MORAY EAST
OFFSHORE WINDFARM

Development Layout and Specification Plan

Moray East Offshore Wind Farm and Associated Offshore Transmission Infrastructure

March 2019

Moray Offshore Windfarm (East) Limited

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Table of Contents

List of Figures

List of Tables

List of Abbreviations

AC	Alternating Current
AEZ	Archaeological Exclusion Zones
BOWL	Beatrice Offshore Windfarm Limited
CaP	Cable Plan
CFMS	Commercial Fisheries Mitigation Strategy
CMS	Construction Method Statement
CoS	Chamber of Shipping
DS	Design Statement
DSLP	Development Specification and Layout Plan
EDA	Eastern Development Area
EMP	Environmental Management Plan
ES	Environmental Statement
GIS	Geographic Information System
HDD	Horizontal Direction Drill(ing) (ed)
HAT	Highest Astronomical Tide
JNCC	Joint Nature Conservation Committee
LAT	Lowest Astronomical Tide
LMP	Lighting and Marking Plan
MARP	Marine Archaeology Reporting Protocol
MCA	Maritime and Coastguard Agency
MCC	Marine Coordination Centre
Moray East	Moray Offshore Windfarm (East) Limited
MORL	Moray Offshore Renewables Limited
MSL	Mean Sea Level
MW	Megawatt
NLB	National Lighthouse Board
OfTI	Offshore Transmission Infrastructure
OSP	Offshore Substation Platform
RYA	Royal Yachting Association
SAR	Search and Rescue.
SFF	Scottish Fishermen's Federation
SHE-T	Scottish Hydro Electric Transmission
SNH	Scottish Natural Heritage
SSSI	Site of Special Scientific Interest
TI	Transmission Infrastructure
WGS84	World Geodetic System 1984

WSI	Written Scheme of Investigation
WTG	Wind Turbine Generator

Definitions

The following definitions have been used throughout this document with respect to the company, the consented wind farms and how these definitions have changed since submission of the Moray East Environmental Statement (ES) in 2012 and the Modified Transmission Infrastructure ES in 2014.

- **Moray Offshore Windfarm (East) Limited (formerly known as Moray Offshore Renewables Limited)** – the legal entity submitting this Development Specification and Layout Plan (DSLP);
- **Moray East Offshore Wind Farm** – the wind farm to be developed in the Moray East site (also referred as the Wind Farm);
- **The Moray East site** – the area in which the Moray East Offshore Wind Farm will be located. Section 36 Consents and associated Marine Licences to develop and operate up to three generating stations on the Moray East site were granted in March 2014. At that time the Moray East site was made up of three sites known as the Telford, Stevenson and MacColl Offshore Wind Farm sites. The Section 36 Consents and Marine Licences were subsequently varied in March 2018;
- **Telford, Stevenson and MacColl wind farms** – these names refer to the three consented offshore wind farm sites located within the Moray East site;
- **Transmission Infrastructure (TI)** – includes both offshore and onshore electricity transmission infrastructure for the consented Telford, Stevenson and MacColl wind farms. Includes connection to the national electricity transmission system near New Deer in Aberdeenshire encompassing AC offshore substation platforms (OSPs), AC OSP interconnector cables, AC export cables offshore to landfall point at Inverboyndie continuing onshore to the AC collector station (onshore substation) and the additional regional Transmission Operator substation near New Deer. A Marine Licence for the offshore TI was granted in September 2014 and a further Marine Licence for two additional distributed offshore substation platforms (OSPs) was granted in September 2017. The onshore TI was awarded Planning Permission in Principle in September 2014 by Aberdeenshire Council and a Planning Permission in Principle under Section 42 in June 2015;
- **Offshore Transmission Infrastructure (OfTI)** – the offshore elements of the transmission infrastructure, comprising AC OSPs, OSP inter-connector cables and AC export cables offshore to landfall;
- **Moray East ES 2012** – The ES for the Telford, Stevenson and MacColl wind farms and Associated Transmission Infrastructure, submitted August 2012;
- **Moray East Modified TI ES 2014** – the ES for the Modified Transmission Infrastructure works (revised export cable route) in respect to the Telford, Stevenson and MacColl wind farms, submitted June 2014;
- **The Development** – the Moray East Offshore Wind Farm and Offshore Transmission Infrastructure (OfTI);
- **Design Envelope** – the range of design parameters used to inform the assessment of impacts;
- **OfTI Corridor** – the export cable route corridor, i.e. the OfTI area excluding the Moray East site.

- **Moray East Offshore Wind Farm Consents** – are comprised of the following:

  Section 36 Consents:

  - Section 36 consent for the Telford Offshore Wind Farm (as varied) – consent under section 36 of the Electricity Act 1989 for the construction and operation of the Telford Offshore Wind Farm assigned to Moray East on 19 June 2018.
  - Section 36 consent for the Stevenson Offshore Wind Farm (as varied) – consent under section 36 of the Electricity Act 1989 for the construction and operation of the Stevenson Offshore Wind Farm assigned to Moray East on 19 June 2018.
  - Section 36 consent for the MacColl Offshore Wind Farm (as varied) – consent under section 36 of the Electricity Act 1989 for the construction and operation of the MacColl Offshore Wind Farm assigned to Moray East on 19 June 2018.

  Marine Licences

  - Marine Licence for the Telford Offshore Wind Farm (as varied) – Licence Number: 04629/18/1 – consent under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area transferred to Moray East on 19 July 2018.
  - Marine Licence for the Stevenson Offshore Wind Farm (as varied) – Licence Number: 04627/18/1 – consent under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area transferred to Moray East on 19 July 2018.
  - Marine Licence for the MacColl Offshore Wind Farm (as varied) – Licence Number: 04628/18/2 (as varied) - consent under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area transferred to Moray East on 19 July 2018.

- **OfTI Licences** – are comprised of the following:
  - Marine Licence for the Offshore Transmission infrastructure – Licence Number 05340/14/0 – consent under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction works and deposits of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area (referred to as the "OfTI Marine Licence")
  - Marine Licence for two additional distributed OSPs – Licence Number 06347/17/1 – consent under the Marine (Scotland) Act 2010 & Marine and Coastal Access Act 2009, Part 4 marine licensing for marine renewables construction, operation and maintenance works and the deposit of substances or objects in the Scottish Marine Area and the United Kingdom Marine Licensing Area (referred to as the "OSP Marine Licence")

Executive Summary

This Development Specification and Layout Plan (DSLP) has been prepared to address the specific requirements of the relevant conditions attached to the Moray East Offshore Wind Farm Consents and the OfTI Consents.

This DSLP confirms details of the design and layout of the wind farm array and OfTI, namely the wind turbine generators (WTGs), inter-array cables, offshore substation platforms (OSPs), OSP inter-connector cables and offshore export cables.

This DSLP confirms that the design and layout parameters of the wind farm array and OfTI align with those considered in the Moray East ES 2012 and Moray East Modified TI ES 2014 Design Envelope.

1 Introduction

1.1 Background

In March 2014, Moray Offshore Windfarm (East) Limited (Moray East, formerly known as Moray Offshore Renewables Limited) received consents from the Scottish Ministers under Section 36 of the Electricity Act 1989, and the associated Marine Licences, for the construction and operation of the Moray East Offshore Wind Farm (together these are referred to as the Moray East Offshore Wind Farm Consents). These Marine Licence conditions did not seek to duplicate the relevant Section 36 provisions. As a consequence the primary specification design matters are dealt with in the Section 36 consents. The only matter reserved for the Marine Licences is the third party verification / certification of certain design elements which would be undertaken at a later date. At that time the Moray East site made up of three sites known as Telford, Stevenson and MacColl offshore wind farm sites. The Moray East Offshore Wind Farm Consents were varied in March 2018 and this DSLP is submitted in accordance with these consents.

A Marine Licence for the Offshore Transmission Infrastructure (OfTI) was granted in September 2014 and a further Marine Licence for two additional distributed offshore substation platforms (OSPs) was granted in September 2017 (together these are referred to as the OfTI Licences). This DSLP is also submitted in accordance with the OfTI Licences.

Moray East is a joint venture partnership between EDP Renewables, Engie, Diamond Generating and China Three Gorges and has been established to develop, finance, construct, operate, maintain and decommission the Moray East Offshore Wind Farm and associated offshore and onshore Transmission Infrastructure.

1.2 Objectives of this Document

The Section 36 Consents and OfTI Licences contain a variety of conditions that must be discharged through approval by the Scottish Ministers prior to the commencement of offshore construction. One such requirement is the approval of the proposed layout and specification of the wind farm and OfTI design through the preparation and approval of a Design Specification and Layout Plan (DSLP).

The relevant conditions setting out the requirement for a DSLP for approval are set out in full in Table 1-1.

This document is intended to fully satisfy the requirements of the Section 36 Consents and OfTI Licences conditions by providing details of the proposed design and layout specification.

Table 1-1: Consent conditions to be discharged by this DSLP

Consent Document	Condition Reference	Condition Text	Reference in this DSLP
Section 36 Consents	12	The Company must, no later than 6 months prior to the Commencement of the Development, submit a DSLP in writing, to the Scottish Ministers for their written approval.	This document sets out the DSLP for approval by the Scottish Ministers
		Such approval may only be granted following consultation by the Scottish Ministers with the Maritime and Coastguard Agency (MCA), Northern Lighthouse Board (NLB), Chamber of Shipping (CoS), the Joint Nature Conservation Committee (JNCC), Scottish Natural Heritage (SNH), Scottish Fishermen's Federation (SFF) and any such other advisors or organisations as may be required at the discretion of the Scottish Ministers.	Consultation to be undertaken by the Scottish Ministers

Consent Document	Condition Reference	Condition Text	Reference in this DSLP
		The Development must, at all times, be constructed in accordance with the approved DSLP (as updated and amended from time to time by the Company).	Section 2
		Any updates or amendments made to the DSLP by the Company must be submitted, in writing, by the Company to the Scottish Ministers for their written approval.	-
		The DSLP must include, but not be limited to the following: a) A plan showing the proposed location of each individual WTG (subject to any required micro-siting), including information on WTG spacing, WTG identification / numbering, location of the substation platforms, seabed conditions, bathymetry, confirmed foundation type for each WTG and any key constraints recorded on the Site;	Section 3.2
		b) A list of latitude and longitude co-ordinates accurate to three decimal places of minutes for each WTG, this should also be provided as a GIS shape file using WGS84 format;	Section 3.3
		c) A table or diagram of each WTG dimensions including – height to blade tip (measured above HAT), height to hub (measured above HAT to the centreline of the generator shaft), rotor diameter and rotation speed;	Section 3.4
		d) The generating capacity of each WTG used on the Site and a confirmed generating capacity for the Site overall;	Section 3.5
		e) The finishes for each WTG (see Condition 15 on WTG lighting and marking); and	Section 3.6
		f) The length and proposed arrangements on the seabed of all inter-array cables.	Section 3.7
OfTI Marine Licence	3.2.2.6	The Licensee must, no later than 6 months prior to the Commencement of the Works, submit a DSLP, in writing, to the Licensing Authority for their written approval.	This document sets out the DSLP for approval by the Scottish Ministers
		Such approval may only be granted following consultation by the Licensing Authority with the MCA, NLB, CoS, JNCC, SNH, SFF and any such other advisors or organisations as may be required at the discretion of the Licensing Authority.	Consultation to be undertaken by the Scottish Ministers
		The DSLP must include, but not be limited to the following: a) A plan showing the proposed location of each individual OSP, seabed conditions, bathymetry, confirmed foundation type for each OSP and any key constraints recorded on the Site;	Section 4.2
		b) A list of latitude and longitude co-ordinates accurate to three decimal places of minutes of arc for each OSP, this should also be provided as a geographic information system (“GIS”) shape file using WGS84 format;	Section 4.3
		c) A table or diagram of each OSP, showing dimensions;	Section 4.4
		d) The finishes for each OSP; and	Section 4.5
		e) The length and proposed arrangements on the seabed of all cables.	Section 4.6

Consent Document	Condition Reference	Condition Text	Reference in this DSLP
OSP Marine Licence	3.2.2.7	The Licensee must, no later than 6 months prior to the Commencement of the Works, submit a DSLP, in writing, to the Licensing Authority for their written approval.	This document sets out the DSLP for approval by the Scottish Ministers
		Such approval may only be granted following consultation by the Licensing Authority with the MCA, NLB, CoS, SNH, SFF, Royal Yachting Association Scotland (RYA Scotland) and any such other advisors or organisations as may be required at the discretion of the Licensing Authority.	Consultation to be undertaken by the Scottish Ministers
		The DSLP must include, but not be limited to the following: a) A plan showing the proposed location of each individual OSP, seabed conditions, bathymetry, confirmed foundation type for each OSP and any key constraints recorded on the Site;	Section 4.2
		b) A list of latitude and longitude co-ordinates accurate to three decimal places of minutes of arc for each OSP, this should also be provided as a geographic information system ("GIS") shape file using WGS84 format;	Section 4.3
		c) A table or diagram of each OSP, showing dimensions;	Section 4.4
		d) The finishes for each OSP; and	Section 4.5
		e) The length and proposed arrangements on the seabed of all cables.	Section 4.6

1.3 DSLP Document Structure

In response to the specific requirements of the Section 36 Consents and OfTI Licences conditions, this DSLP has been structured so as to be clear that each part of the specific requirements have been met and that the relevant information to allow the Scottish Ministers to approve the DSLP has been provided. The document structure is set out in Table 1-2.

