RWE Innogy UK

Triton Knoll Offshore Wind Farm Limited
Triton Knoll Electrical System

Outline Soil Management Plan

April 2015

Document Reference: 8.7.5

Appendix Five to the Outline Code of Construction Practice

APFP Regulation 5(2)(q)

RWE
The energy to lead

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Date of Approval	April 2015
Revision	A

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1 INTRODUCTION

Overview

1.1 Triton Knoll Offshore Wind Farm Limited (TKOWFL) is submitting an application to the Planning Inspectorate (PINS), on behalf of the Secretary of State for Energy and Climate Change, for a Development Consent Order (DCO) for the Triton Knoll Electrical System (the proposed development) under the Planning Act 2008. The Triton Knoll Electrical System (TKES) would connect the consented Triton Knoll Offshore Wind Farm (TKOWF) offshore array to the existing National Grid substation at Bicker Fen, Boston.

1.2 The TKOWF is located approximately 33km (20.5 miles) east of the Lincolnshire coast. The Secretary of State granted a DCO for the TKOWF offshore array on 12th July 2013.

1.3 All terms, acronyms and abbreviations used within this Outline Soil Management Plan (SMP) are explained on first use, and / or set out in full within the Glossary appearing in the Environmental Statement - Application Document 6.2.

The Applicant

1.4 TKOWFL is a joint venture between two leading international energy companies; RWE Innogy UK Limited and Statkraft UK Limited. RWE Innogy UK is the UK subsidiary of the German renewable energy company RWE Innogy (part of RWE AG), a company with a strong and diversified position in renewable energy development. Statkraft UK Limited is the UK subsidiary of Statkraft Group, Europe's largest generator of renewable energy and the leading power company in Norway.

Project Overview

1.5 The components of the TKES, which are needed to connect TKOWF to the National Grid, comprise:

- Up to six offshore export cable circuits – to transmit the high voltage alternating current (HVAC) electricity from the offshore substations to the transition joint bays at the landfall;
- Landfall infrastructure just north of Anderby Creek, Lincolnshire – including transition joint bays which house the connection between the offshore cables and the onshore cables;

- Up to six onshore export cable circuits (up to 220 kV) – to transmit the HVAC electricity from the transition joint bays at the landfall to the proposed Triton Knoll Substation via the Intermediate Electrical Compound;
- An Intermediate Electrical Compound near to Orby Marsh – to provide compensation for reactive power to allow more efficient transmission to minimise losses;
- A substation near the existing Bicker Fen National Grid Substation – to step-up the voltage to the voltage used by the National Grid and provide additional compensation for reactive power built up over the export transmission;
- Up to four onshore export cable circuits (400 kV) – to transmit the electricity from the proposed Triton Knoll Substation to the existing National Grid substation at Bicker Fen, Boston; and
- Unlicensed Works within the existing National Grid substation compound comprising up to two bays each accommodating electrical equipment.

1.6 The Order Limits for the Triton Knoll Electrical System are shown on the Order Limits Plans – Application Document 2.1.

1.7 Any works at the National Grid substation near Bicker Fen required to connect the power produced by TKOWF will be consented, constructed and operated by National Grid (the 'Enabling Works'). National Grid has not yet completed the engineering studies necessary to define the Enabling Works required at their existing Bicker Fen substation. However, it is anticipated that these works will only involve modifications to the existing infrastructure within the existing site boundary.

Purpose of this Outline Soil Management Pan

1.8 This Outline SMP (Application Document 8.7.5) forms part of the application for a DCO for the TKES . Its purpose is to provide details of mitigation measures and best practice handling techniques to safeguard soil resources by ensuring their protection, conservation and appropriate reinstatement.

1.9 Requirement 14 of the draft DCO requires the CoCP and its supporting appendices to be submitted for each stage of the works permitted by the Order. This Outline SMP will therefore be adapted and submitted separately for each stage of works as part of the CoCP for that stage. For certain stages of works it may be the case that a particular environmental plan is not required for that specific stage of works, and in those cases the undertaker

will agree with the relevant planning authority which of the appendices to the CoCP are (not) required for such works. It may therefore be that this Outline SMP is not provided for a particular stage of works.

