One Earth Solar Farm

Volume 7.0: Other Documents [EN010159]

Outline Soil Management Plan

November 2025

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

Contents

1. Introduction

1.1 Introduction and Purpose

1.1.1. The document references have not been updated from the original submission. Please refer to the Guide to the Application **[EN010159/APP/1.3.2]** for the list of current versions of documents

1.1.2. An outline Soil Management Plan (oSMP) has been produced by ADAS on behalf of One Earth Solar Farm Ltd, to support the construction, operation (including maintenance) and decommissioning phases of the Proposed Development (described below). The purpose of the oSMP is to ensure the protection and conservation of soil resources within the Order Limits by:

> Best practice measures to maintain the physical properties of the soil within the Order Limits; and

> Measures for the management of the soil resource for site operators.

1.1.3. This document covers measures for soil handling, soil moisture content assessments and storage and trafficking of soils during the construction, operation (including maintenance) and decommissioning phase of the Proposed Development. The terminology used in this document is defined in the **Glossary of Terms and Abbreviations [EN010159/APP/7.17].**

1.1.4. The objective of the oSMP is to identify the importance and sensitivity of the soil resource and to provide specific guidance to ensure that there is no significant adverse effect on the soil resource as a result of the Proposed Development.

1.1.5. A final Soil Management Plan (SMP) will be produced for the Proposed Development in accordance with a requirement of the Development Consent Order (DCO) prior to commencing construction, which will be required to be in accordance with this oSMP submitted as part of the DCO Application.

1.1.6. The measures proposed within the SMP will be agreed upon prior to the commencement of construction and decommissioning works with the host authorities (which includes Nottinghamshire County Council; Lincolnshire County Council; Newark and Sherwood District Council; West Lindsey District Council; and Bassetlaw District Council). The SMP will be prepared following the appointment of the contractor, prior to the start of works and in accordance with this oSMP.

1.1.7. This SMP is intended to be a live document, such that modifications and necessary interventions can be made as construction and decommissioning is carried out.

1.1.8. This document provides detail on the following:

> A description of the soil types and their resilience to being trafficked;

- Soil handling;
- Description of works and how soil damage will be minimised;
- Monitoring measures for soil condition and criteria against which compliance will be assessed; and
- Remediation and aftercare measures.

1.2 The Proposed Development

1.2.1 A full description of the Proposed Development is provided in **ES Volume 1, Chapter 5: Description of the Proposed Development [EN010159/APP/6.5]** and as such has not been repeated here.

1.3 The Order Limits

1.3.1 The extent of the Solar PV array, Mitigation and Enhancement Areas, the substation and BESS compounds and River Crossing are shown in the **Works Plan [EN010159/APP/2.3]** and, as above, are described in full in **ES Volume 1, Chapter 5: Description of the Proposed Development [EN010159/APP/6.5]**.

2. Soil Resources

2.1 Climatic Conditions

2.1.1 The Agricultural Land Classification (ALC) process uses a fixed set of climate data for each location on a five kilometre grid across England and Wales[1]. From these data, the climatic conditions for any specific location can be interpolated. The climatic data for the Order Limits, using the ALC climate data set, shows annual rainfall of approximately 570 mm across the Order Limits.

2.1.2 The ALC climate dataset also indicates that soils within the Order Limits are typically at field capacity for 110 days per year, from late autumn to early spring. This is the period when soils are most susceptible to damage because they are saturated.

2.2 Agricultural Land Classification

2.2.1 Detailed ALC surveys have been carried out between 26th June 2023 and 22nd August 2024 across the area within the Order Limits (see **Works Plan [EN010159/2.3]**). The results of the ALC survey are set out in **ES Volume 2, Chapter 8: Land and Soils [EN010159/APP/6.8]**, and **ES Volume 3, Appendix 8.6: Agricultural Land Classification Survey Report [EN010159/APP/6.21]**.

2.2.2 The ALC survey classifies land according to the extent to which its physical or chemical characteristics impose long term limitations on agricultural use. After all factors are consisdered, the land is classified into one of the following grades: Grade 1, excellent quality; Grade 2, very good quality; Subgrade 3a, good quality; Subgrade 3b, moderate quality; Grade 4, poor quality; and Grade 5, very poor quality.

2.2.3 Best and Most Versatile Land (BMV) is a classification of agricultural land that is considered to be the most productive and efficient for growing crops. It is defined as land which falls into Grades 1, 2 or 3a in the ALC system.

2.2.4 As set out in the ALC, there are six principle soil types within the Order Limits: clayey soils, medium loamy over clayey soils; light loamy over sandy soils; sandy soils; medium loamy soils; and light loamy over clayey soils.

2.2.5 Poorly draining clayey soils are found across most of the west of the Order Limits, as well as adjacent to the River Trent and in a small area near the centre of land to the east of the river within the Order Limits. The limitation to agricultural use of

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[1] Climatalogical Data for Agricultural Land Classification; 1989 https://publications.naturalengland.org.uk/file/4830386468159488

these soil is winter soil wetness with ALC grade limited to Subgrade 3a and more frequently Subgrade 3b by soil wetness.

2.2.6 Sandy soils are found across much of the land to the east of the River Trent within the Order Limits. These soils are free to moderately well draining, with the limitation to agricultural use being by summer droughtiness. Droughtiness limits the ALC grade to Subgrade 3a and more frequently Subgrade 3b.

2.2.7 A summary of the ALC findings are detailed below:

Table 2.1: Areas and percentages of each ALC Grade within the Survey Area.

ALC Grade	Total Area (ha)	% of the Order Limits
1	0.0	0
2	244.8	19.7
3a	416.1	33.5
3b	579.5	46.7
4	0.0	0.0
Non-Agriculture	0.0	0.0
Total	1,240.4	100

2.3 Characterisation

2.3.1 As detailed in the ALC report, the dominant characteristics affecting the agricultural quality of land within the Order Limits are soil wetness in the clayey soils found predominantly to the west of the River Trent, and soil droughtiness in sandy soils to the east of the river. The higher quality land (Grades 2 and 3a) found within the Order Limits mostly has medium textured topsoils and upper subsoils which are not particularly prone to winter wetness nor summer droughtiness.