Table 1-2: DSLP Document Structure

Section		Summary of Contents
1	Introduction	Background to consent requirements and overview of the DSLP scope and structure; and Identifies those other consent plans relevant to the design and specification of the Development (i.e. the Moray East Offshore Windfarm and the OfTI) and provides a statement of consistency between the DSLP and those plans.
2	Statements of Compliance	Sets out the Moray East statements of compliance in relation to the DSLP consent conditions.
3	Design, Specification and Layout – Wind Farm	Provides the required details in relation to the design, specification and layout of the wind farm including inter-array cables.
4	Design, Specification and Layout – Offshore Transmission	Provides the required details in relation to the design, specification and layout of the offshore substation platforms (OSPs) and export cables.
5	Compliance with the Application	Sets out confirmation that the details set out in this DSLP are in accordance with those assessed in the ESs.

1.4 Linkages with other Consent Plans

This DSLP document sets out the proposed design and layout specification for the wind farm and the OfTI. However, ultimately it forms part of a suite of approved documents that provides the framework for the construction process – namely the other Consent Plans required under the Moray East Offshore Wind Farm Consents and OfTI Licences.

The linkage between this DSLP and other Consent Plans is summarised in Table 1-3 below.

Table 1-3: DSLP consistency and links to other Consent Plans

Condition	Consent Plan	Consistency with and linkage to DSLP
Section 36 Condition 13; OfTI Marine Licence Condition 3.2.2.7; & OSP Marine Licence: Condition 3.2.2.8	Design Statement (DS)	Provides representative visualisations of the wind farm layout from key viewpoints, as detailed in the DSLP.
Section 36 Condition 19; OfTI Marine Licence Condition 3.2.2.14; & OSP Marine Licence Condition 3.2.2.5	Lighting and Marking Plan (LMP)	Provides details of lighting and marking of the Development during construction and operation. Operational lighting requirements have been defined based upon the Development layout presented in the DSLP.
Section 36: Condition 18: OfTI Marine Licence: Condition 3.2.2.10	Cable Plan (CaP)	The CaPs provide details on cable specification, installation and cable protection. The detailed cable route layout is also presented in line with the cable arrangements provided within the DSLP.

2 Statements of Compliance

2.1 Introduction

The following section is intended to re-affirm the Moray East commitment to ensuring that the Development is constructed in such a manner as to meet the relevant legislative requirements set out by the Section 36 Consents and OfTI Licences.

2.2 Statements of Compliance

Moray East in undertaking the final design and construction of the Development and will ensure compliance with this DSLP as approved by the Scottish Ministers (and as updated or amended as relevant from time to time).

Where updates or amendments are required to this DSLP, Moray East will ensure the Scottish Ministers are informed as soon as reasonably practicable and where necessary the DSLP will be updated or amended.

Moray East in undertaking the construction of the Development will require compliance with the limits defined by the original applications (and the project descriptions defined in the Moray East ES 2012, Moray East Modified TI ES 2014 and OSP Marine Licence Application Documents 2017) referred to in Annex 1 of the Section 36 Consents and Part 2 of the OfTI Licences in so far as they apply to this DSLP (unless otherwise approved in advance by the Scottish Ministers).

Moray East will, in undertaking the design and construction of the Development, require compliance with the approved DSLP (and all other relevant, approved Consent Plans) by the key contractors and subcontractors through condition of contract and by an appropriate auditing process.

3 Design, Specification and Layout – Wind Farm

3.1 Introduction

This section of the DSLP details the wind farm design and layout specification as required by the Section 36 Consents conditions detailed in Table 1-1. Details related to the OfTI required by the OfTI Licences conditions are provided separately under Section 4.

3.2 Wind Farm Layout and Specification

The Section 36 Consents Condition 12 requires that this DSLP includes the following:

> *A plan showing the proposed location of each individual WTG (subject to any required micro-siting), including information on WTG spacing, WTG identification / numbering, location of the substation platforms, seabed conditions, bathymetry, confirmed foundation type for each WTG and any key constraints recorded on the Site;*

The wind farm layout is presented in Figure 3-1 below. There are a total of 110 locations shown in Figure 3-1, representing:

- 100 Wind Turbine Generators (WTGs);
- 3 Offshore Substation Platforms (OSPs); and
- 7 "spare" locations.

The spare locations will only be utilised in circumstances such as where there are ground conditions with a high risk of pile refusal including where these are encountered during the foundation installation operations at one or more of the WTG or OSP locations that cannot be overcome by micro-siting (described further in Section 3.2.1 below).

3.2.1 WTG Spacing

The WTGs are arranged in a regular geometric pattern that permits navigation between rows of turbines in any direction. The WTGs are spaced at a distance of 1,128 m apart in the north to south axis and at a distance of 1,547 m apart in the east to west axis.

It is considered that there is sufficient distance between WTG locations that fishing vessels would be able to operate within the site. A Commercial Fisheries Mitigation Strategy (CFMS) will be finalised in consultation with fishing industry representatives to develop practical coexistence and mitigation measures.

There are minor variations in spacing in the layout shown in Figure 3-1 where WTG spacing is differs from the 1,128 m specified above. This results from turbines being moved to ensure they lie with the Moray East site "developable area" (the developable area is shown in Figure 3-4). These positions have the suffix "-OFF" included in the layout naming convention for the location (further information on marking and lighting is included within the LMP). The WTGs that are spaced differently are as follows:

- ME-B05-OFF (1,120.00 m to nearest turbine)
- ME-J19-OFF (1,120.07 m to nearest turbine)
- ME-K17-OFF (1,198.52 m to nearest turbine)

The distances stated are separations pre-micrositing. Micro-siting allows for the movement of a WTG or OSP structure by up to 50 m within the Moray East site on any axis as measured from the centre-point jacket substructure position. The final coordinates of the WTGs and OSPs will be confirmed following completion of installation activities.

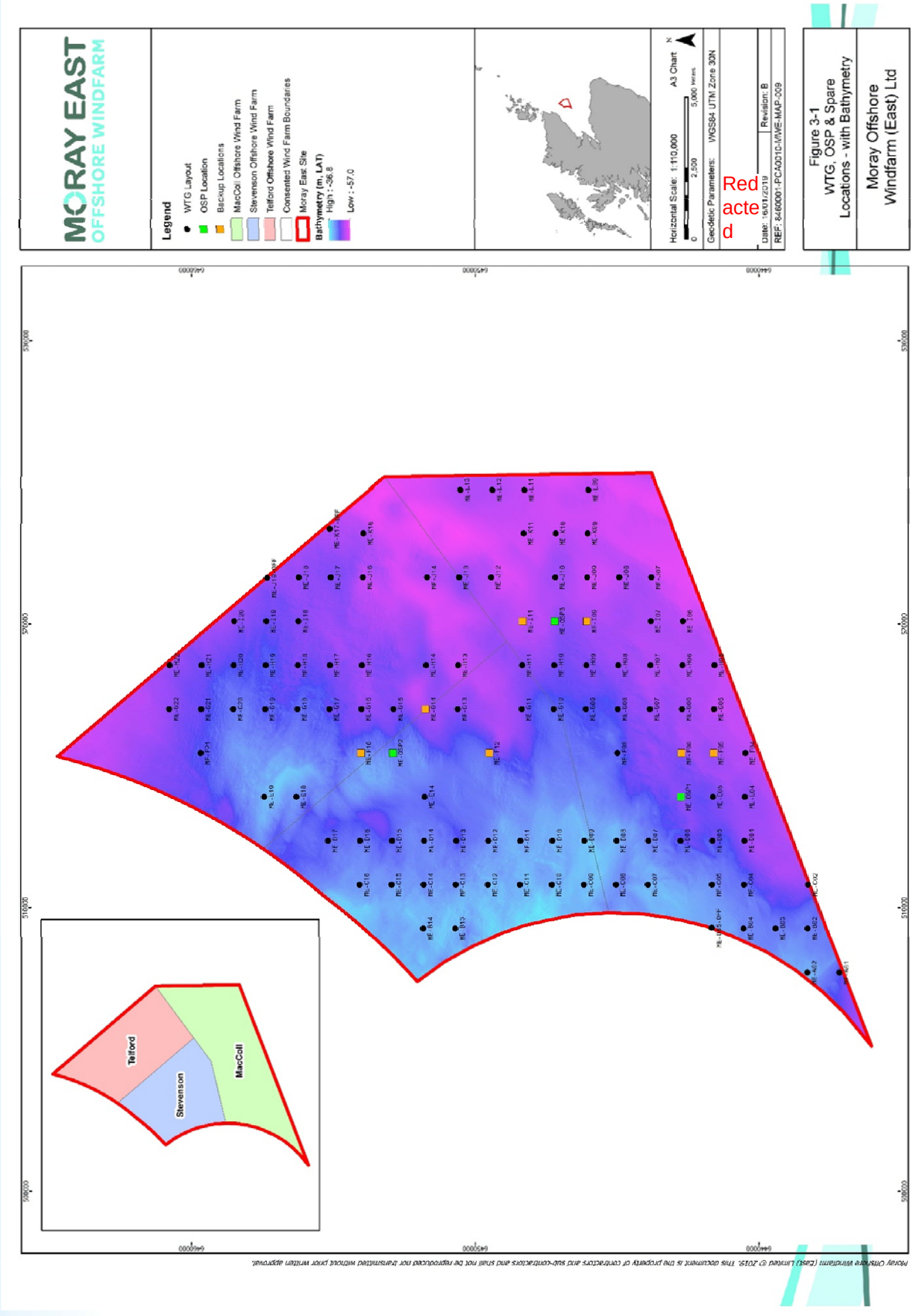

Figure 3-1: Wind Farm WTG, OSP and spare locations with site bathymetry

3.2.2 WTG Identification

Each WTG is marked with a unique alpha-numeric identifier (alpha from east to west, numeric south to north), as shown in Figure 3-1. The WTG identification system has been devised in line with the following principles and / or requirements:

- Each unique WTG or OSP identifier is prefixed with a capital ME, which is short for Moray East;
- The unique identifiers consist of a letter and a number;
- Consideration has been given to ”Search and Rescue (SAR) lanes”, and facilitating navigation through the Wind Farm.

The MCA confirmed that the indicative SAR lanes through the neighbouring Beatrice Offshore Windfarm Limited (BOWL) site extend in a slight northeast to southwest (and vice versa) direction (letter from the MCA titled ”Beatrice Offshore Wind Farm – Search and Rescue and Navigational Safety Layout Assessment” dated 21st April 2015). The proposed Moray East numbering system has considered this in that the WTGs and OSPs located along these lanes all have the same letter in their unique identifiers, followed by a descending or ascending number from the next WTG / OSP along the lane, depending on the direction of travel (Figure 3-1). This approach has been agreed with the MCA during a meeting on 10 April 2018.

Further to this, the numbering system has been designed to aid navigation through the Wind Farm. When navigating through the Wind Farm along any lane in any direction, one would follow rows of WTGs and OSPs with unique identifiers of either the same letter and ascending/ descending number, or letters in ascending/ descending alphabetical order, and the same number. The naming convention has been developed in agreement with the MCA.

The unique identifiers will be displayed on signs installed on the WTG on the outside of the transition piece railings so as to provide adequate visual coverage such that they can be read from all directions. The lettering will be black on a yellow background that is clearly readable by an observer stationed 3 m above sea level, at a distance of at least 150 m away from the WTG and illuminated by low intensity white shrouded lights (which will be controlled by a twilight sensor). Aviation unique identifiers will be on top of the WTG nacelles in clear black lettering and designed so as to be visible from a height of 500 ft (152 m) above the highest part of the WTG (excluding the blades). MGN 543 Annex 5 Advice from the CAA (October 2013), following discussion with the MCA, is that such numbers should be as large as practicable but not less than 1.5 metres in height and of proportionate width. The WTG markings will therefore be designed taking into account this advice and any further feedback provided by the CAA and MCA during consultation on the LMP. Illumination will be controlled from the Moray East Marine Coordination Centre (MCC) and activated as required.

Further details on the WTG marking are provided within the LMP.