Scope of this Outline Soil Management Plan

1.10 This Outline SMP relates to the onshore elements of the TKES for the proposed TKOWF, landward of Mean Low Water (MLW). This document does not relate to offshore works seaward of MLW, or any works above MLW that are principally marine activities.

2 BASELINE CONDITIONS

Overview of Soils Types and Distribution

2.1 In terms of soils, the Electrical System passes through a series of three key soil types (Cranfield University: NSRI, 2012):

- Loamy and clayey soils of coastal flats with naturally high groundwater;
- Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils; and
- Loamy and sandy soils with naturally high groundwater and a peaty surface.

2.2 From the landfall to the Intermediate Electrical Compound and beyond to Thorpe Fendykes the land is generally underlain by loamy and clayey soils that are naturally wet. As the cable route passes from Thorpe Fendykes to south of Stickney around East Fen Lane, the land is generally underlain by loamy and sandy soils with naturally high groundwater and a peaty surface. The remainder of the cable route passes through mainly loamy and clayey soils that are naturally wet, with the exception of a small area of slightly acidic loamy and clayey soils in the vicinity of Northlands. Table 2-1 provides a brief description of the characteristics of the main soil types.

Table 2-1: Soils types found within the vicinity of the Electrical System

Soil Type 21	**Loamy and clayey soils of coastal flats with naturally high groundwater**
Texture	Loamy and clayey
Drainage	Naturally wet
Fertility	Lime-rich to moderate
General cropping	Lighter soils support a wide range of crops and are highly productive as they contain much available water and are stoneless and flat. Heavier soils are less easily worked and favour grass.
Soil Type 18	**Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils**
Texture	Loamy and clayey

Drainage	Impeded drainage
Fertility	Moderate
General cropping	Mostly suited to grass production for dairying or beef; some cereal production often for feed. Timeliness of stocking and fieldwork is important, and wet ground conditions should be avoided at the beginning and end of the growing season to avoid damage to soil structure. Land is tile drained and periodic moling or subsoiling will assist drainage.
Soil Type 23	**Loamy and sandy soils with naturally high groundwater and a peaty surface**
Texture	Peaty
Drainage	Naturally wet
Fertility	Low to high
General cropping	Cereals, roots, potatoes and field vegetables provided groundwater is controlled. Ease of working and winter harvesting, which can be damaging to structure, dependent on texture and drainage of subsoil. Irrigation needed on lighter soils.

3 PRE-CONSTRUCTION SURVEYS

Role of the Agricultural Liaison Officer

3.1 Prior to construction, a qualified Agricultural Liaison Officer (ALO) will be employed to ensure that information on existing agricultural management and soil/land conditions is obtained, recorded and verified by way of a detailed pre-construction condition survey. Soil sampling will be undertaken along the cable route to prevent the translocation of soil diseases etc i.e. arable land soil/blights.

3.2 As part of the condition survey, and in addition to addressing matters relating to soils and other factors including existing crop regimes, the position and condition of field boundaries, existing drainage of the soil, existing access arrangements and private water supplies (as far as reasonable investigations allow) the type of agriculture taking place, the yield of crops and the quality of grazing land will also be recorded. Liaison with affected landowners and tenants will be undertaken to identify potential constraints and barriers to construction and identify the provision of any temporary drainage requirements and/or diversions.

3.3 Such aspects will be recorded and entered into a pre-entry record of condition for the affected landowner. The commencement of construction will reflect ALO agreements made with affected parties to minimise disruption, where possible, to existing farming regimes and timings of activities (e.g. cropping).

3.4 The ALO will undertake site inspections during construction to monitor working practices and ensure landowners' and farmers' reasonable requirements are fulfilled. The ALO will also retain a function with regards to agreeing reinstatement measures following completion of the works.

Thermal resistivity survey

3.5 Prior to construction, a thermal resistivity survey will be undertaken along the cable route to determine surface temperature and soil thermal resistivity.

3.6 The findings of the survey will be used by the TKOWFL engineering team to ensure that the soil that will surround the cable has appropriate physical properties. Any areas where alternative fill material may be necessary will be identified at this stage.