Soil Types

2.3.2 Multiple soil types are found across the Order Limits, which can loosely be placed into six main groups:

- clayey soils
- medium loamy over clayey soils
- light loamy over clayey soils

- medium loamy soils
- light loamy over sandy soils
- sandy soils

Propensity to Damage

2.3.3 The Institute of Environmental Management and Assessment (IEMA) has classified the resilence of soils to structural damage during soil handling. This is represented in **Table 2.2**.

2.3.4 As shown in **Table 2.2** locations with fewer than 150 Field Capacity Days (FCD), medium (loamy) and heavy (clayey) soils have a Medium Resilience to structural damage during handling (Soil Handling Unit {SHU} B). In comparision Light (sandy) soils have a High Resilience to damage (SHU A).

2.3.5 Whilst the pattern of soil types across the Order Limits is complex, areas of different soil handling units are relatively distinct **(Figure 2.1)**. Approximately 40% of the land has SHU A topsoil which has a Low Susceptibility to damage during handling. Over 80% of the land with SHU A topsoil is found to the East of the River Trent.

2.3.6 Most of the land to the west of the River Trent and several areas making up approximately a third of land to the east of the river have predominantly SHU B topsoils. These have a Medium Resilience to damage during handling operations and will be more prone to compaction if trafficked in the wetter mid-winter months than SHU A soils.

2.3.7 Works involving trafficking on the topsoil during the winter months will need to be carried out carefully, otherwise there may be an increased need for amelioration in the Spring. If site work during the winter period is unavoidable, the more resilient SHU A soils will be prioritised for working on during this period.

Table 2.2: Soil resilience to structural damage classification[2]

Soil Handling Unit	Resilience to Structural damage during soil handling in a dry condition	Soil texture class
A (Green)	High	Soils with a high sand fraction (sands, loamy sands, sandy loams and sandy silt loams) where the FCDs are fewer than 225 and are in wetness classes WCI to WCII
B (Orange)	Medium	Clays, silty clays, sandy clays, heavy silty clay loams, heavy clay loams, silty loams and organo-mineral and peaty soils where the FCDs are fewer than 150. Medium-textured soils (silt loams, medium silty clay loams, medium clay loams and sandy clay loams) where FCDs are fewer than 225. Sands, loamy sands, sandy loams and sandy silt loams where the FCDs are 225 or greater or are in wetness classes WCIII and WCIV
C (Red)	Low	Soils with high clay and silt fractions (clays, silty clays, sandy clays, heavy silty clay loams and heavy clay loams) and organo-mineral and peaty soils where the Field Capacity Days (FCD) are 150 or greater. Medium-textured soils (silt loams, medium silty clay loams, medium clay loams and sandy clay loams) where the FCDs are 225 or greater. All soils in wetness class (WCV or WCVI).

[2] IEMA. A New perspective on Land and Soil in Environmental Impact Assessment, 2022

Topsoil Handling Unit

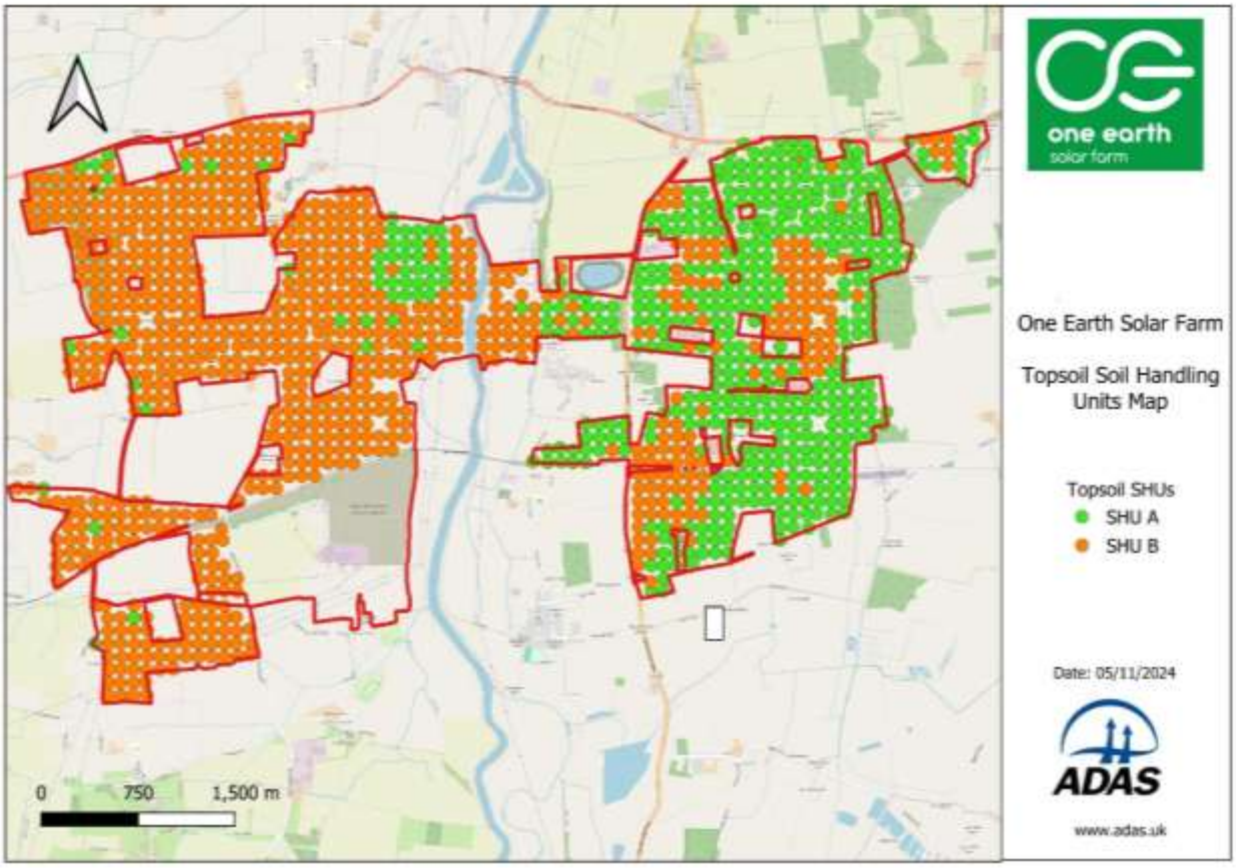

Figure 2.1: Soil Handling Unit Map

Land west of the River Trent.

2.3.8 Soils belonging to seven different soil associations are found within the Order Limits to the west of the River Trent.