3.2.3 WTG Foundation Types

All of the 100 WTGs will be supported by tubular jacket substructures and foundation piles.

The foundation piles will measure a maximum of 2.5 m in diameter and protrude from the seabed by nominal 2 m (or 2 m above the scour protection in case of scour protection is used), penetrating the seabed by approximately 36-50 m.[1]

The substructure type is a three legged jacket structure. Four ”clusters” have been defined for the jacket substructure design to take account of variable water depths across the site (see Table 3-1). Accordingly, the jacket substructures will have either three of four X-braces and range in overall elevation above seabed level from approximately 66-77 m. The general design and arrangement of the WTG supports is

[1] Protruding piles have been accounted for in the Decommissioning Programme (DP) submitted to MS-LOT for approval in May 2018 and will be accounted for in any revised versions of the document.

shown in Figure 3-2 The height of the structures above the surface of the sea will range from 17-20 m above lowest astronomical tide (LAT). All jackets have a maximum base width at the seabed of 30 m.

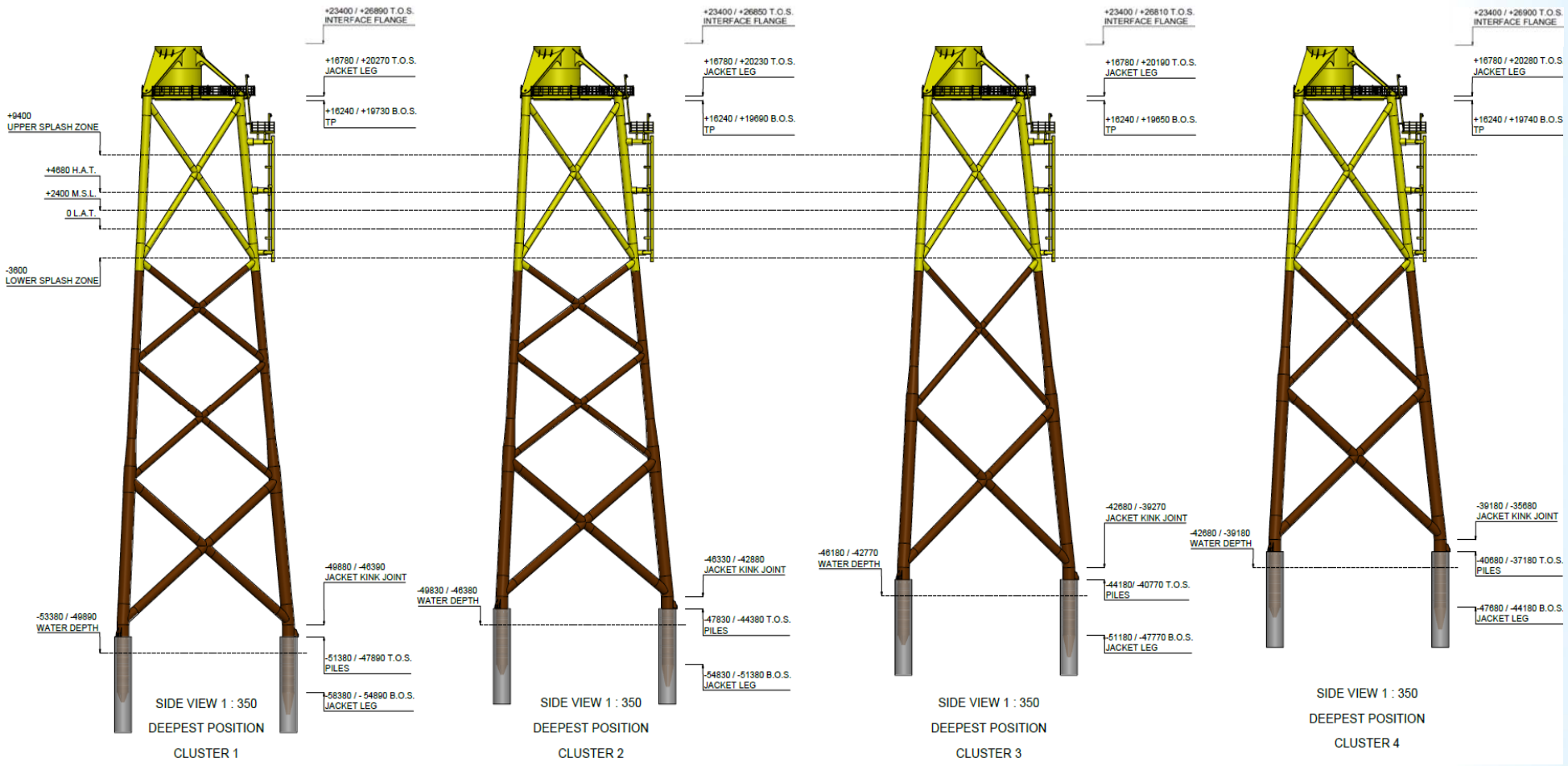

Figure 3-2: Illustration of WTG support structures

19

3.2.4 Wind Farm Bathymetry and Seabed Conditions

Bathymetry across the Moray East site ranges from 37 m below LAT in the west up to 57 m in the east (see Figure 3-1). There is a general downwards slope across the site from west to east.

The WTGs will be installed in water depths ranging from approximately 39 m to 54 m below LAT. Water depths at each WTG location are listed in Table 3-2 below.

The clusters have been defined on the basis of their depth range as presented in Table 3-1[2]. Further information on the phasing of installation across clusters will be presented in the Moray East Wind Farm Piling Strategy.

Table 3-1: WTG jacket "clusters" and bathymetry range

CLUSTER	1	2	3	4
Number of WTG Positions	31	28	21	20
Maximum Water Depth below LAT [m]	53	50	46	42
Minimum Water Depth below LAT [m]	50	46	43	39

Throughout the Moray East site the dominant seabed sediment varies between sand and gravel. Based on the most recent analysis of geophysical and geotechnical information approximately 20% of the boulders in the Moray East site are greater than 1 m in diameter. Seabed sediments are shown in Figure 3-3.

3.2.5 Key Constraints

There are a small number of physical spatial constraints within the Moray East site. Infrastructure to be installed within the site avoids the following constraints, as shown in Figure 3-4:

- Six plugged and abandoned wells and their associated exclusion zones;
- Several features of potential archaeological interest, identified by the analysis of geophysical and geotechnical survey data, and their associated Archaeological Exclusion Zones (AEZs) as relevant (see Marine Archaeology Reporting Protocol (MARP) and Written Scheme of Investigation (WSI) Report for details).

The following constraints have been taken into account in defining the Moray East site developable area boundaries, and are also shown on Figure 3-4:

- A 5x rotor diameter (i.e. 820 m) buffer from the northern boundary of the Moray East site to the adjacent BOWL site (as required under the terms of the Crown Estate Agreement for Leases).
- A 250 m proximity area either side of the Moray-Caithness subsea HVDC cable has been considered when defining the design layout. Where certain activities are planned within this proximity area they be agreed with the asset owner, Scottish Hydro Electric Transmission.

No further constraints have been identified relevant to determination of the final wind farm layout.

[2] The number of WTGs in each cluster may vary slightly depending on the need to use spare positions (as detailed within Table 3-3).