4 GENERAL CONSTRUCTION METHODOLOGY

Cable route

Overview

4.1 Up to six onshore cable circuits will be required to transmit the power from the transition joint bays at the landfall to the Substation via the Intermediate Electrical Compound. The voltage will be determined by detailed studies, but is likely to be between 132 kV to 220 kV. Depending on the final design of the Substation, up to four export circuits will be required to transmit the power from the Substation to the grid interface point at the National Grid substation at Bicker Fen. The voltage would be 400 kV as required by National Grid.

4.2 The cable route will be constructed in stages. Up to six individual trenches for the 220 kV cable, and up to four individual trenches for the 400 kV cable will be excavated, the cable ducts will be laid, the trenches backfilled and the reinstatement process commenced. At regular intervals (approximately 600 m – 1,000 m) along the route, cable joint pits will be installed to enable the cable installation and connection process.

Construction & installation

4.3 It is expected the sequence of works for cable installation will be as follows:

- Site investigation;
- Archaeological investigation and evaluation;
- Preconstruction ecological surveys;
- Enabling works (access, earthworks, utility diversions, archaeological, ecological mitigation works as necessary);
- Site establishment (offices, welfare facilities, security and fencing, wheel wash, lighting, signage);
- Installation of temporary site drainage;
- Topsoil removal (to edge of working area);
- Haul road installation in required sections of the route;
- Trenchless duct installation below large obstacles (major roads, railways, rivers);
- Trench excavation;
- Duct installation;

- Trench backfilling;
- Existing field drainage repairs (where disruption occurs);
- Jointing pit installation;
- Cable installation (pulled through ducts from each joint pit);
- Cable jointing;
- Cable testing ;
- Remove haul road;
- Jointing pit ground re-instatement;
- Replacement of topsoil;
- Landscaping and hedge re-planting; and
- Demobilisation and fence removal (farming practices resume).

Timescales & seasonal timing considerations

4.4 The duration of the excavation, cable installation and backfilling works will depend on localised ground conditions e.g. rock content, dewatering content. For a cable route of this length (circa 60 km including the 400 kV section) cable installation is expected to take up to 42 months. Work units will move along the length of the cable route so that at any single location there will be times when no work is being carried out.

4.5 The majority of the work would be carried out across 12-hour day shifts. However, trenchless operations could take place across back-to-back 24 hour periods. Illumination would be required during night-time and in low-light conditions, and will be controlled by the Outline Artificial Light Emissions Plan (Application Document 8.7.6).

Working width

4.6 The working width will generally be no wider than 60 m, with the six individual trenches placed at a minimum of 3.5 m centres within the cable easement (for 220 kV cable), and the four individual trenches placed at a minimum of 5 m centres within the cable easement (for 400 kV cable). The nominal width of each cable trench will be 0.5 m – 2 m.

4.7 The working width will incorporate adequate space for the storage of excavated material, generally comprising a subsoil storage area and a topsoil storage area. For the majority of the cable route, one temporary haul road (6.5 m wide) will be formed to allow the safe passage of construction personnel and machinery within the working width. Up to two haul roads will

be formed for the cable route section between the Intermediate Electrical Compound and the A158, to take extra traffic associated with the construction of the Intermediate Electrical Compound.

Topsoil stripping

4.8 Once the working width has been cleared of vegetation, existing topsoil will be stripped (with the exception of an area to be used for topsoil storage). The precise method of stripping and the depth to which the soil will be stripped will be determined during the detailed design phase. The detailed design stage will include geotechnical surveys to be undertaken along the cable route; the findings of which will determine the depth to subsoil.

4.9 Machinery with low ground pressure will be used to minimise soil compaction where the soil conditions indicate that compaction is possible.

4.10 Stripped topsoil will be stored to the side/s of the working width in a manner that provides sufficient separation from subsoil and vehicles. Typically, this will be stored as an earth bund of a maximum height of 2 m to avoid compaction from the weight of the soil. Storage time will be kept to the practicable minimum to prevent the soil deteriorating in quality. Topsoil will be stored on a section of working width that is not stripped. Topsoil stripped from different fields will be stored separately, as will soil from hedgerow banks or woodland strips, to reduce the potential for crop contamination during reinstatement.

Haul Roads

4.11 A temporary haul road (6.5 m wide) will be constructed within the working width. Is it assumed that there will be a requirement to import aggregates to create a stable surface for construction traffic movements. Other options such as bog-matting and geotextiles will also be considered.