2.3.9 Compton, Whimple 3, Fladbury 2, Brockhurst 2 and Worcester soils all have predominantly clayey topsoils and subsoils. Dunnington Heath topsoils are lighter in texture than these five associations, but also have heavy subsoils. Topsoils and subsoils within these six soil assocaitions have a Medium Resilience to structural damage during soil handling (SHU B).

2.3.10 Blackwood association soils are found in a north-south band in the eastern half of the land to the west of the river within the Order Limits. Soils in the northern half of this area are predominantly light loamy topsoil over sandy subsoil and have a High Resilience to damage during handling (SHU A). The southern land mapped as Blackwood association on the western side of the river has medium loamy topsoils and subsoils, which have a Medium Resilience to structural damage during soil handling (SHU B).

Land east of the River Trent.

2.3.11 Soils belonging to four different soil associations are mapped within the Order Limits to the east of the River Trent[3], although Evesham 2 association soils are only found in one small (7 ha) area in the north-east of this land.

2.3.12 The majority of the land to the east of the River Trent is mapped as Blackwood Association. These soils are mostly light loamy or sandy topsoils overlying sandy subsoils and have a High Resilience to damage during handling (SHU A).

2.3.13 An area in the centre of land mapped as Blackwood soil association was identified as a different soil type by the ALC Survey (**ES Volume 3, Appendix 8.6: Agricultural Land Classification Survey Report [EN010159/APP/6.21]**). This approximately 33 ha area across five fields has clayey topsoil and subsoil which have a Medium Resilience to damge during handling (SHU B).

2.3.14 Dunnington Heath soils are mapped within the Order Limits down the centre of land to the east of the River Trent. Much of the land across the centre of this area has light loamy topsoil overlying clayey subsoil, which have a High (SHU A) and Medium (SHU B) Resilience to damage during handling respectively. The north-western and southern areas of this land have medium textured tospoils over heavier subsoils and have a Medium Resilience to damge during handling (SHU B).

2.3.15 Fladbury 2 soil associaton is mapped adjacent to the eastern bank of the River Trent. These soils are clayey and on flat land at risk of flooding. With heavy topsoil and subsoil, these soils have a Medium Resilience to damage during handling operations (SHU B).

[3] Hodge C.A.H. et al.; 1984. Soils and their use in Eastern England. Soil Survey of England and Wales; Harpenden.

3. Construction – Key Principles

3.1.1 Across most of the land within the Order Limits, soils will remain *in situ* throughout the project. Measures detailed in this oSMP are designed to minimise the impact of trafficking on the *in situ* soil during construction and amelioration measures to restore soils where damage has occurred.

3.1.2 The main potential impacts upon land will be trafficking by vehicles involved in the installation of solar arrays and fencing. This has the potential to compact and damage soils. The main mitigation methods will be to avoid working in unsuitable conditions and to utilise low ground pressure vehicles (tracked vehicles or vehicles fitted with tyres designed to operate at low inflation pressures).

3.1.3 Whilst mitigation methods will minimise impacts upon the soil during installation of the PV arrays, some damage or compaction is inevitable. Agricultural land is routinely trafficked by farm machinery during farm operations and resultant compaction alleviated using standard farm equipment, such as grassland slitters, spikers or subsoilers followed by discing, harrowing and/or rolling if levelling is required. Similar tractor operated farm cultivation equipment will be used to ameliorate localised damage resulting from the solar installation.

3.1.4 Throughout the construction, operation and decommissioning phases, regular inspections will be made by a qualifed soil scientist (a member of the British Society of Soil Science [BSSS]) or individuals who have received soil handling and plasticity testing training provided by a qualified soil scientist. Inspections will check for compliance with the agreed SMP, such as the depth of material stripped for areas of track, confirmation of soil handling and trafficking over land being stopped when soil has wetted to a plastic consistence, and condition of soil material in storage bunds.

3.1.5 Should there be any modifications or deviations from the SMP, a qualified soil scientist will review them and advise the contractors of any resultant specific soil related requirements.

3.1.6 Specific site inspections by a qualifed soil scientist will take place prior to and post decommissioning work to identify any areas of specific remediation work required, and that any such remediation work has been completed successfully. An example would be looking for any areas of subsoil compaction that have developed where service vehicles have been used off the access track routes, specifying appropriate subsoil cultivation and assessing the effectiveness of that cultivation.

3.1.7 Periodic site inspection of the Order Limits will also be used in conjunction with the landowners, to identify any emerging issues such as loss of gravel hardcore from access tracks to adjacent land or unnecessary vehicle movements off the access tracks.

3.1.8 All soil trafficking and handling operations will be undertaken under the supervision of a suitably qualified or trained person (see **Section 3.1.4**). These individuals will advise on and supervise soil handling, including identifying when soils are dry enough to be handled.

3.1.9 Site inspections by suitably trained persons (see **Section 3.1.4**) of the soil condition prior to vehicle movements across the Order Limits are required, particularly during wet weather conditions.

3.1.10 The key principles for minimising damage to soils are:

- Timing;
- Retaining soil profiles;
- Avoiding compaction;
- Ameliorating compaction; and
- Storing soils for re-use.

3.2 Timing

3.2.1 Timing of soil operations is the most critical management decision to minimise soil damage.

3.2.2 At this location the ALC data indicates that soils will be at field capacity for a period of approximately 110 days in an average year, typically between early December and mid-March, although this commonly varies by 4 weeks either side of these dates. During this period there is an increased risk of localised damage to soil structure from trafficking and soil handling, particularly SHU B soils.

3.2.3 If sustained heavy rainfall (e.g. >10mm in 24 hours) occurs during soil handling operations, work must be suspended and not restarted until the ground has had at least a full dry day or agreed moisture criteria (such as ‘drier than the plastic limit’) can be met. Lighter soil (SHU A) can generally be moved at a higher moisture content without causing damage than a heavy soil.

3.2.4 Soil stripping, storing and restoration operations should only occur when the soils are as dry as reasonably practicable (and below the plastic limit), or meets **Table 2.2** soil characteristics for SHU A soils. However, if handling plastic soils is unavoidable due to operational restrictions, they will be laid out in windrows and not formed into ‘sealed’ stockpiles until they have dried out and passed plasticity tests - as detailed in the ‘Construction Code of Practice for the Sustainable Use of

Soils on Construction Sites (Defra, 2009), Section 5.4.10'[4] A suitably trained person (**see Section 3.1.4**) should test the soil plasticity prior to soil handling operations, following the procedure detailed below in **Tables 3.1, 3.2 and 3.3**.