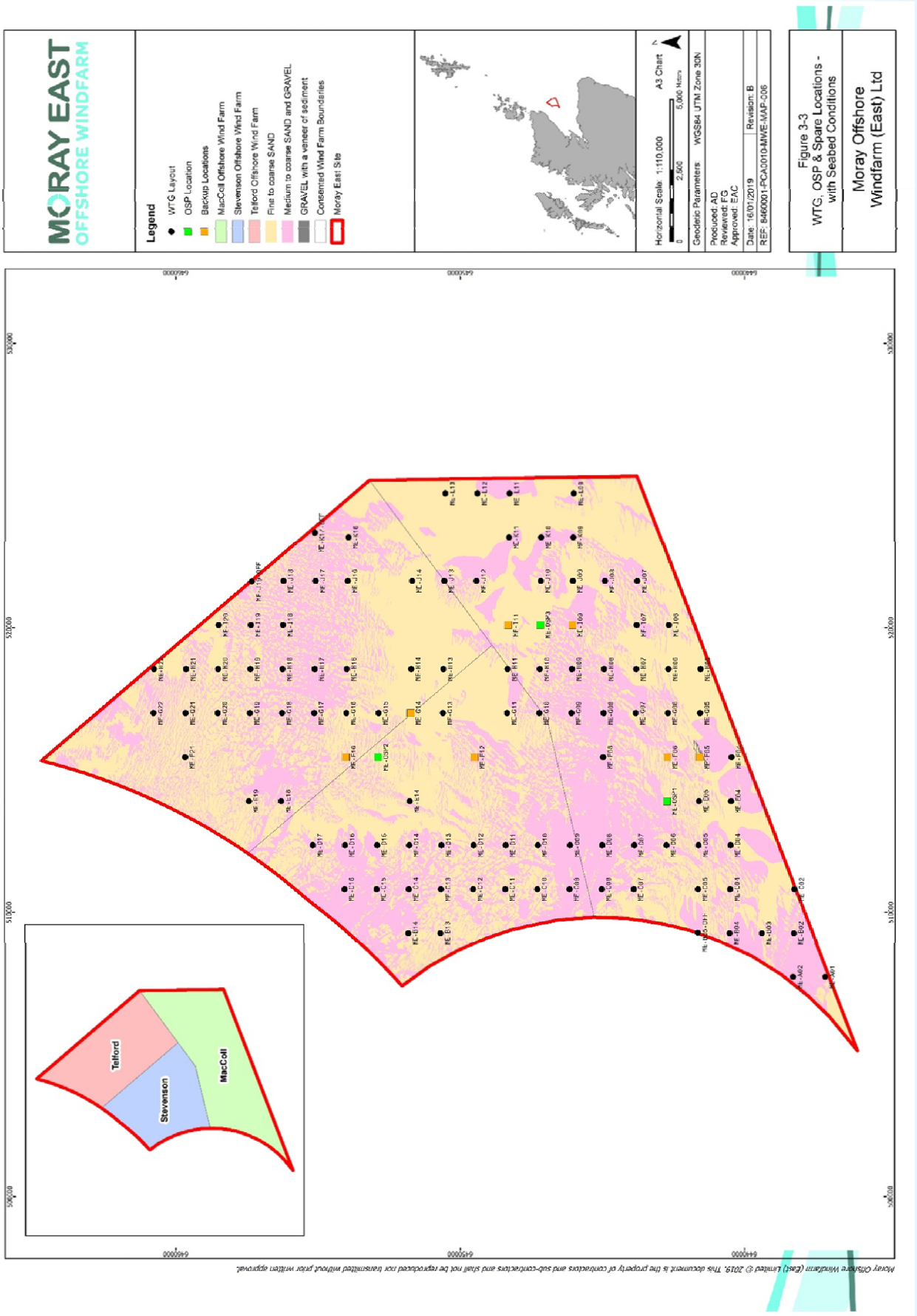

Figure 3-3: Seabed conditions across the wind farm site

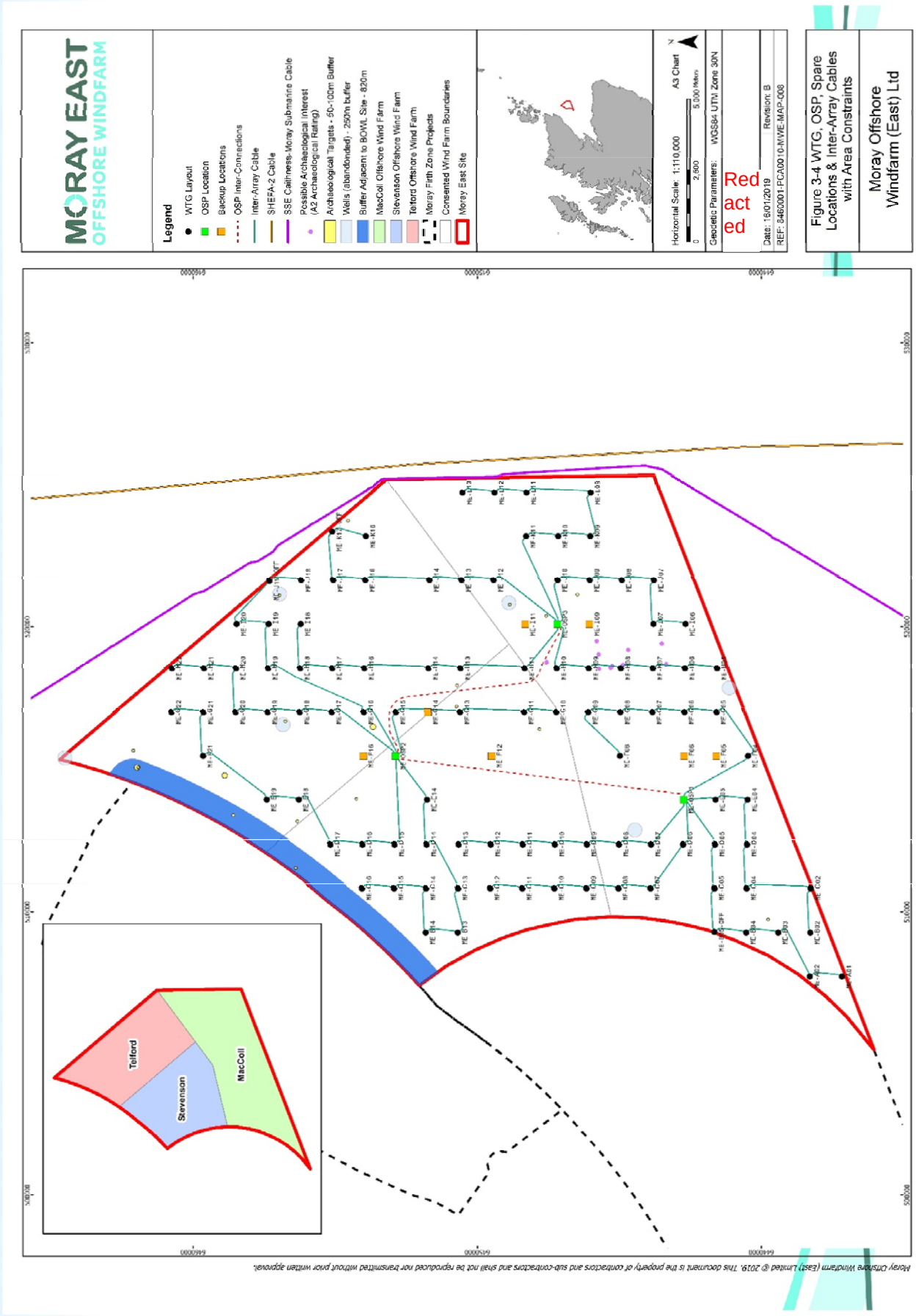

Figure 3-4: Key constraints to the wind farm developable area

3.3 Co-ordinates for WTG Locations

The Section 36 Consents Condition 12 requires that this DSLP includes the following:

> *A list of latitude and longitude co-ordinates accurate to three decimal places of minutes for each WTG, this should also be provided as a GIS shape file using WGS84 format;*

The WTGs will be installed, within a 50 m radius micro-siting tolerance from the jacket centre point, at the locations listed in Table 3-2. As described in Section 3.2.1, WTG positions with small deviations off the standard grid have the suffix "-OFF" included in the naming convention for the location[3].

The co-ordinates of the "spare" locations are provided in Table 3-3.

As required by the Section 36 Consents condition, a GIS shape files with this co-ordinate data accompanies this DSLP.

Table 3-2: WTG location co-ordinates (WGS84) and water depths

WTG Identification	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) LAT	Consented Wind Farm
ME-A01	58° 4.550' N	2° 52.147' W	45.89	MacColl
ME-A02	58° 5.158' N	2° 52.144' W	40.41	MacColl
ME-B02	58° 5.147' N	2° 50.570' W	43.75	MacColl
ME-B03	58° 5.755' N	2° 50.567' W	44.13	MacColl
ME-B04	58° 6.364' N	2° 50.564' W	43.35	MacColl
ME-B05-OFF	58° 6.967' N	2° 50.544' W	41.31	MacColl
ME-B13	58° 11.838' N	2° 50.540' W	39.56	Stevenson
ME-B14	58° 12.446' N	2° 50.538' W	40.27	Stevenson
ME-C02	58° 5.136' N	2° 48.995' W	49.76	MacColl
ME-C04	58° 6.353' N	2° 48.989' W	44.52	MacColl
ME-C05	58° 6.961' N	2° 48.986' W	42.43	MacColl
ME-C07	58° 8.177' N	2° 48.980' W	40.3	MacColl
ME-C08	58° 8.785' N	2° 48.977' W	42.21	MacColl
ME-C09	58° 9.394' N	2° 48.973' W	39.87	Stevenson
ME-C10	58° 10.002' N	2° 48.970' W	40.69	Stevenson
ME-C11	58° 10.610' N	2° 48.967' W	40.07	Stevenson
ME-C12	58° 11.218' N	2° 48.964' W	40.43	Stevenson
ME-C13	58° 11.826' N	2° 48.961' W	42.27	Stevenson
ME-C14	58° 12.435' N	2° 48.958' W	42.93	Stevenson
ME-C15	58° 13.043' N	2° 48.955' W	41.88	Stevenson
ME-C16	58° 13.651' N	2° 48.951' W	42.29	Stevenson
ME-D04	58° 6.341' N	2° 47.414' W	49.88	MacColl
ME-D05	58° 6.949' N	2° 47.410' W	46.7	MacColl
ME-D06	58° 7.557' N	2° 47.407' W	46.94	MacColl
ME-D07	58° 8.166' N	2° 47.403' W	43.43	MacColl
ME-D08	58° 8.774' N	2° 47.399' W	40.12	MacColl
ME-D09	58° 9.382' N	2° 47.396' W	39.18	Stevenson
ME-D10	58° 9.990' N	2° 47.392' W	40.61	Stevenson
ME-D11	58° 10.598' N	2° 47.389' W	41.24	Stevenson

[3] Please note that the 'OFF' suffix has been added for internal purposes only and will not be included in the WTG identification within the Wind Farm.

WTG Identification	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) LAT	Consented Wind Farm
ME-D12	58° 11.207' N	2° 47.385' W	42.77	Stevenson
ME-D13	58° 11.815' N	2° 47.381' W	45.91	Stevenson
ME-D14	58° 12.423' N	2° 47.378' W	43.15	Stevenson
ME-D15	58° 13.031' N	2° 47.374' W	45.58	Stevenson
ME-D16	58° 13.639' N	2° 47.371' W	44.49	Stevenson
ME-D17	58° 14.248' N	2° 47.367' W	45.35	Stevenson
ME-E04	58° 6.329' N	2° 45.838' W	49.44	MacColl
ME-E05	58° 6.937' N	2° 45.834' W	47.94	MacColl
ME-E14	58° 12.411' N	2° 45.798' W	45.11	Stevenson
ME-E18	58° 14.844' N	2° 45.782' W	42.16	Telford
ME-E19	58° 15.452' N	2° 45.778' W	40.21	Telford
ME-F04	58° 6.317' N	2° 44.263' W	51.89	MacColl
ME-F08	58° 8.750' N	2° 44.245' W	45.35	MacColl
ME-F21	58° 16.656' N	2° 44.187' W	46.08	Telford
ME-G05	58° 6.913' N	2° 42.683' W	52.45	MacColl
ME-G06	58° 7.521' N	2° 42.678' W	50.4	MacColl
ME-G07	58° 8.129' N	2° 42.673' W	49.49	MacColl
ME-G08	58° 8.737' N	2° 42.668' W	47.01	MacColl
ME-G09	58° 9.345' N	2° 42.663' W	46.4	MacColl
ME-G10	58° 9.954' N	2° 42.658' W	45.44	Stevenson
ME-G11	58° 10.562' N	2° 42.653' W	48.59	Stevenson
ME-G13	58° 11.778' N	2° 42.643' W	48.84	Stevenson
ME-G15	58° 12.995' N	2° 42.633' W	48.23	Telford
ME-G16	58° 13.603' N	2° 42.629' W	48.69	Telford
ME-G17	58° 14.211' N	2° 42.624' W	46.78	Telford
ME-G18	58° 14.819' N	2° 42.619' W	45.53	Telford
ME-G19	58° 15.428' N	2° 42.614' W	45.95	Telford
ME-G20	58° 16.036' N	2° 42.609' W	44.26	Telford
ME-G21	58° 16.644' N	2° 42.604' W	47.25	Telford
ME-G22	58° 17.252' N	2° 42.599' W	49.49	Telford
ME-H05	58° 6.900' N	2° 41.107' W	51.94	MacColl
ME-H06	58° 7.508' N	2° 41.102' W	51.34	MacColl
ME-H07	58° 8.116' N	2° 41.096' W	50.98	MacColl
ME-H08	58° 8.724' N	2° 41.091' W	49.85	MacColl
ME-H09	58° 9.333' N	2° 41.086' W	48.56	MacColl
ME-H10	58° 9.941' N	2° 41.080' W	48.05	MacColl
ME-H11	58° 10.549' N	2° 41.075' W	48.74	Stevenson
ME-H13	58° 11.765' N	2° 41.064' W	52.54	Telford
ME-H14	58° 12.374' N	2° 41.059' W	48.52	Telford
ME-H16	58° 13.590' N	2° 41.048' W	49.81	Telford
ME-H17	58° 14.198' N	2° 41.042' W	48.36	Telford
ME-H18	58° 14.806' N	2° 41.037' W	48.09	Telford
ME-H19	58° 15.415' N	2° 41.032' W	46.01	Telford
ME-H20	58° 16.023' N	2° 41.026' W	46.25	Telford

WTG Identification	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) LAT	Consented Wind Farm
ME-H21	58° 16.631' N	2° 41.021' W	48.05	Telford
ME-H22	58° 17.239' N	2° 41.015' W	49.7	Telford
ME-I06	58° 7.495' N	2° 39.526' W	51.98	MacColl
ME-I07	58° 8.103' N	2° 39.520' W	50.88	MacColl
ME-I18	58° 14.793' N	2° 39.455' W	48.88	Telford
ME-I19	58° 15.401' N	2° 39.450' W	47.56	Telford
ME-I20	58° 16.010' N	2° 39.444' W	49.12	Telford
ME-J07	58° 8.090' N	2° 37.943' W	52.21	MacColl
ME-J08	58° 8.698' N	2° 37.937' W	51.87	MacColl
ME-J09	58° 9.306' N	2° 37.930' W	53.04	MacColl
ME-J10	58° 9.914' N	2° 37.924' W	49.99	MacColl
ME-J12	58° 11.131' N	2° 37.912' W	51.66	MacColl
ME-J13	58° 11.739' N	2° 37.905' W	49.65	MacColl
ME-J14	58° 12.347' N	2° 37.899' W	51.59	Telford
ME-J16	58° 13.563' N	2° 37.886' W	52.6	Telford
ME-J17	58° 14.172' N	2° 37.880' W	48.38	Telford
ME-J18	58° 14.780' N	2° 37.874' W	49.78	Telford
ME-J19-OFF	58° 15.383' N	2° 37.887' W	50.02	Telford
ME-K09	58° 9.292' N	2° 36.353' W	52.46	MacColl
ME-K10	58° 9.900' N	2° 36.346' W	52.64	MacColl
ME-K11	58° 10.509' N	2° 36.339' W	53.25	MacColl
ME-K16	58° 13.550' N	2° 36.306' W	50.99	Telford
ME-K17-OFF	58° 14.189' N	2° 36.133' W	51.23	Telford
ME-L09	58° 9.278' N	2° 34.775' W	52.58	MacColl
ME-L11	58° 10.494' N	2° 34.761' W	52.58	MacColl
ME-L12	58° 11.103' N	2° 34.754' W	51.57	MacColl
ME-L13	58° 11.711' N	2° 34.747' W	51.7	MacColl

Table 3-3: Spare location co-ordinates (WGS84) and water depths

Spare Location Identification	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) LAT	Consented Wind Farm
ME-F05	58° 6.925' N	2° 44.259' W	49.58	MacColl
ME-F06	58° 7.533' N	2° 44.254' W	48.88	MacColl
ME-F12	58° 11.183' N	2° 44.227' W	45.45	Stevenson
ME-F16	58° 13.615' N	2° 44.209' W	42.83	Telford
ME-G14	58° 12.387' N	2° 42.638' W	50.67	Telford
ME-I09	58° 9.320' N	2° 39.508' W	50.23	MacColl
ME-I11	58° 10.536' N	2° 39.496' W	51.94	MacColl

3.4 WTG Dimensions

The Section 36 Consents Condition 12 requires that this DSLP includes the following:

A table or diagram of each WTG dimensions including height to blade tip (measured above HAT), height to hub (measured above HAT to the centreline of the generator shaft), rotor diameter and rotation speed;

Moray East has chosen to install MHI Vestas V164 9.5 MW WTGs. The dimensions of the WTGs are summarised in Table 3-4.