Installation and backfilling

4.12 Following trench excavation, a thin layer of stabilised cement bound sand (typically 75 mm to 100 mm) will be packed around the ducts in order to aid heat dissipation. Subsoil and topsoil previously removed will then be backfilled.

4.13 Generally, any surplus soil material from trench excavation will be spread and compacted across the working width prior to topsoil reinstatement on a field-by-field basis, provided this will not impede achievement of restoration objectives, and provided the materials are compatible, in consultation with the landowner.

4.14 Offsite disposal of surplus soil material shall only be considered where use on-site is not feasible. The landowner/occupier will be consulted before any off-site disposal is planned. In such instances disposal will be undertaken in accordance with the Waste Management Regulations.

Reinstatement

4.15 Disturbed ground will be reinstated with the stored topsoil and subsoil following trenching. If necessary, the subsoil will be ripped prior to topsoil placement if compaction has occurred. Topsoil will be spread in such a way as to ensure that it does not become compacted.

Intermediate Electrical Compound

4.16 Construction of the Intermediate Electrical Compound will temporarily affect approximately 8.4 ha of agricultural land. Of this, up to 6.2 ha will be required to accommodate the permanent footprint of the Intermediate Electrical Compound (Intermediate Electrical Compound Accommodating all the Above-Ground Electrical Infrastructure, landscaping areas and Indicative Access Road). Construction of the Intermediate Electrical Compound will be facilitated via a double width (12 m) haul road within the cable corridor from the A158 north to the Intermediate Electrical Compound. A 6 m access track from Marsh Lane will be maintained for operational purposes.

Construction & installation

4.17 It is expected the sequence of works for construction of the Intermediate Electrical Compound will be as follows:

- Site investigation
- Site access and set-up
- Site enabling works and diversions
- Strip topsoil
- Bulk earthworks (end of enabling works)
- Underground site utilities
- Building foundations
- Equipment pads
- Install heavy equipment
- Building superstructure
- Gantries

- Busbar connections

Timescales

4.18 Construction of the Intermediate Electrical Compound is expected to comprise up to 46 months construction work over a 54 month period.

Topsoil stripping and earthworks

4.19 Once the Intermediate Electrical Compound has been cleared of vegetation, existing topsoil will be stripped. Stripped topsoil will be stored within the temporary compound.

Reinstatement

4.20 Stripped topsoil will be re-used in landscaping and excavated material will be used in landscaping screening bunds where possible.

Substation

4.21 Construction of the Substation will temporarily affect approximately 44.8 ha of agricultural land. Of this, up to 23.9 ha will be required to accommodate land associated with the Substation (Substation Compound Accommodating all the Above-Ground Electrical Infrastructure, indicative landscaping and Indicative and Permanent Access Road). A new access road (approx 5 km in length) will be required from the A17 to the Substation site. This will be a tarmacadam road constructed on a stone foundation. The road will be used as the permanent road to the Substation. In addition, a temporary road of up to 6 m width will be laid adjacent to the path of the permanent road and will be formed of stone; this will be removed once the permanent road has been completed and will provide temporary access to the Substation site during the early stages of construction.

Construction & installation

4.22 Construction of the new access roads will be required for site access before construction of the Substation commences. It is expected the sequence of works for construction of the Substation will be as follows:

- Site investigation
- Site access and set-up
- Site enabling works and diversions
- Strip topsoil

- Bulk earthworks (end of enabling works)
- Underground site utilities
- Building foundations
- Equipment pads
- Install heavy equipment
- Building superstructure
- Gantries
- Busbar connections

Timescales

4.23 Construction of the Substation is expected to comprise up to 65 months construction work over a 71 month period.

Topsoil stripping and earthworks

4.24 Once the Substation compound has been cleared of vegetation, existing topsoil will be stripped. Stripped topsoil will be stored within the temporary Substation compounds.

Reinstatement

4.25 Given the volume of soil being stripped from the Substation compound area, there may be a requirement to remove soil off-site. Where possible, stripped topsoil will be re-used in landscaping and excavated material will be used in landscaping screening bunds.

Unlicensed Works at Bicker Fen Substation

4.26 The Unlicensed Works will take place entirely within the current hard standing footprint of the existing NGET Bicker Fen Substation.