Table 3.1: Visual Assessment of Soil Moisture

Soil Condition	Procedure
If the soil is wet, films of water are visible on the surface of the soil particles or aggregates and/or when a soil sample is squeezed by hand and readily deforms into a 'cohesive' ball	NO HANDLING
Soil peds readily break up or crumble when squeezed in the hand	HANDLING OK
If the sample is moist (a slight dampness when squeezed by hand) but the soil colour does not change upon further wetting	HANDLING OK IF UNDERTAKEN BY TRACKED EXCAVATOR AND CONSISTENCY TEST IS PASSED
If the sample is dry and darkens if water is added the soil is brittle	HANDLING OK IF CONSISTENCY TEST IS PASSED

Table 3.2: Consistency Test (1) – Attempt to mould a soil sample into a ball by hand

Soil Condition	Procedure
Impossible because the soil is too hard or dry	HANDLING OK
Impossible because the soil is too loose (dry)	HANDLING OK
Impossible because the soil is too loose and wet	HANDLING NOT OK
Possible	GO TO CONSISTENCY TEST (2)

[4]Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra, 2009) https://assets.publishing.service.gov.uk/media/5b2264ff40f0b634cfb50650/pb13298-code-of-practice-090910.pdf

Table 3.3: Consistency Test (2) – Attempt to roll the ball by hand into a thread of 3mm diameter on a flat non-adhesive surface

Soil Condition	Procedure
Impossible the soil crumbles or disintegrates	HANDLING OK
Possible	NO HANDLING

3.2.5 As detailed in **Section 3.2.3**, soils should be left to dry for a full day or to an agreed moisture content fowllowing a significant rain event. If it is not possible to strip topsoils when they are below the plastic limit, they should be deposited into windrows prior to lifting them into their final bund once they have dried out sufficiently.

3.2.6 Once test results indicate that soil to be handled or trafficked is in a suitable condition (below the plastic limit for SHU B soils, or meets **Table 2.2** soil characteristics for SHU A soils), further assessment is not required until there is a significant rain event (>10mm in the previous 24 hours).

3.2.7 Soil handling methods will be as specified in the Defra Construction Code of Practice for the Sustainable Use of Soils on Construction Sites[4] and Institute of Quarrying Good Practice Guide for Handling Soils in Mineral Working[5], unless employed methods are supported by a suitably a trained person (see **Section 3.1.4**).

3.3 Retaining soil profiles

3.3.1 Cabling installations require trenches to be excavated. These are usually dug to a depth below the topsoil, requiring some subsoil removal.

3.3.2 Topsoil and subsoil should be stored separately and restored in the same order to retain the original soil profile.

3.3.3 It is possible that a second, clearly different subsoil is encountered during trench excavation. This lower subsoil is most frequently of poorer quality for agriculture and, where possible, should be stockpiled separately and restored below the upper subsoil and topsoil to retain the original profile.

3.4 Avoiding compaction

[5] Institute of Quarrying (2021). Good Practice Guide for Handling Soils in Mineral Working. https://www.quarrying.org/soils-guidance.

3.4.1 The most critical factors in avoiding compaction are to:

- work when soils are dry and friable (see **Section 3.2**)
- use low ground pressure vehicles/plant
- avoiding trafficking of soil by using designated haul routes

3.5 Ameliorating compaction

3.5.1 A degree of compaction is likely during operations trafficking on the land or handling soils during the installation. This compaction should be ameliorated at an appropriate timing and during suitable conditions.

3.5.2 Specific details of amelioration methods following each different operation are detailed below in the relevant sections.

3.6 Storing soils for re-use

3.6.1 The site should be constructed with the aim of keeping the soils in store for as short a time as possible, whilst minimising damage to the soil or site. It is acknowledged that a small amount of soil will need to be stored for the life of the solar farm.

3.6.2 As most of the land within the Order Limits will not have any soil removed, volumes of soil to be stored will be relatively small. Soil storage will fall into two main categories, short-term storage and long-term storage.

3.6.3 Soils removed during cable trenching, fencing, temporary haul road construction and temporary compound construction will be stored for the short term; no longer than the duration of the construction phase. Soils excavated during cable trenching and fencing works are likely to be stored for shortest period of time.

3.6.4 Soil removed during the construction of infrastructure, such as the substation, BESS and access tracks which will remain in situ until decommissioning of the solar farm, will require storage for the duration of the operational phase of the project.

3.6.5 Soil storage methods will normally be as specified as in the Construction Code of Practice for the Sustainable Use of Soils on Construction Sites[4].

4. Solar Arrays

4.1.1 The solar (PV) arrays will be installed across the Order Limits as per the **Works Plan [EN010159/APP/2.3]**.

4.2 Construction Methodology

Installation

4.2.1 As detailed in **Section 3**, installation of the PV arrays does not require any soil removal.

4.2.2 It is important that trafficking over the soil surface is limited to periods when the soil is suitably dry to minimise rutting. Details of soil suitability testing are set out in **Section 3.2**.

4.2.3 The PV array installation typically involves three stages:

> Marking and laying out the mounting structures framework. This requires a low ground pressure (LGP) vehicle and trailer to transport the mounting frames across the Order Limits (see an example of such equipment included in **Figure 4.1** below). Suitable vehicles would include Bobcats or tractors fitted with LGP tyres.

> Pile driving. Support poles will be knocked into the ground with a pile driver to the required depth. Typical pile drivers used in solar installations are tracked and lightweight, resulting in minimal soil damage.

Figure 4.1: Example of a LGP Pile Driver

> Construction of mounting structure. The mounting frame is constructed in situ and the panels transported to the site using a LGP vehicle and trailer. The PV modules are then bolted on.

4.2.4 The Mounting Structure upon which the PV Modules will be mounted will be pile driven or screw mounted into the ground to a maximum pile depth of 3.0 m.

4.2.5 The option to install concrete blocks known as "shoes" may also be considered, avoiding the need for driven or screw anchored installation, therefore minimising ground disturbance.

4.2.6 Provided that the ground conditions are suitable, with tyre tracks no deeper than approximately 100 mm when travelling across the land, PV array installation will not result in any structural damage or significant compaction of the soil.