Table 3-4: Key dimensions of the MHI Vestas V164 9.5 MW WTG

Parameter	Dimension (measured above HAT) (variable dependent on cluster)
Height to blade tip[4]	Upper ("12 o'clock") 190.8-194.2 m above HAT (195.5-198.9 m above LAT) Lower ("6 o'clock") 26.8-30.2 m above HAT (31.5-34.9 m above LAT)
Height to hub[11]	108.8-112.2 m above HAT (113.5-116.9 m above LAT)
Rotor diameter	164 m (blade length 80 m)
Rotation speed	10.5 rpm at nominal rating, range 6.5-12.8 rpm

3.5 Generating Capacity

The Section 36 Consents Condition 12 requires that this DSLP include the following:

The generating capacity of each WTG used on the Site and a confirmed generating capacity for the Site overall;

The chosen WTG for installation at the Moray East Offshore Wind Farm is the MHI Vestas V164 9.5 MW. Each of the WTGs will have a generating capacity of 9.525 MW.

The total generating capacity of the Moray East Offshore Wind Farm will be 952.5 MW (split between the consented wind farms as 438.15 MW in the MacColl Wind Farm site, 276.225 MW in the Telford Wind Farm site and 238.125 MW in the Stevenson Wind Farm site). The total generating capacity of the three wind farms combined will be constrained by a transmission entry capacity of 900 MW.

3.6 WTG Finishes

The Section 36 Consents Condition 12 requires that this DSLP includes the following:

The finishes for each WTG (see Condition 15 on WTG lighting and marking);

Each WTG (tower sections, nacelle and blades) will be finished in the standard light grey, RAL 7035.

To comply with aviation and marine navigation requirements the WTGs will have additional marking which are detailed within the LMP. This is likely to include:

- Blade tips and marked dots along the blade will be painted in traffic red (RAL 3020) to provide SAR helicopter pilots with a reference when hovering over the Nacelle during a rescue;
- Heli-hoist platforms on top of the WTG Nacelle will be painted in traffic red (RAL 3020); and
- Jacket substructure (from at least 2 m below LAT) and transition piece up to WTG tower interface level will be painted in traffic yellow (RAL 1023).

The LMP should be referred to for full details of WTG marking.

3.7 Inter-Array Cable Arrangement and Lengths

The Section 36 Consent Condition 12 requires that this DSLP includes the following:

[4] The WTG height may vary slightly depending on the need to use spare positions (as detailed within Table 3-3).

The length and proposed arrangements on the seabed of all inter-array cables.

The WTGs are connected at a voltage of 66 kV by an inter-array cabling network arranged in "strings" or "circuits". There are fifteen strings and 4-8 WTGs per string[5]. The inter-array cable network follows a radial design.

There will be a total of 100 inter-array cables, of two different sizes (two sizes of cable are used to allow for tapering of cable capacity away from the OSPs), installed across the wind farm as follows:

- Cables of 630 mm^2 conductor cross-sectional area, with a total cable outer diameter of 160 mm;
- Cables of 240 mm^2 conductor cross-sectional area, with a total cable outer diameter of 131 mm.

The arrangement of the cables between the WTGs and the connections to the OSPs is set out in Figure 3-5.

The lengths of each of the inter-array cables between the WTGs and OSP locations are presented in Table 3-5. The total length of the inter-array cabling to be installed on the seabed is approximately 156 km. This does not account for cable route micro-siting (further details will be provided within the Wind Farm Cable Plan (CaP)).

[5] The number of WTGs per string may vary slightly depending on the need to use spare positions (up to 8 WTG, 76.2 MW).

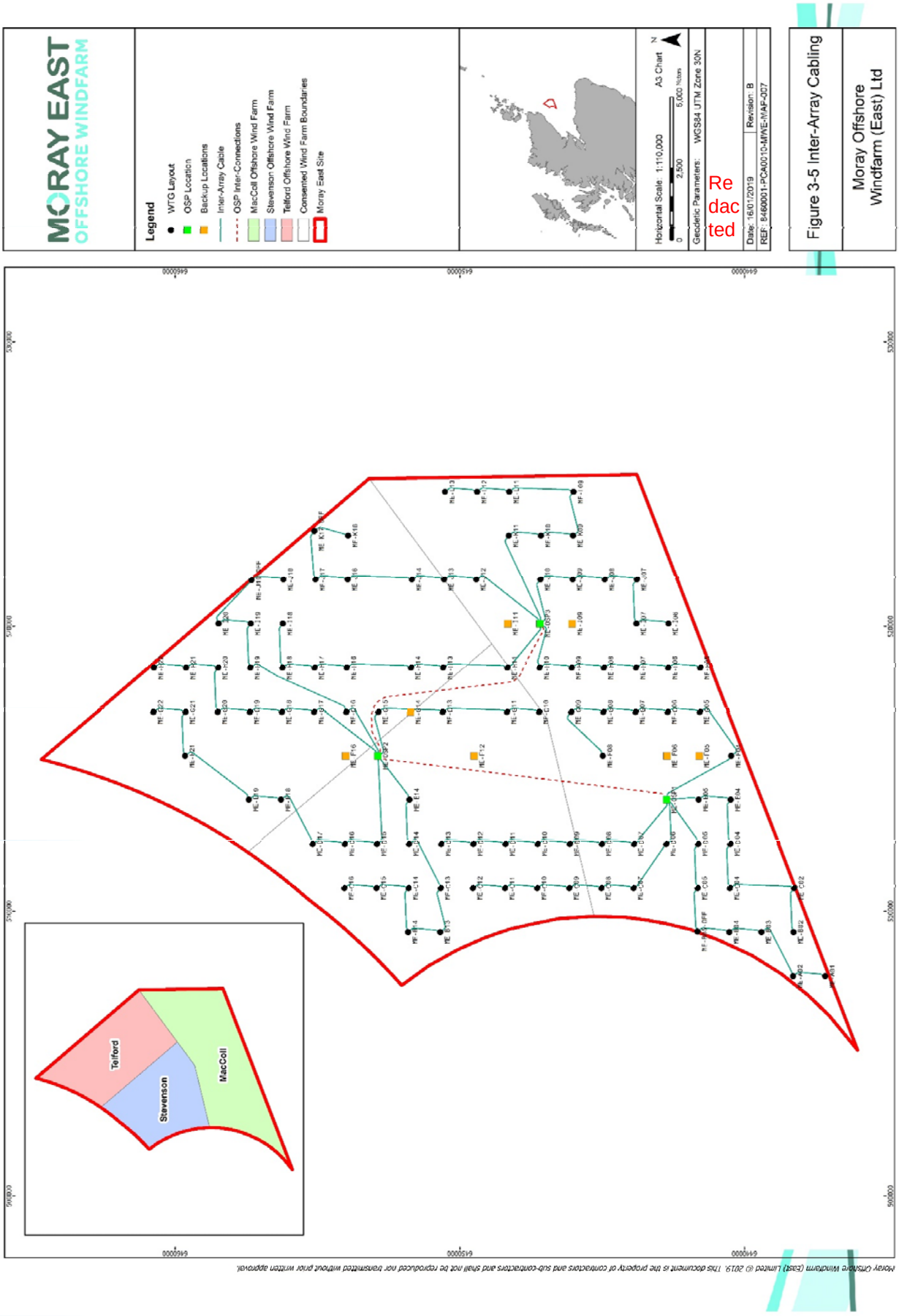

Figure 3-5: Inter-array cable connection configuration, showing inter-array and inter-connector cable connectivity between WTGs and OSPs

Table 3-5: Inter-array cable arrangements and cable lengths

Cable Route		Start Point			End Point			Route length from J-tube to J-tube (m)
Start	End	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Water Depth (m) LAT	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Water Depth (m) LAT	
ME-OSP1	ME-E05	58° 7.538' N	2° 45.831' W	48.88	58° 6.945' N	2° 45.824' W	47.94	1111.8
ME-E05	ME-E04	58° 6.928' N	2° 45.826' W	47.94	58° 6.337' N	2° 45.828' W	49.44	1150.7
ME-E04	ME-D04	58° 6.333' N	2° 45.855' W	49.44	58° 6.346' N	2° 47.398' W	49.88	1567.8
ME-D04	ME-C04	58° 6.345' N	2° 47.430' W	49.88	58° 6.358' N	2° 48.973' W	44.52	1567.8
ME-C04	ME-C02	58° 6.344' N	2° 48.981' W	44.52	58° 5.144' N	2° 48.985' W	49.76	2277.7
ME-C02	ME-B02	58° 5.140' N	2° 49.012' W	49.76	58° 5.153' N	2° 50.554' W	43.75	1567.8
ME-OSP1	ME-D05	58° 7.541' N	2° 45.840' W	48.88	58° 6.955' N	2° 47.395' W	46.7	1889.5
ME-D05	ME-C05	58° 6.954' N	2° 47.427' W	46.7	58° 6.966' N	2° 48.971' W	42.43	1567.8
ME-C05	ME-B05-OFF	58° 6.965' N	2° 49.003' W	42.43	58° 6.973' N	2° 50.528' W	41.31	1550.6
ME-B05-OFF	ME-B04	58° 6.958' N	2° 50.536' W	41.31	58° 6.372' N	2° 50.554' W	43.35	1143.7
ME-B04	ME-B03	58° 6.355' N	2° 50.556' W	43.35	58° 5.764' N	2° 50.557' W	44.13	1150.7
ME-B03	ME-A02	58° 5.747' N	2° 50.559' W	44.13	58° 5.164' N	2° 52.129' W	40.41	2140.4
ME-A02	ME-A01	58° 5.149' N	2° 52.136' W	40.41	58° 4.558' N	2° 52.136' W	45.89	1150.7
ME-OSP1	ME-D06	58° 7.543' N	2° 45.843' W	48.88	58° 7.549' N	2° 47.398' W	46.94	1621.8
ME-D06	ME-C07	58° 7.562' N	2° 47.423' W	46.94	58° 8.168' N	2° 48.972' W	40.3	1896.8
ME-C07	ME-C08	58° 8.185' N	2° 48.969' W	40.3	58° 8.777' N	2° 48.968' W	42.21	1150.7
ME-C08	ME-C09	58° 8.793' N	2° 48.966' W	42.21	58° 9.385' N	2° 48.965' W	39.87	1150.7
ME-C09	ME-C10	58° 9.402' N	2° 48.963' W	39.87	58° 9.993' N	2° 48.962' W	40.69	1150.7
ME-C10	ME-C11	58° 10.010' N	2° 48.960' W	40.69	58° 10.601' N	2° 48.959' W	40.07	1150.7
ME-C11	ME-C12	58° 10.618' N	2° 48.957' W	40.07	58° 11.209' N	2° 48.956' W	40.43	1150.7
ME-OSP1	ME-D07	58° 7.545' N	2° 45.845' W	48.88	58° 8.157' N	2° 47.395' W	43.43	1946.7
ME-D07	ME-D08	58° 8.174' N	2° 47.393' W	43.43	58° 8.765' N	2° 47.391' W	40.12	1150.7
ME-D08	ME-D09	58° 8.782' N	2° 47.389' W	40.12	58° 9.373' N	2° 47.388' W	39.18	1150.7
ME-D09	ME-D10	58° 9.390' N	2° 47.385' W	39.18	58° 9.981' N	2° 47.384' W	40.61	1150.7
ME-D10	ME-D11	58° 9.998' N	2° 47.382' W	40.61	58° 10.590' N	2° 47.381' W	41.24	1150.7
ME-D11	ME-D12	58° 10.607' N	2° 47.378' W	41.24	58° 11.198' N	2° 47.377' W	42.77	1150.7
ME-D12	ME-D13	58° 11.215' N	2° 47.375' W	42.77	58° 11.806' N	2° 47.373' W	45.91	1150.7
ME-OSP1	ME-F04	58° 7.546' N	2° 45.817' W	48.88	58° 6.321' N	2° 44.280' W	51.89	2801.0
ME-F04	ME-G05	58° 6.308' N	2° 44.255' W	51.89	58° 6.904' N	2° 42.675' W	52.45	2331.6
ME-G05	ME-G06	58° 6.921' N	2° 42.672' W	52.45	58° 7.512' N	2° 42.670' W	50.4	1150.7
ME-G06	ME-G07	58° 7.529' N	2° 42.667' W	50.4	58° 8.120' N	2° 42.665' W	49.49	1150.7
ME-G07	ME-G08	58° 8.137' N	2° 42.662' W	49.49	58° 8.728' N	2° 42.660' W	47.01	1150.7
ME-G08	ME-G09	58° 8.745' N	2° 42.658' W	47.01	58° 9.337' N	2° 42.655' W	46.4	1150.7
ME-G09	ME-F08	58° 9.350' N	2° 42.681' W	46.4	58° 8.756' N	2° 44.229' W	45.35	2060.6
ME-OSP2	ME-E14	58° 13.004' N	2° 44.226' W	43.54	58° 12.417' N	2° 45.783' W	45.11	1880.9
ME-E14	ME-D14	58° 12.416' N	2° 45.815' W	45.11	58° 12.429' N	2° 47.362' W	43.15	1566.5
ME-D14	ME-C13	58° 12.414' N	2° 47.370' W	43.15	58° 11.832' N	2° 48.945' W	42.27	2140.5
ME-C13	ME-B13	58° 11.831' N	2° 48.978' W	42.27	58° 11.829' N	2° 50.532' W	39.56	1664.4
ME-B13	ME-B14	58° 11.846' N	2° 50.530' W	39.56	58° 12.437' N	2° 50.529' W	40.27	1150.7
ME-B14	ME-C14	58° 12.451' N	2° 50.522' W	40.27	58° 12.439' N	2° 48.974' W	42.93	1567.8

