandry, then there is no reason why the land under the panels cannot successfully be grazed by sheep, as is common practice on other operational solar farms both within the UK and internationally"*.

2.7.36 Sheep grazing on solar PV facilities is successfully used in the UK and carries with it multiple benefits such as soil health improvement and biodiversity enhancement. Sheep can move safely between and under the solar PV panels, and shelter under them from sun or rain. It is noted that the use of single axis tracker panels is not yet typical in the UK, however it is known from schemes elsewhere in the world (e.g., Australia and the USA) that the use of tracker technology does not influence grazing. The panels would be at a minimum height above ground level of approximately 1 m at maximum tilt with greater clearance during the rest of the day. Therefore, it is unlikely that grazing will be limited by the panels themselves.

2.7.37 **Plate 2-16** illustrates the installation of stockproof fencing within a larger field to create rotational grazing.

2.7.38 As grazing achieves an essential maintenance function (maintaining the grass at a low level) without the need for/cost of machinery, it is possible for solar farms to use less agriculturally productive breeds (such as heritage breeds) and to graze at a low densities. The agricultural business model for grazing would be around the provision of vegetation management services in combination with the sale of fleece, meat or other products. The current landowners may not have sheep husbandry skills but these can be developed, or other shepherds may wish to rent the land to keep and expand their own sheep enterprises.

2.7.39 The flock would be of a suitable size for the land available, rotated as required to ensure that no areas were over-grazed and that the land being currently grazed was sufficiently dry to support them thereby avoiding potential damage to soil structure.

**Plate 2-16. Sheep grazing on a solar PV facility**

2.7.40 Should grazing not be possible in some or all areas of the Solar PV Site, grassland will instead be managed by mowing, typically using a tractor and flail.

## Habitat Management

2.7.41 The **Framework LEMP [EN010143/APP/7.14]** sets out the principles for how the land will be managed throughout the operational phase, following the completion of construction, and specifies mitigation and enhancement measures that would support BNG. A detailed LEMP will be produced following the granting of the DCO and prior to the start of construction (this will be secured by a Requirement attached to the DCO).

### Permissive Paths

2.7.42 The design of the Scheme allows for the provision of Permissive Paths, which are routes available to the public during the operational life of the Scheme. These are restricted to the Solar PV Site as this land will remain in control of the Applicant for the lifetime of the Scheme, whereas land within the Grid and Interconnecting Cable Corridors will be returned to the landowners following construction. Land within the Ecology Mitigation Area also remains in the control of the Applicant, however, to provide the maximum ecological benefits this area should be disturbed as little as possible and so Permissive Paths are not proposed within this area.

2.7.43 Two Permissive Paths are shown on the indicative site layout plan (**Figure 2-3, ES Volume 3 [EN010143/APP/6.3]**). **Figure 2-3** also shows the existing PRoW routes, which are also identified on **Figure 2-2, ES Volume 3 [EN010143/APP/6.3].** The first proposed Permissive Path is a continuation of Bridleway SPALB08 which currently terminates at Johnson's Farm (the site of the Operations and Maintenance Hub). Following discussions with East Riding of Yorkshire Council's PRoW Team it is proposed that this is a Permissive Path allowing travel on horses. The proposed Permissive Path runs northwards for approximately 340 m until it connects with the second proposed Permissive Path. This second Permissive Path runs eastwards from footpath SPALF14 (to the north of Spaldington) parallel with Londesborough Drain, connecting with the first Permissive Path and continuing eastwards to the edge of the grassland habitat created in the east of Solar PV Area 1e adjacent to the River Foulness. The route would be approximately 1.4 km in length. From discussions with East Riding of Yorkshire Council's PRoW Team it is proposed that the section from SPALF14 to the connection with the first Permissive Path would also be a Permissive Path allowing travel on horses, helping to reinforce the Council's aspirations for the provision of recreational routes for equestrian users. From the point where the two Permissive Paths meet, heading westwards it is anticipated that the route (approximately 250 m in length) will be an ordinary Permissive Path (i.e. a footpath).

2.7.44 The routing of Permissive Paths and treatment of existing PRoW has been discussed the East Riding of Yorkshire Council, as described in **Chapter 12: Socio Economics and Land Use, ES Volume 1 [EN010143/APP/6.1].**

## 2.8 Design Life and Decommissioning

2.8.1 The design life of the Scheme is 40 years with decommissioning to commence 40 years after final commissioning (currently anticipated to be 2027 to 2067).