Decommissioning

4.2.7 It is not possible to confirm the exact method of uninstalling the solar arrays and piles at the restoration stage of the project, as current techniques may be superseded by alternative techniques during the lifetime of the project.

4.2.8 The current method of removing piles is to use a pile driver/extractor which vibrates the piles out of the ground, allowing for a clean extraction with minimal soil disturbance.

4.3 Soil Management

4.3.1 Where it can be achieved, grass establishment prior to installation works is advantageous for construction purposes, as it helps minimise rutting caused by vehicles trafficking on the soil surface. Therefore, a grass sward will be established across as much of the land to receive solar panels as possible in advance of piling works. The decision about which locations are suitable for grass seeding prior to installation will be influenced by the timing of construction works relative to the agricultural crop harvest dates and the weather and soil conditions.

4.3.2 During installation and decommissioning works, wheel ruts should be levelled out using standard farm equipment such as discs, harrow and rollers. Horticultural scale cultivation tools may be best suited to operating between the relatively narrowly spaced rows of solar panels.

4.3.3 Amelioration of soil ruts should be undertaken once construction of solar arrays has been completed and after array removal at decommissioning and soils have dried out. This will likely be between April and October.

4.3.4 The cultivation tools will loosen soil compaction and, when used in conjunction will a roller, produce a surface suitable for seeding/re-seeding with grass when required. This will be achieved using standard tractor mounted farm grass seeding tools.

5. Infrastructure and Access Tracks

5.1.1 Infrastructure, comprising Substation and BESS compounds, Power Conversion Station (PCS) along with associated access tracks will be installed as part of the Proposed Development within the Order Limits as detailed in the **Works Plan [EN010159/APP/2.3]**.

5.2 Construction methodology

5.2.1 Specific construction techniques will vary depending on the specific requirements of each facility. However, this will usually involve the removal of soil prior to the construction of a hard surface; typically asphalt, concrete or compressed aggregate, to remain *in situ* for the duration of the project. Hard surfaces will be removed during decommissioning and soils decompacted where necessary prior to restoration to agriculture.

5.3 Soil Management

Soil stripping

5.3.1 Prior to construction of a hard surface, topsoil will be stripped and stored for the duration of the project.

5.3.2 There may be a requirement for subsoil to also be stripped prior to surfacing. These soils will be stored separately from topsoil.

5.3.3 The land within the Order Limits will be cleared of any deposited rubbish ahead of soil stripping and all collected material treated as waste and managed under the Site Waste Management Plan which forms part of the Construction Environmental Management Plan.

5.3.4 Existing utilities will be clearly marked and protected by ‘no dig’ areas.

5.3.5 Any hedges, trees and fencing that are to be removed, will be removed from the working area prior to stripping the topsoil.

5.3.6 Prior to any works, tree root protection zones will be marked out and fenced off.

5.3.7 Any vegetative growth higher than 100 mm will be cut or sprayed off with a systemic herbicide and removed from site prior to topsoil stripping. If species of invasive vegetation, such as Japanese Knotweed are encountered, they will be treated according to the particular requirements for the species encountered.

5.3.8 If any land drains are encountered, advice will be sought from a drainage specialist.

5.3.9 Typical topsoil depths within each area to be stripped will be included in the SMP produced prior to the start of the construction works. However, this will only be used as a guide and topsoil will be stripped as deep as the base of the visibly darker topsoil layer.

5.3.10 Soil stripping will only occur when the soils are as dry and friable as reasonably practicable (and below the plastic limit), or meets **Table 2.2** soil characteristics for SHU A soils. However, if handling plastic soils is unavoidable due to operational restrictions, they will be laid out in windrows and not formed into 'sealed' stockpiles until they have dried out and passed plasticity tests - as detailed in the 'Construction Code of Practice for the Sustainable Use of Soils on Construction Sites' (Defra, 2009), Section 5.4.10[4]. A suitably trained person (see **Section 3.1.**) will test the soil plasticity prior to commencing work, following the procedure detailed in **Tables 3.1, 3.2 and 3.3**.

Soil storage

5.3.11 Stripped soil will be stored in designated bunds at locations to be specified in the SMP.

5.3.12 The SMP will also include a map detailing the different soil units of land to be stripped. Topsoil and subsoil will be stored in separate bunds according to their soil unit.

5.3.13 Soil should be dry when put into bunds for storage to avoid any anaerobic activity developing in the soil. If this is not possible, storage practice should follow that outlined in Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (Defra, 2009)[4]. Topsoil will be stored in bunds no taller than 2m high and lightly formed to consolidate the surface and shed water. Any stripped subsoil will be stored in bunds up to 3m high.

5.3.14 Topsoil will be stored on topsoil and subsoil stored on subsoil i.e., the topsoil will be removed from areas to be used for subsoil storage bunds.

5.3.15 A record of all soils which are placed in store will be kept.

5.3.16 All bunds which will be in place for more than 6 months or over the winter period will be sown with a low maintenance grass seed mix at a rate of 5g/m^2.

5.3.17 All bunds will be labelled with their historic land use, volume and soil type (e.g. pasture, ***m^3; Unit 1 topsoil).

5.3.18 All soil bunds will be inspected annually in the spring to ensure that the grass cover is intact and to decide if an herbicide is required to control invasive weeds. The species present will determine the most appropriate herbicide or cutting regime.

Decommissioning

5.3.19 During the decommissioning phase, all concrete, hardstanding areas, foundations for the infrastructure and any internal tracks will be removed. Any concrete bases or asphalt will need to be broken up. This will most likely involve breaking with a pneumatic drill or back-actor bucket to crack the base, after which it can be dug up and loaded onto trailers and removed.

5.3.20 Compressed aggregate will be removed using an excavator, along with any membrane placed on the subsoil surface.

5.3.21 The cleared surface will be soil sampled in any areas at risk of having been contaminated. Samples will be collected and submitted to UKAS and MCERTS accredited laboratories for a range of commonly occurring pollutants such as metals, oils and PAHs. Results will be assessed by a land contamination specialist and any required remediation advice will be followed.

5.3.22 It is likely that the soil beneath the hard surface will require subsoiling to remove compaction. A soil scientist or suitably trained person will assess the depth and severity of compaction to inform the type and depth of subsoiling operation required.