Cable Route		Start Point			End Point			Route length from J-tube to J-tube (m)
Start	End	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Water Depth (m) LAT	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Water Depth (m) LAT	
ME-C14	ME-C15	58° 12.443' N	2° 48.947' W	42.93	58° 13.034' N	2° 48.946' W	41.88	1150.7
ME-C15	ME-C16	58° 13.051' N	2° 48.944' W	41.88	58° 13.642' N	2° 48.943' W	42.29	1150.7
ME-OSP2	ME-D15	58° 13.007' N	2° 44.228' W	43.54	58° 13.022' N	2° 47.366' W	45.58	3141.3
ME-D15	ME-D16	58° 13.039' N	2° 47.364' W	45.58	58° 13.631' N	2° 47.363' W	44.49	1150.7
ME-D16	ME-D17	58° 13.648' N	2° 47.360' W	44.49	58° 14.239' N	2° 47.359' W	45.35	1150.7
ME-D17	ME-E18	58° 14.253' N	2° 47.352' W	45.35	58° 14.835' N	2° 45.774' W	42.16	2135.2
ME-E18	ME-E19	58° 14.852' N	2° 45.771' W	42.16	58° 15.443' N	2° 45.770' W	40.21	1150.5
ME-E19	ME-F21	58° 15.458' N	2° 45.762' W	40.21	58° 16.648' N	2° 44.179' W	46.08	2879.7
ME-F21	ME-G21	58° 16.662' N	2° 44.171' W	46.08	58° 16.648' N	2° 42.620' W	47.25	1567.8
ME-G21	ME-G22	58° 16.652' N	2° 42.593' W	47.25	58° 17.243' N	2° 42.591' W	49.49	1150.7
ME-OSP2	ME-G17	58° 13.010' N	2° 44.201' W	43.54	58° 14.202' N	2° 42.615' W	46.78	2875.0
ME-G17	ME-G18	58° 14.219' N	2° 42.613' W	46.78	58° 14.810' N	2° 42.611' W	45.53	1150.7
ME-G18	ME-G19	58° 14.827' N	2° 42.608' W	45.53	58° 15.419' N	2° 42.606' W	45.95	1150.7
ME-G19	ME-G20	58° 15.436' N	2° 42.603' W	45.95	58° 16.027' N	2° 42.601' W	44.26	1150.7
ME-G20	ME-H20	58° 16.041' N	2° 42.593' W	44.26	58° 16.027' N	2° 41.043' W	46.25	1567.8
ME-H20	ME-H21	58° 16.031' N	2° 41.016' W	46.25	58° 16.622' N	2° 41.013' W	48.05	1150.7
ME-H21	ME-H22	58° 16.639' N	2° 41.010' W	48.05	58° 17.230' N	2° 41.007' W	49.7	1150.7
ME-OSP2	ME-G16	58° 13.008' N	2° 44.200' W	43.54	58° 13.594' N	2° 42.620' W	48.69	2169.4
ME-G16	ME-H19	58° 13.608' N	2° 42.613' W	48.69	58° 15.406' N	2° 41.024' W	46.01	3849.2
ME-H19	ME-I19	58° 15.420' N	2° 41.016' W	46.01	58° 15.406' N	2° 39.466' W	47.56	1567.8
ME-I19	ME-I20	58° 15.410' N	2° 39.439' W	47.56	58° 16.001' N	2° 39.436' W	49.12	1150.7
ME-I20	ME-J19-OFF	58° 16.015' N	2° 39.428' W	49.12	58° 15.388' N	2° 37.904' W	50.02	1988.7
ME-J19-OFF	ME-J18	58° 15.374' N	2° 37.879' W	50.02	58° 14.788' N	2° 37.863' W	49.78	1140.7
ME-OSP2	ME-G15	58° 13.002' N	2° 44.205' W	43.54	58° 12.999' N	2° 42.650' W	48.23	1697.8
ME-G15	ME-G13	58° 12.986' N	2° 42.625' W	48.23	58° 11.786' N	2° 42.633' W	48.84	2277.7
ME-G13	ME-G11	58° 11.769' N	2° 42.635' W	48.84	58° 10.570' N	2° 42.643' W	48.59	2277.7
ME-G11	ME-G10	58° 10.553' N	2° 42.645' W	48.59	58° 9.962' N	2° 42.648' W	45.44	1150.7
ME-OSP3	ME-H10	58° 9.924' N	2° 39.512' W	49.79	58° 9.946' N	2° 41.065' W	48.05	1672.8
ME-H10	ME-H09	58° 9.932' N	2° 41.072' W	48.05	58° 9.341' N	2° 41.075' W	48.56	1150.7
ME-H09	ME-H08	58° 9.324' N	2° 41.078' W	48.56	58° 8.733' N	2° 41.080' W	49.85	1150.7
ME-H08	ME-H07	58° 8.716' N	2° 41.083' W	49.85	58° 8.124' N	2° 41.086' W	50.98	1150.7
ME-H07	ME-H06	58° 8.107' N	2° 41.088' W	50.98	58° 7.516' N	2° 41.091' W	51.34	1150.7
ME-H06	ME-H05	58° 7.499' N	2° 41.094' W	51.34	58° 6.908' N	2° 41.097' W	51.94	1150.7
ME-OSP3	ME-H11	58° 9.927' N	2° 39.517' W	49.79	58° 10.540' N	2° 41.067' W	48.74	1947.0
ME-H11	ME-H13	58° 10.557' N	2° 41.064' W	48.74	58° 11.757' N	2° 41.056' W	52.54	2277.7
ME-H13	ME-H14	58° 11.774' N	2° 41.054' W	52.54	58° 12.365' N	2° 41.051' W	48.52	1150.7
ME-H14	ME-H16	58° 12.382' N	2° 41.048' W	48.52	58° 13.581' N	2° 41.040' W	49.81	2277.7
ME-H16	ME-H17	58° 13.598' N	2° 41.037' W	49.81	58° 14.189' N	2° 41.034' W	48.36	1150.7
ME-H17	ME-H18	58° 14.206' N	2° 41.032' W	48.36	58° 14.798' N	2° 41.029' W	48.09	1150.7
ME-H18	ME-I18	58° 14.812' N	2° 41.022' W	48.09	58° 14.798' N	2° 39.472' W	48.88	1567.8
ME-OSP3	ME-J12	58° 9.931' N	2° 39.489' W	49.79	58° 11.122' N	2° 37.904' W	51.66	2875.1
ME-J12	ME-J13	58° 11.139' N	2° 37.901' W	51.66	58° 11.730' N	2° 37.897' W	49.65	1149.8

Cable Route		Start Point			End Point			Route length from J-tube to J-tube (m)
Start	End	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Water Depth (m) LAT	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Water Depth (m) LAT	
ME-J13	ME-J14	58° 11.747' N	2° 37.895' W	49.65	58° 12.338' N	2° 37.891' W	51.59	1150.7
ME-J14	ME-J16	58° 12.355' N	2° 37.889' W	51.59	58° 13.555' N	2° 37.878' W	52.6	2277.7
ME-J16	ME-J17	58° 13.572' N	2° 37.876' W	52.6	58° 14.163' N	2° 37.872' W	48.38	1150.7
ME-J17	ME-K17-OFF	58° 14.177' N	2° 37.866' W	48.38	58° 14.193' N	2° 36.150' W	51.23	1734.3
ME-K17-OFF	ME-K16	58° 14.180' N	2° 36.125' W	51.23	58° 13.558' N	2° 36.295' W	50.99	1238.1
ME-OSP3	ME-K11	58° 9.929' N	2° 39.489' W	49.79	58° 10.513' N	2° 36.356' W	53.25	3382.0
ME-K11	ME-K10	58° 10.500' N	2° 36.331' W	53.25	58° 9.909' N	2° 36.336' W	52.64	1150.7
ME-K10	ME-K09	58° 9.892' N	2° 36.338' W	52.64	58° 9.300' N	2° 36.342' W	52.46	1150.7
ME-K09	ME-L09	58° 9.283' N	2° 36.345' W	52.46	58° 9.282' N	2° 34.792' W	52.58	1664.5
ME-L09	ME-L11	58° 9.286' N	2° 34.765' W	52.58	58° 10.486' N	2° 34.753' W	52.58	2277.7
ME-L11	ME-L12	58° 10.503' N	2° 34.751' W	52.58	58° 11.094' N	2° 34.746' W	51.57	1150.7
ME-L12	ME-L13	58° 11.111' N	2° 34.743' W	51.57	58° 11.702' N	2° 34.739' W	51.7	1150.7
ME-OSP3	ME-J10	58° 9.923' N	2° 39.493' W	49.79	58° 9.919' N	2° 37.941' W	49.99	1680.3
ME-J10	ME-J09	58° 9.905' N	2° 37.916' W	49.99	58° 9.314' N	2° 37.920' W	53.04	1150.7
ME-J09	ME-J08	58° 9.297' N	2° 37.922' W	53.04	58° 8.706' N	2° 37.926' W	51.87	1150.7
ME-J08	ME-J07	58° 8.689' N	2° 37.929' W	51.87	58° 8.098' N	2° 37.933' W	52.21	1150.7
ME-J07	ME-I07	58° 8.094' N	2° 37.960' W	52.21	58° 8.109' N	2° 39.504' W	50.88	1567.9
ME-I07	ME-I06	58° 8.094' N	2° 39.512' W	50.88	58° 7.503' N	2° 39.515' W	51.98	1150.7

Details on cable burial and protection, and results of the cable burial risk assessment will be presented in the Wind Farm CaP. The Moray East ES 2012 considered a Design Envelope which included parameters such as diamond layout, irregular pattern and spacing across the Telford, Stevenson and MacColl Offshore Wind Farms and a minimum spacing of 600 m. This DSLP confirms that the Moray East site will be developed as a single wind farm with a grid layout (and therefore with regular spacing and layout), with a minimum spacing of 1,120 m (see section 3.2.1 above) with a reduced number of WTGs (and therefore reduced the amount of cabling from that considered within the Moray East ES 2012). This DSLP is therefore in line with Moray East's aims to minimise the impacts of the Development on commercial fishing. The information presented within this DSLP and the Wind Farm CaP will inform the CFMS.

4 Design, Specification and Layout – Offshore Transmission Infrastructure

4.1 Introduction

This section of the DSLP details the OSP and export cable design and layout specification as required by the OfTI Marine Licence Condition 3.2.2.6 and the OSP Marine Licence Condition 3.2.2.7 detailed in Table 1-1.

4.2 OSP Layout and Specification

The OfTI Marine Licence Condition 3.2.2.6 and the OSP Marine Licence Condition 3.2.2.7 require that this DSLP includes the following:

> *A plan showing the proposed location of each individual OSP, seabed conditions, bathymetry, confirmed foundation type for each OSP and any key constraints recorded on the Site;*

The location of the three OSPs within the Moray East site are included in Figure 3-1 to Figure 3-5 above.

4.2.1 OSP Foundation Types

Each OSP is supported by a tubular jacket substructure and foundation piles (Figure 4-1). To encourage efficiencies and make best use of Development assets, such as the pile installation template, the jackets have the same three pile position footprint to those used for the WTGs and as described in Section 3.2 above.

The maximum variation in nominal water depth across the three OSP positions is approximately 6 m. To reduce the effect of water depth variation and to reduce fabrication complexity, the bottom part of the jacket structures is kept the same on all positions. However, to account for the water depth variation between the three OSP positions, and keep the same interface elevation and pile stick-up for all positions, three different adapter frames (marked red in Figure 4-1) are positioned on top of the jacket.