5 SOIL MANAGEMENT

General

5.1 All soil handling, placing, compaction and management will be undertaken in accordance with best practice (DEFRA, 2009). Mitigation measures will comprise the following:

- Topsoil from areas currently in agricultural use to be stripped before the start of general construction works, with priority focussed on those areas of highest grade Best and Most Versatile (BMW) land;
- Soils shall be categorised on the basis of their origin, and stockpiled/stored accordingly;
- Transportation of soils to be kept to the absolute minimum to reduce the risk of contamination between fields;
- Soils suitable for reuse as part of wider mitigation (e.g. planting areas) to be reused in a broadly similar location to their origin, and stored for the shortest amount of time permissible; and
- Any surplus soils to be disposed of in an appropriate manner off-site.

Construction Mitigation

5.2 Before commencing work on site, where soils are to be disturbed, the Contractor will be required to ensure that the construction plant being proposed is appropriate to the size of the site, the volume of soil and haul distances. The selection of appropriate equipment and work practices is important as mishandling of soil can have an adverse effect on its fertility, permeability, ecological diversity, and the performance and visual quality of vegetated areas. Mishandling can also increase the risk of flooding and off-site discharges. Multiple handling of soil materials will be minimised.

Drainage

5.3 Existing land drains, where encountered during construction, will be appropriately marked. Temporary drainage will be installed within the working width to intercept existing field drains and ditches in order to maintain the integrity of the existing field-drainage system. Such measures will also assist in reducing the potential for wet areas to form during the works, with a consequential impact on soil structure and fertility. Where necessary, existing land drains will be replaced to ensure continued agricultural use.

5.4 Particular care will be taken to ensure that the existing land drainage regime is not compromised as a result of construction. Land drainage systems will be maintained during construction and reinstated on completion. Temporary cut-off drains will be installed parallel to the trench-line, before the start of construction, to intercept soil and groundwater before it reaches the trench.

Compaction

5.5 Plant and traffic movements will be confined to designated routes to minimise the potential for soil disturbance, compaction and indirect contamination. Tracked equipment will be used wherever possible to reduce compaction.

Stripping

Topsoil

5.6 Topsoil stripping will be undertaken along the working width for the cable route and at the Intermediate Electrical Compound and Substation sites. Stripping will generally be undertaken by an excavator positioned on the surface of the topsoil, and to the maximum topsoil depth without disturbing or removing the subsoil.

Subsoil

5.7 Following the topsoil strip, subsoil will be excavated to the required depth from the trenches. Stripping will be undertaken by an excavator positioned on the surface of the subsoil.

Storage

Locating soil stores

5.8 The stripped topsoil and excavation subsoil will be stored within the working width. The ground where the soil stores will be placed will be free from vegetation and waste, and positioned away from tree crowns, watercourses and ditches. To ensure soil stores are located away from runoff, cut off ditches will be used to divert water to a suitable drainage system.

Timing of soil storage

5.9 Effective programming will ensure soil is stored for the minimum time possible. Where soil is to be stored for over 6 months it will be covered to minimise erosion or allowed to re-vegetate naturally to minimise soil run-off.

Formation of soil stores

5.10 Topsoil and subsoil will be stored separately and once stored, appropriately demarcated with signage to clearly identify the type of soil contained within each store.

Reinstatement

5.11 Following installation of the cable, all areas of disturbed ground will be restored to their original levels and profiles using the stored subsoil followed by the topsoil.

5.12 Subsoils will be placed and 'naturally' consolidated (to the same as the surroundings) within the trench excavations and in reverse order to its removal. Where there is excess subsoil within an area, soils will be spread over the working width and in agreement with the landowner. Agricultural fields will be restored to their previous condition. Topsoil will be prepared and seeded using an appropriate seed mix or returned to arable cultivation.

6 REFERENCES

- Cranfield University: National Soil Resources Institute (2012), available from: http://www.landis.org.uk/soilscapes/
- Department for Environment, Food and Rural Affairs DEFRA (2009), 'Construction Code of Practice for the Sustainable Use of Soils on Construction Sites'.
- Ministry of Agriculture, Fisheries and Food (MAFF) (2000), 'Good Practice Guide for Handling Soils'.