5.3.23 Subsoiling will be undertaken using tractor mounted farm equipment, such as detailed in **Figure 5.1**, below.

Figure 5.1: Tractor mounted subsoiler

5.3.24 Subsoiling will only be undertaken when soils are dry, as plastic soils would smear and likely exacerbate the compaction.

5.3.25 At least 2 passes of the subsoiler will be made across each area, at an angle of 45 to 60 degrees to each other in order to fully break up the soil compaction to the required depth.

5.3.26 If required due to damage to an existing drainage system, new drains should be installed into the subsoil, prior to topsoil reinstatement.

5.3.27 Approximately a month prior to restoration, soil stockpiles should be strimmed, cuttings removed and remaining vegetation sprayed with a systemic herbicide as advised by a suitably qualified person.

5.3.28 As with all soil handling operations, stockpiled soils will only be handled when in a suitable condition, to be decided by a suitably trained person. This would usually be between May and October.

5.3.29 Soils will be transported to site and tipped using a dumper, with an excavator used to position the soil across the area to be restored.

5.3.30 Topsoil depth will be checked during restoration. As newly restored soils slump over time, an allowance for this will be made, establishing approximately 10-20% deeper loose topsoil than the final target depth detailed in the SMP.

5.3.31 The excavator will 'work its way backwards' from the far end of the restoration area, so as not to operate on the newly placed soil. No vehicles should traffic over restored topsoil.

5.3.32 Reinstatement of soil will be monitored by a suitably qualified person and records of operations kept, with photographic evidence.

Aftercare

5.3.33 On completion of the restoration works the soils will be in a fragile condition and all works will be geared towards stabilising the soil structure and establishing a strongly growing crop to ensure the best chance of a successful and sustainable restoration.

5.3.34 A process will be developed through which field drainage will be assessed and the types of remedial measures will be identified, against a set of criteria.

6. On Site Trenching Works

6.1.1 Trenching will be undertaken at various location across the Order Limits to enable cable laying as detailed in the **Works Plan [EN010159/APP/2.3]**.

6.2 Construction methodology

6.2.1 Trenching for cable laying is mostly undertaken using a mini-digger or trenching machine, as shown in **Figure 6.1.**

Figure 6.1: Cable trenching, showing topsoil stripped and set to one side, with subsoil placed on the other side ready for reinstatement (image courtesy of British Solar Renewables)

6.2.2 Trenches are mostly dug to a depth of 0.8 - 0.9m, where soil depth permits, but do vary depending on cable type.

6.3 Soil Management

6.3.1 Any vegetative growth higher than 100 mm will be cut or sprayed off with a systemic herbicide prior to trenching. If species of invasive vegetation, such as Japanese Knotweed are encountered, they will be treated according to the particular requirements for the species encountered.

6.3.2 Trenching operations will only occur when the soils are as dry and friable as reasonably practicable (and below the plastic limit), or meets **Table 2.2** soil characteristics for SHU A soils. However, if handling plastic soils is unavoidable due to operational restrictions, they will be laid out in windrows and not formed into 'sealed' stockpiles until they have dried out and passed plasticity tests - as detailed in the 'Construction Code of Practice for the Sustainable Use of Soils on

Construction Sites' (Defra, 2009), Section 5.4.10[4]. A suitably trained person (see **Section 3.1.4**) will test the soil plasticity prior to commencing work, following the procedure detailed in **Tables 3.1, 3.2 and 3.3**.

6.3.3 Topsoil with be removed by excavating soils as deep as the base of the visibly darker topsoil layer and placed to one side of the trench. If it is not possible to visually identify the change from topsoil to subsoil, soil will be removed to the depth of topsoil detailed for the location in the SMP.

6.3.4 Following topsoil removal, subsoil is then removed down to the required trench depth and placed on the other side of the trench to the topsoil.

6.3.5 If a clear colour change is identified within the subsoil, the upper and lower subsoils should be stored side by side so that they can be replaced in the 'same order' as excavated.

6.3.6 The location of any land drains damaged during the trenching operation will be marked and a log kept. Once the cable has been laid, any damaged land drains will be repaired to maintain the integrity of the drainage system. Due to the narrowness of the cabling trenches, there is no need to support repair joints with lintels, but solid/rigid pipe will be used to repair the drain which extends a minimum of 0.5 m onto undisturbed soil either side of the trench.

6.3.7 Once the cable has been placed, subsoils are returned to the trench, with lower subsoil placed below upper subsoil if stripped and stored separately. Subsoils will be lightly consolidated with the excavator bucket, using increased force if particularly blocky in order to reduce the amount of air gaps.

6.3.8 If it is not possible to consolidate the subsoil such that there is space for the topsoil to be restored, the topsoil will be left alongside the trench and only replaced once the subsoil has naturally settled.

6.3.9 The topsoil will be replaced with only minimal consolidation, ideally leaving a linear mound approximately 50 to 100 mm high along the cable route which will settle over time.

6.3.10 Cable trenches are narrow (mostly <0.5 m) and following soil replacement it is not anticipated that grass seeding will be required. However, seed will be spread by hand over any areas requiring re-seeding.

Decommissioning

6.3.11 All underground cabling up to a depth of 0.9m will be removed and cable ends sealed, it is assumed that all the below ground cables deeper than 0.9m will be left in situ. If industry standards change at the time of decommissioing this approach can be reconsidered to align with best practice.

7. Fencing

7.1.1 Fencing will be installed around the perimeters of the Solar PV fields, PCS, BESS and Substation compounds.

7.1.2 The fields encompassing the Solar PV modules and supporting infrastructure will likely be fenced using 'deer-proof fencing', which is formed of wooden or metal posts and wire mesh.

7.1.3 Palisade fencing would be installed around the perimeter of the PCS, BESS and Substation compounds and would be made of steel rails attached to horizontal-running rails connected to vertical steel joints

7.1.4 Pole mounted closed-circuit television (CCTV) systems will also be installed around the perimeter of the Solar PV fields, PCS, BESS and Substation compounds.

7.2 Construction methodology

Installation

7.2.1 Fencing is likely to comprise of steel mesh attached to wooden posts which will be knocked into the ground using a post knocker mounted on a tractor equipped with low ground pressure tyres as shown in **Figure 7.1**. Large corner and gate posts will typically be installed using a tractor mounted auger type post hole digger as shown in **Figure 7.2**.