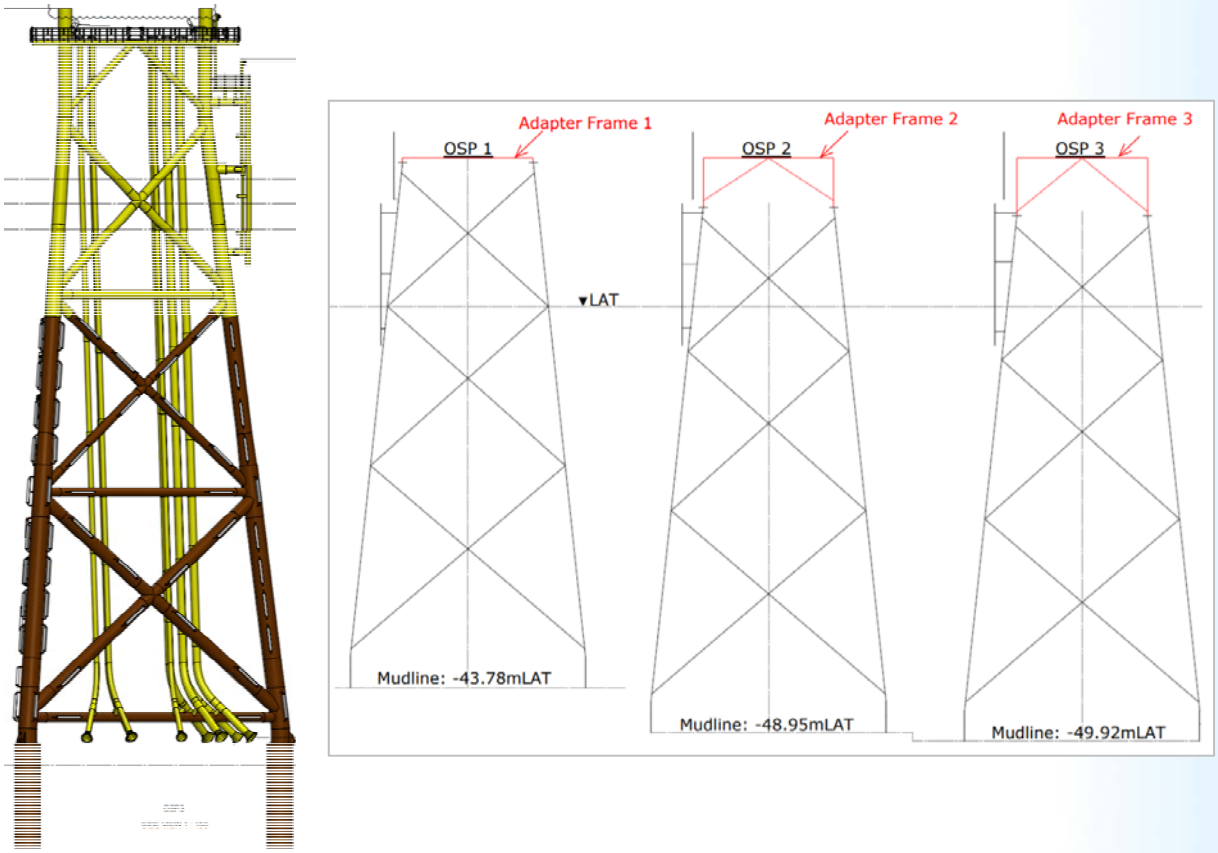

Figure 4-1: Illustration of OSP support structure

4.2.2 Moray East Site Bathymetry and Seabed Conditions

The bathymetry in the area where the OSPs are located is in the middle of the depth range found across the Moray East site and as described under Section 3.2 above (see also Figure 3-1, Figure 3-3 and Table 4-1). The seabed conditions in this area are characterised similarly to those of the wider site as described under Section 3.2, in general dominant seabed sediment varies throughout the Moray East site between sand and gravel. The water depths at the OSP locations (below LAT) are set out in Table 4-1.

4.2.3 Other Spatial Constraints

The constraints that have been taken into account in defining the Moray East Offshore Wind Farm developable area boundaries, within which the OSPs are located, are presented in Section 3.2 above.

4.3 Co-ordinates for OSP Locations

The OfTI Marine Licence Condition 3.2.2.6 and the OSP Marine Licence Condition 3.2.2.7 require that this DSLP includes the following:

> *A list of latitude and longitude co-ordinates accurate to three decimal places of minutes for each OSP, this should also be provided as a geographic information system ("GIS") shape file using WGS84 format;*

The OSPs will be installed, within a permitted 50 m radius micro-siting tolerance, in the locations presented in Table 4-1.

As required by the OfTI Licences consent conditions, GIS shape files with this co-ordinate data accompany this DSLP.

Table 4-1: OSP location co-ordinates (WGS84) and water depths

OSP Identification	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Depth (m) LAT
ME-OSP1	2° 45.830' W	58° 7.546' N	-49
ME-OSP2	2° 44.214' W	58° 13.007' N	-44
ME-OSP3	2° 39.502' W	58° 9.928' N	-50

4.4 OSP Dimensions

The OfTI Marine Licence Condition 3.2.2.6 and the OSP Marine Licence Condition 3.2.2.7 require that this DSLP includes the following:

A table or diagram of each OSP, showing dimensions;

The OSPs are comprised of the OSP topside which sits upon the tubular jacket substructure. The OSP topside arrangement is shown in Figure 4-2 to Figure 4-4 below. Dimensions for the OSPs are provided in Table 4-2 below. A designated area for helicopter winching is located above the 66 kV MV GIS container as shown in Figures 4-3 and 4-4 below.

Table 4-2: Key dimensions of the OSPs

Parameter	Dimension
OSP topside dimensions	33 m (length) x 30.7 m (width) x 26.9 m (height)
Height of OSP jacket	15.7 m above HAT (20.4 m above LAT)
Height of topside	30.3 m above HAT (35 m above LAT)

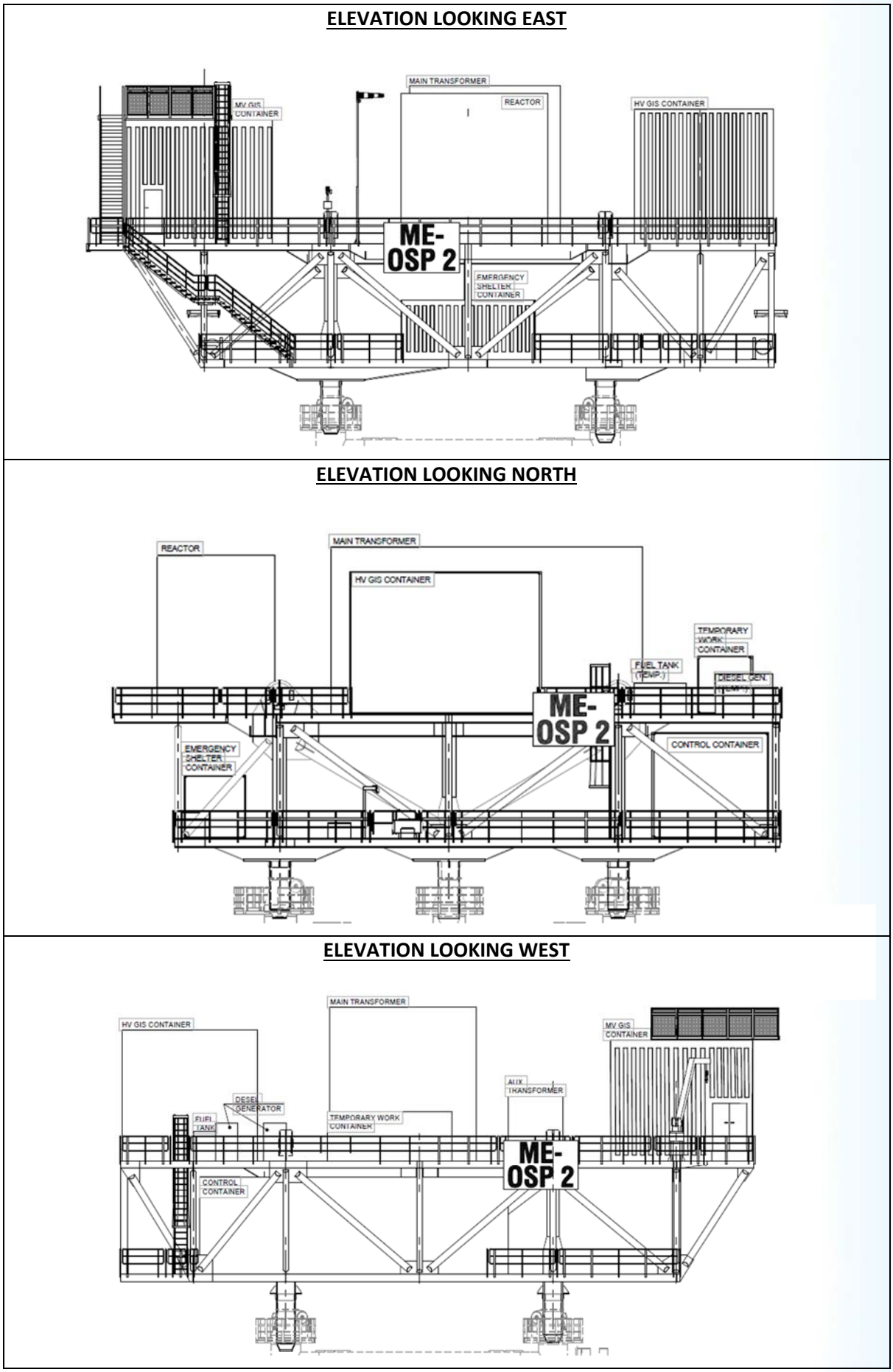

Figure 4-2: OSP general arrangement of topside – side elevation, end elevation and reverse side elevation