2.8.2 It is expected that throughout this period faulty or damaged solar PV panels and other components will require replacement as part of normal maintenance operations on an ad hoc basis. There will be no 'wholesale' replacement of solar PV panels or other equipment.

2.8.3 The assessments presented in this ES therefore assume a design/operational life of 40 years.

2.8.4 When the operational phase ends, the Solar PV Site will require decommissioning. All solar PV panels, mounting poles, cabling, inverters, transformers and switchgear would be removed from the Solar PV Site and recycled or disposed of in accordance with good practice and market conditions at that time. Additionally, as the Applicant would no longer have any rights over the land within the Site the Permissive Paths would no longer be available/ the permissive right of access would be removed. The majority of the Solar PV Site will be returned to its original use (arable) and condition after decommissioning. This would include the removal of any hard standing created by the Scheme and reinstatement of the soil profile (using the stockpiled site won soils) in areas where topsoils were removed. Application of measures set out in Defra's code of practice (Ref. 2-20) will ensure that the restored soils are appropriately managed allowing their quality and function to be retained upon reinstatement and that any agricultural land it restored to the same quality (ALC grade) as prior to construction. The undisturbed soils within the Solar PV Site will have been removed from intensive agriculture for a long period and are expected to have achieved improvements in soil structure and carbon sequestration over that time.

2.8.5 It is noted accesses into the site installed during the construction phase (either new accesses or modified/extended existing accesses) will remain in place until the end of decommissioning in the area they serve. Noting that on the Grid Connection Corridor alone, some accesses may have been modified/reduced in footprint at the end of the construction period. Once no longer required by the Scheme the land will be reinstated to its pre-development land use.

2.8.6 Johnson's Farm (operation and maintenance hub) including all buildings will revert to the landowner.

2.8.7 It is common practice for infrastructure such as 132 kV Substations and their associated export cables (i.e., the Grid Connection Substations and Grid Connection Cables) to be retained and used for another purpose after the development they were originally installed to support is decommissioned. Therefore, it is possible that the Grid Connection Substations and Grid Connection Cables may remain in place/operational after decommissioning of the Solar Farm. This cannot be confirmed at this time and will depend upon demand closer to the decommissioning date. Where retention /decommissioning of this infrastructure is relevant, the technical assessments presented in Chapters 6 to 6 of this ES have considered a worst case in respect to that discipline.

2.8.8 All work to the National Grid Drax Substation would remain under National Grid's control.

2.8.9 The mode of cable decommissioning for the Grid Connection and Interconnecting Cables will be dependent upon government policy and best practice at that time. Currently, the most environmentally acceptable option is leaving the cables in situ, as this avoids disturbance to overlying land and habitats and to neighbouring communities. Alternatively, the cables can be removed by opening the ground at regular intervals and pulling the cable through to the extraction point, avoiding the need to open up the entire length of the cable route. The impact assessment is based on the worst-case parameters for each technical topic. A **Framework Decommissioning Environmental Management Plan (DEMP) [EN010143/APP/7.9]** is included with the DCO Application. This sets out the general principles to be followed in the decommissioning of the Scheme. A detailed DEMP will be prepared and agreed with the relevant authorities at that time of decommissioning, in advance of the commencement of decommissioning works, and would include timescales and transportation methods. The detailed DEMP would ensure that decommissioning was undertaken safely and with regard to the environmental legislation at the time of decommissioning, including relevant waste legislation.

2.8.10 Decommissioning is expected to take between 12 and 24 months and will likely be undertaken sequentially.

2.8.11 The effects of decommissioning are usually similar to, or of a lesser magnitude than, construction effects and are considered in the relevant sections of the ES. The specific method of decommissioning the Scheme 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 Scheme. Assumptions will therefore be made where appropriate.

## Waste

2.8.12 The wastes generated at decommissioning will primarily be the electrical components of the Solar PV Site, the solar PV frames and fencing. Wastes will be managed in accordance with the relevant legislation and guidance at the time and in accordance with the DEMP. Wastes will be safely and securely stored. It is anticipated that waste will either be segregated and stored on-site in containers (covered skips) or will be stored within the secure storage buildings at Johnson’s Farm or Solar PV Area 1h, prior to transport to an approved, licensed third-party landfill and recycling facilities.

2.8.13 At this time, it is not possible to identify either the waste management routes or specific facilities that would be used, as these are liable to change over such a timescale. The waste types generated, and effects of decommissioning are likely to be similar or of a lesser magnitude than the construction effects. Using current UK-based recycling technology 90% of the glass and 95% of the semiconductor materials can be extracted from waste solar PV panels for use in new solar PV panels.

## 2.9 References

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