Figure 7.1: Post knocker

Figure 7.2: Post hole digger

7.2.2 Palisade fencing is installed using one of two main methods.

7.2.3 Firstly, post holes will be dug using the same technique as detailed in **Section 7.2.1**. A 50-100 mm layer of gravel will then be compacted in the base of the hole by hand. This will be brought to site using a tractor and trailer or small dumper. Once the post has been positioned, the holes will be filled with concrete. This will either be a bagged dry mix concrete poured into the hole by hand and then watered, or wet mixed on site using a standard sized cement mixer, placed on a wooden board and concrete placed in a mortar tub to prevent soil contamination. Washings and left over concrete and cement will be disposed of safely off site. Horizontal rails and vertical pales will be installed by hand once the concrete has set.

7.2.4 Secondly, a baseplate can be bolted to a concrete slab and the metail posts welded to the baseplate.

7.2.5 CCTV poles will be installed using the same methods detailed in **Section 7.2.1**.

Decommissioning

7.2.6 At the end of life, all solar infrastructure, fencing and CCTV equipment and concrete will be removed at decommissioning, using tractor mounted equipment and excavators.

7.3 Soil Management

7.3.1 Fencing can be installed and removed at any time that conditions allow vehicles to traverse the land without creating ruts deeper than 100 mm.

7.3.2 Any soil rutting resulting from fencing works will be made good using the methods detailed in **Section 4.3**.

8. Temporary Access Tracks and Construction Compounds

8.1.1 The proposed location of temporary access tracks and Construction Compounds are detailed on the **Works Plan [EN010159/APP/2.3]**.

8.1.2 These areas are intended for short-term activity only and will be removed and land restored by the end of the construction phase of the project.

8.2 Construction Methodology

8.2.1 Temporary compounds and access tracks will usually be constructed of compressed aggregate on top of a permeable membrane, which is used to prevent mixing of aggregate and the soil, as shown in **Figure 8.1**.

Figure 8.1: Temporary access *track*

8.2.2 Topsoils will be stripped to the required depth using an excavator.

8.2.3 Aggregate will be transported to the site and tipped by dumper and spread over the membrane using an excavator. This will then be rolled level using a vibration roller.

8.2.4 An excavator will remove the aggregate at the end of temporary use and farm cultivation equipment used to loosen the soil surface and alleviate compaction prior to topsoil placing.

8.2.5 Topsoil will be reinstated using an excavator.

8.3 Soil Management

8.3.1 Prior to stoning, topsoil will be stripped and stored in a low bund adjacent to the track or compound.

8.3.2 As soil will be stored in a linear bund alongside temporary access tracks, there will be no requirement to separately stockpile soils belonging to different soil units. Soil will be replaced in its original location.

8.3.3 If the SMP details two different soil types within a temporary compound area, these will be stripped and stored adjacent to the compound in separate labelled bunds and restored to their original location.

8.3.4 The areas will be cleared of any deposited rubbish ahead of soil stripping and all collected material treated as waste and managed under the Construction Waste Management Plan which forms part of the Construction Environment Management Plan.

8.3.5 Any hedges, trees and fencing that are to be removed, will be removed from the working area prior to stripping the topsoil.

8.3.6 Prior to any works, tree root protection zones will be marked out and fenced off.

8.3.7 Any vegetative growth higher than 100 mm will be cut or sprayed off with a systemic herbicide and removed from site prior to topsoil stripping. If species of invasive vegetation, such as Japanese Knotweed are encountered, they will be treated according to the particular requirements for the species encountered.

8.3.8 Typical topsoil depths within each area to be stripped will be included in the detailed Soil Management Plan (SMP). However, these data will only be used as a guide and topsoil will be stripped as deep as the base of the visibly darker topsoil layer.

8.3.9 Soil stripping will only occur when the soils are as dry and friable as reasonably practicable (and below the plastic limit), or meets **Table 2.2** soil characteristics for SHU A soils. However, if handling plastic soils is unavoidable due to operational restrictions, they will be laid out in windrows and not formed into 'sealed' stockpiles until they have dried out and passed plasticity tests - as detailed in the **'**Construction Code of Practice for the Sustainable Use of Soils on Construction Sites' (Defra, 2009), Section 5.4.10[4]. A suitably trained person (see **Section 3.1.4**) will test the soil plasticity prior to commencing work, following the procedure detailed in **Tables 3.1, 3.2 and 3.3**.

8.3.10 If it is not possible to strip topsoils when they are below the plastic limit or suitably dry by visual assessment, they will be loose tipped into windrows with the surface lightly consolidated to shed water so that once they have dried out sufficiently the topsoils can be transferred to bunds for longer term storage.

8.3.11 All bunds which will be in place for more than 6 months or over the winter period will be sown with a low maintenance grass seed mix at a rate of $5g/m^2$.

8.3.12 All soil bunds will be inspected in the spring to ensure that the grass cover is intact and to decide if an herbicide is required to control invasive weeds. The species present will determine the most appropriate herbicide or cutting regime.

8.3.13 At the end of the temporary use period, compressed aggregate will be removed using an excavator, along with any membrane placed on the subsoil surface.

8.3.14 Aggregate removal will be undertaken with the excavator working on the aggregate and not the newly exposed soil surface, to minimise soil compaction.

8.3.15 The cleared surface will be soil sampled in any areas at risk of having been contaminated. Samples will be collected and submitted to UKAS and MCERTS accredited laboratories for a range of commonly occurring pollutants such as metals, oils and PAHs. Results will be assessed by a land contamination expert and any required remediation advise will be followed.

8.3.16 It is likely that the soil which was beneath the stoned surface will require subsoiling to remove compaction. A qualified soil scientist (and member of BSSS) will assess the depth and severity of compaction to inform the type and depth of subsoiling operation required.

8.3.17 Subsoiling will be undertaken using tractor mounted farm equipment, such as detailed in **Figure 5.1**

8.3.18 Subsoiling will only occur when the soils are as dry and friable as reasonably practicable (and below the plastic limit) as plastic soils may smear and exacerbate the compaction. However, if handling plastic soils is unavoidable due to operational restrictions, they will be laid out in windrows and not formed into ‘sealed’ stockpiles until they have dried out and passed plasticity tests - as detailed in the ‘Construction Code of Practice for the Sustainable Use of Soils on Construction Sites’ (Defra, 2009), Section 5.4.10[4]. A suitably trained person (see **Section 3.1.4**) will test the soil plasticity prior to commencing work, following the procedure detailed in **Tables 3.1, 3.2 and 3.3**.

8.3.19 At least 2 passes of the subsoiler will be made across each compound area, at an angle of 45 to 60 degrees to each other in order to fully break up the soil to the required depth.

8.3.20 Several passes of the subsoiler will be made up along the length of the narrow access tracks, as there will be insufficient space to make a second pass at an angle to the first. Prior to topsoil placement, the soil should be inspected by a suitably trained person to ensure that compaction has been successfully removed.

8.3.21 If stockpiles are densely vegetated, approximately a month prior to restoration, soil stockpiles should be strimmed, cuttings removed and remaining vegetation sprayed with a systemic herbicide.

8.3.22 As with all soil handling operations, stockpiled soils will only be handled when in a suitable condition, to be decided by a suitably trained person. This would usually be between May and October.

8.3.23 Soils will be placed and spread across the area to be restored using an excavator, which will 'work its way backwards' from the far end of the restoration area, so as not to track over the newly placed soil. No vehicles should traffic over restored topsoil.

8.3.24 Topsoil depth will be checked during restoration. As newly restored soils slump over time, an allowance for this will be made, establishing approximately 10-20% deeper loose topsoil than the final target depth detailed in the SMP.

8.3.25 Reinstatement of soil will be monitored by a suitably trained qualified person (see **Section 3.1.4**) and records of operations kept, with photographic evidence.

8.3.26 On completion of the restoration works the soils will be in a fragile condition. A strongly growing crop will be established to help stabilise the soil structure and ensure the best chance of a successful and sustainable restoration.

9. Direct Drilling Under The River Trent

9.1.1 Cables will be direct drilled under the River Trent, between the main infrastructure within the Order Limits, as illustrated in the **Works Plan [EN010159/APP/2.3]**.

9.2 Construction Methodology

9.2.1 Trenchless crossing, such as Horizontal Direct Drilling (HDD), will initially involve drlling a pilot hole under the river along a predetermined route. The equipment will then enlarges the pilot hole. A typical HDD rig is shown in **Figure 9.1**.

9.2.2 During the drilling process, the hole will be circulated with a water and mud lubricating mixture. The is normally made up of 95% water and 5% bentonite, which is a non-toxic natural substance.

9.2.3 Finally, the cable is pulled through the enlarged hole.

Figure 8. Example of a Horizontal Direct Drilling (HDD) rig.

9.3 Soil Management

9.3.1 Direct drilling involves the digging of a temporary pit at either end of the route using an excavator. The size and depth of the depth will be dependent on the specific equipment used.

9.3.2 Any vegetative growth higher than 100mm over the pit locations will be cut or sprayed off with a systemic herbicide prior to excavation. If species of invasive vegetation, such as Japanese Knotweed are encountered, they will be treated according to the particular requirements for the species encountered.

9.3.3 Excavation will only occur when the soils are as dry and friable as reasonably practicable (and below the plastic limit), or meets **Table 2.2** soil characteristics for SHU A soils. However, if handling plastic soils is unavoidable due to operational restrictions, they will be laid out in windrows and not formed into 'sealed' stockpiles until they have dried out and passed plasticity tests - as detailed in the **'**Construction Code of Practice for the Sustainable Use of Soils on Construction Sites' (Defra, 2009), Section 5.4.10[4]. A suitably trained person (see **Section 3.1.4**) will test the soil plasticity prior to commencing work, following the procedure detailed in **Tables 3.1, 3.2 and 3.3**.

9.3.4 Topsoil with be removed by excavating soils as deep as the base of the visibly darker topsoil layer and placed to the side of the pit. If it is not possible to visually identify the change from topsoil to subsoil, soil will be removed to the depth of topsoil detailed for the location in the SMP.

9.3.5 Following topsoil removal, subsoil will then removed down to the required depth and placed alongside the pit in a seperate stockpile to the subsoil.

9.3.6 If a clear colour change is identified within the subsoil, the upper and lower subsoils should be stored side by side so that they can be replaced in the 'same order' as excavated.

9.3.7 Any land drains damaged during the trenching operation will be marked and a log kept. Once the cable has been laid, any damaged land drains will be repaired to maintain the integrity of the drainage system prior to the pit being infilled.

9.3.8 Any land drain repair will be supported by a lintel in order to retain it's integrity should the infilled soil below slump. The lintels will extend a minimum of 0.5m onto undisturbed soil either side of the pit.

9.3.9 Once the drilling works have been completed the subsoils will be returned to the trench, with lower subsoil placed below upper subsoil if stripped and stored separately. Subsoils will be lightly consolidated with the excavator bucket, using increased force if particularly blocky in order to reduce the amount of air gaps.

9.3.10 If it is not possible to consolidate the subsoil such that there is space for the topsoil to be restored, the topsoil will be left alongside the pit and only replaced once the subsoil has naturally settled.

9.3.11 The topsoil will be replaced with only minimal consolidation, ideally leaving a raised surface approximately 50 to 100mm higher above the pit location than the surrounding land which will settle over time.

9.3.12 Grass seed will be spread by hand over any areas requiring re-seeding.

10. Monitoring and Aftercare

10.1.1 A soil aftercare programme should be developed for 1 to 5 years after decommissioning to monitor the reinstatement of the soils via a landscape maintenance programme, where long-term storage has occurred (i.e. infrastructure and access tracks). This is to ensure the ALC grade and soil properties are both restored to the same status as prior to the scheme.

10.1.2 Soil conditions will be monitored by an appropriately trained person (see **Section 3.1.4**) prior to soil handling operations, as detailed in **Section 3.2** Soil plasticity testing and soil moisture assessment for SHU 1 soils will be undertaken by an appropriately trained person following the procedure detailed in **Tables 3.1, 3.2 and 3.3**. Records of plasticity test results and soil moisture assessments should be taken and retained.

10.1.3 The grassland under the solar PV arrays will be managed by a cutting regime in line with the **Outline Landscape and Ecological Management Plan [EN010159/APP/7.7]** and **Outline Construction Environmental Management Plan [EN010159/APP/7.4]**.

10.1.4 No significant adverse effects on land or soil are anticipated during the operation phase, so there is no requirement for annual monitoring or reviews.

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