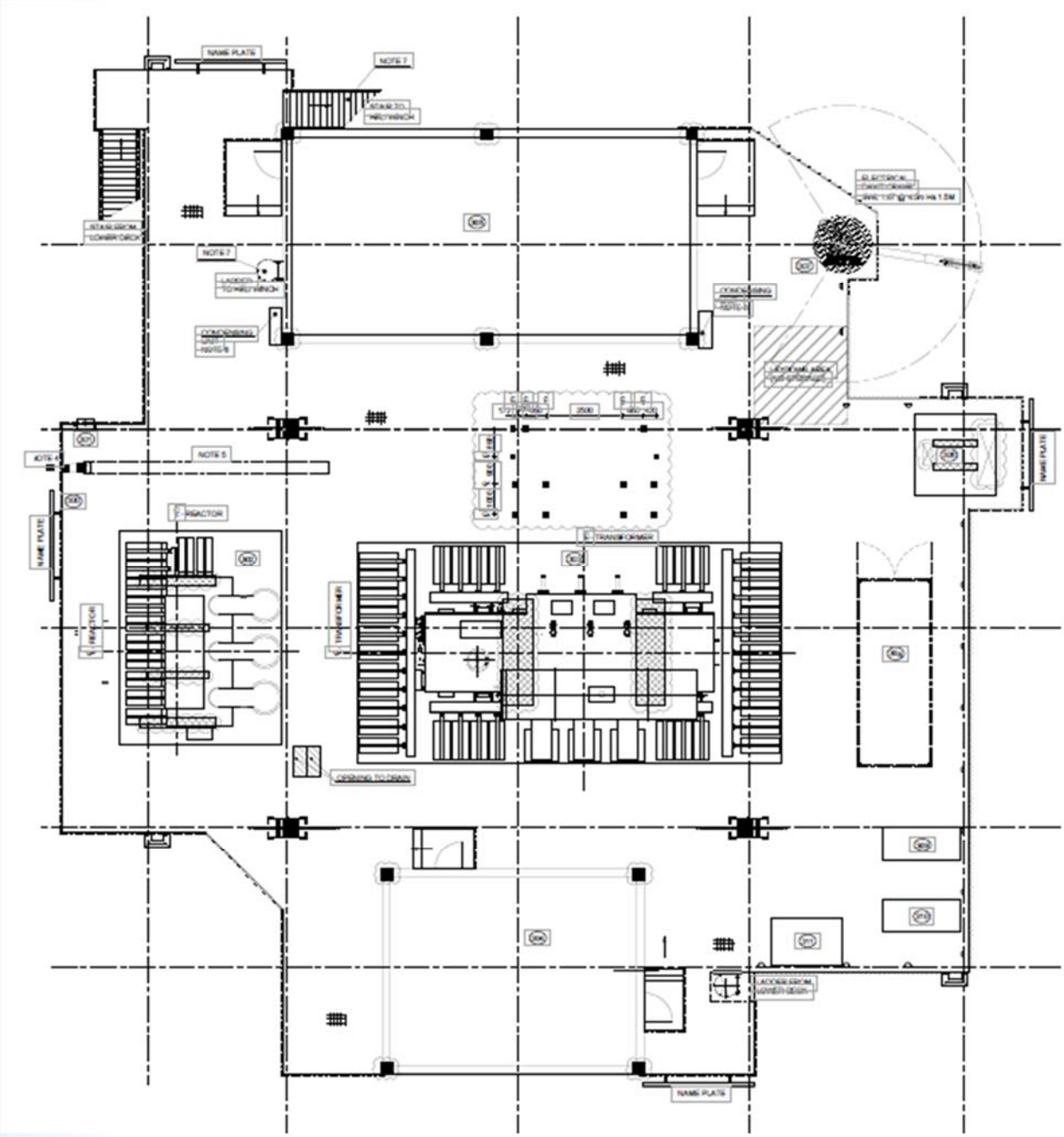

Figure 4-3: OSP general arrangement – plan view of topside upper deck

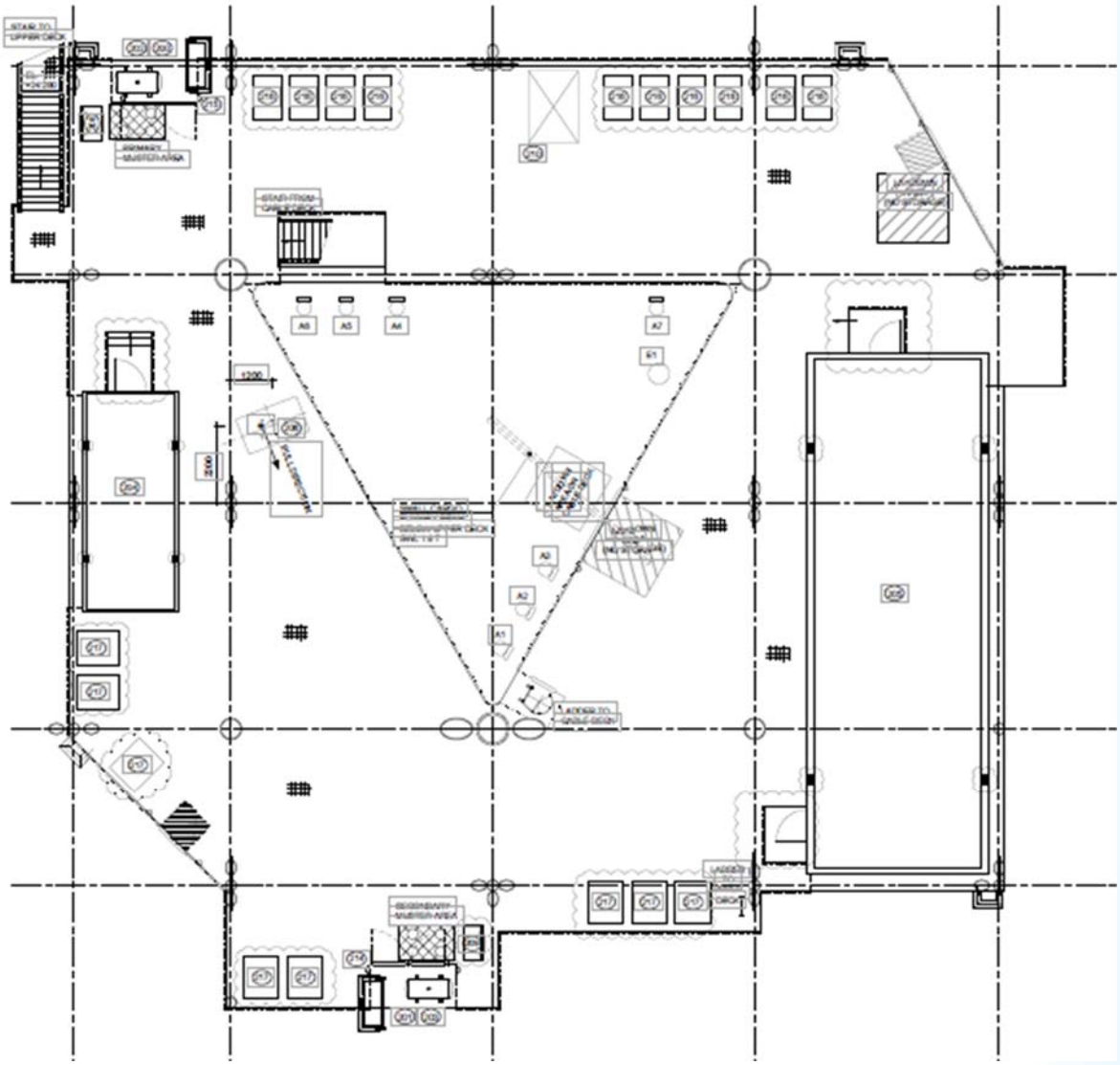

Figure 4-4: OSP general arrangement – plan view of topside lower deck

4.5 OSP Finishes

The OfTI Marine Licence Condition 3.2.2.6 and the OSP Marine Licence Condition 3.2.2.7 require that this DSLP includes the following:

> *The finishes for each OSP;*

The topside of each OSP will be finished in light grey, RAL 7035 (or similar).

To comply with aviation and marine navigation requirements the OSPs will have additional marking which are detailed within the LMP. This includes:

- Jacket substructure (from at least 2 m below LAT) and transition piece will be painted in traffic yellow (RAL 1023).

The LMP should be referred to for full details of WTG marking.

4.6 Length and Proposed Arrangements of Cables

The OfTI Marine Licence Condition 3.2.2.6 and the OSP Marine Licence Condition 3.2.2.7 require that this DSLP includes the following:

> *The length and proposed arrangements on the seabed of all cables.*

This section of the DSLP details the design and layout of the three export cables and the two OSP inter-connector cables.

4.6.1 Export Cables

4.6.1.1 Arrangement and Lengths

The wind farm and OSPs are connected to the onshore transmission works by three alternating current (AC) 220 kV subsea cable circuits, referred to as "export cables" since they export electricity from the Moray East Wind Farm to the onshore transmission infrastructure. The three export cables will be located within the OfTI boundary shown in Figure 4-5, and as defined in the OfTI Marine Licence. The arrangement of the export cables between the OSPs and the onshore transmission infrastructure is shown in greater detail in Figure 4-6 to Figure 4-8.

These three subsea export cables will run from the OSPs within the Moray East site to a landfall location at point at Inverboyndie Bay on the Aberdeenshire coast.

The lengths of the export cables from the OSPs to the boundary of the Moray East site, and the start and end locations of the cables, are set out in Table 4-3 below.

Table 4-3: Export cable arrangements and cable lengths

Layout		Start Point		End Point		Approximate Length (km)
Start	**End**	**Latitude (ddm) WGS84**	**Longitude (ddm) WGS84**	**Latitude (ddm) WGS84**	**Longitude (ddm) WGS84**	
Export Cable 1						
ME-OSP1	Landfall	58° 7.540' N	2° 45.822' W	57° 40.421' N	2° 33.951' W	56.3 km (*c.* 5.4 km within Moray East site)
Export Cable 2						
ME-OSP2	Landfall	58° 13.000' N	2° 44.217' W	57° 40.413' N	2° 33.935' W	63.4 km (*c.* 12.4 km within Moray East site)

Layout		Start Point		End Point		Approximate Length (km)
Start	End	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Latitude (ddm) WGS84	Longitude (ddm) WGS84	
Export Cable 3						
ME-OSP3	Landfall	58° 9.921' N	2° 39.505' W	57° 40.404' N	2° 33.918' W	57 km (*c.* 5.8 km within Moray East site)

The three export cables will be buried where possible within the seabed sediments along their length, or mechanically protected where burial is not possible. At the Inverboyndie landfall, the cables will be installed via three preinstalled horizontal directional drilled (HDD) ducts so as to avoid disturbance to the seabed in the nearshore area.

The final location of the export cables remains subject to possible further micro-siting during installation, and will be set out in the OfTI CaP.

4.6.1.2 Bathymetry and Seabed Conditions

A series of geotechnical, geophysical and benthic surveys have already been completed by Moray East to understand seabed conditions along the OfTI Corridor. Further surveys are currently being undertaken to help define the detailed cable routing and installation methods. Further detail will be provided within the OfTI CaP.

Bathymetry along the OfTI Corridor is highly variable ranging from <10 m mean sea level (MSL) in the shallow inshore area adjacent to the Aberdeenshire coast to approximately 105 m MSL in the Southern Trench, a long deep channel located in the southern part of the outer Moray Firth.

Seabed sediments along the OfTI Corridor are variable, reflecting variability in both the prevailing hydrodynamic conditions and underlying geology. At both the northern end of the offshore export cable route corridor and in the vicinity of the landfall, seabed sediments generally consist of gravelly sands and sandy gravel; fine (silt and clay sized) particles are largely absent. However, seabed sediments become progressively finer in deeper water along the OfTI Corridor, becoming relatively muddy (i.e. sand mud and muddy sand) in the deepest parts, at the western end of the Southern Trench.

4.6.2 OSP Inter-connector Cables

4.6.2.1 Arrangement and Length

Two 66 kV inter-connector cables will connect the three OSPs together and allow a lower level of power to be redirected between OSPs in the event of an export cable or OSP failure. They also allow for back feed power to retain functionality on any affected OSPs.

The total length of the OSP inter-connector cables will be approximately 19.6 km. The total lengths of the OSP inter-connector cables, and the start and end locations of the cables, are set out in Table 4-4 below.

Table 4-4: OSP inter-connector cable arrangements and cable lengths

Layout		Start Point		End Point		Approximate Length (km)
Start	End	Latitude (ddm) WGS84	Longitude (ddm) WGS84	Latitude (ddm) WGS84	Longitude (ddm) WGS84	
ME-OSP1	ME-OSP2	58° 7.549' N	2° 45.817' W	58° 13.003' N	2° 44.224' W	10.3
ME-OSP2	ME-OSP3	58° 13.006' N	2° 44.201' W	58° 9.925' N	2° 39.515' W	9.2

A preliminary arrangement for the OSP inter-connector cables is shown in Figure 4-6. The final location of the OSP inter-connector cables remains subject to possible further micro-siting as will be set out in the OfTI CaP.

4.6.2.2 Bathymetry and Seabed Conditions

The bathymetry in the area close to the OSPs is in the middle of the depth range found across the site as described under Section 3.2 above, varying from approximately 43 m to 50 m (see also Figure 3-1, Figure 3-3 and Table 4-1). The seabed conditions in this area are characterised similarly to those of the wider site as described under Section 3.2, in general dominant seabed sediment varies throughout the site between sand and gravel. There is the potential for subsurface boulders to also be present. Boulders have the potential to hinder seabed burial of the inter-connector cables and as such, boulder clearance will be undertaken prior to cable installation. Boulder clearance methods will be described in the Construction Method Statement (CMS) and the Wind Farm and OfTI CaPs. The water depths at the OSP locations (below LAT) are set out in Table 4-1.

4.6.3 Key Constraints

There are a small number of physical spatial constraints within the Moray East site and along the OfTI Corridor. The constraints that have been taken into account in defining the Moray East Offshore Wind Farm "developable area" boundaries, within which the OSP inter-connector cables are located, these are presented in Section 3.2 above.

There are a small number of additional physical spatial constraints along the export cable corridor. The following constraints have been taken into account in defining the export cable arrangements and layouts, and are shown in Figure 4-6 to Figure 4-8 below:

- A 820 m buffer from the northern boundary of the Moray East site to the adjacent BOWL site (as required under the terms of the Crown Estate Agreement for Leases). Cables within the export cable corridor are not subject to this limitation;
- Plugged or abandoned wellheads have been avoided;
- Features of potential archaeological interest identified by analysis of geophysical and geotechnical survey data have been avoided (see Marine Archaeology Reporting Protocol (MARP) and Written Scheme of Investigation Report for details)[6];
- The location of previously laid cables and/or pipelines have been avoided where possible, although a cable crossing with the Moray-Caithness subsea HVDC cable will still be required. Further details of the cable crossing will be provided in the OfTI CaP;
- Southern Trench area of steep bathymetry; and
- Whitehills to Melrose Coast Site of Special Scientific Interest (SSSI) at the landfall.

In addition to the constraints listed above, the OfTI Marine Licence includes a provision for HDD to install the export cables beneath the Whitehills to Melrose Coast SSSI where the cable makes landfall in order to avoid potential effects on features of geological conservation interest. To avoid affecting designated features of the Whitehills to Melrose Coast SSSI the export cables will be installed via preinstalled horizontal pipes/ducts, beneath the SSSI.

A series of environmental surveys were carried out by Moray East to understand environmental conditions across the OfTI cable route corridor and to identify any environmental sensitivities during the OfTI Environmental Impact Assessment (EIA). The Moray East Modified TI ES 2014 highlighted the

[6] Please note the export cable layout nearshore has changed from that shown in version 2 of the DSLP (dated August 2018) and that archaeological analysis of that section of the export cable is still ongoing. The DSLP and the MARP and WSI report will be updated accordingly with results of this archaeological analysis, however the commitment to avoid features of archaeological interest remains.

presence of habitats of potential nature conservation importance along the cable route corridor (cobble and stony reef (Annex 1 habitat) and muddy sand with seapens and burrowing fauna (Priority Marine Feature habitat)). However, given the small footprint of the cable burial operation and the fact that these habitats are widespread throughout the southern Moray Firth no significant adverse impacts were reported. No specific mitigation was proposed, apart from the use of best practice measures during cable installation (included within the Environmental Management Plan (EMP)).

It should be noted that the routes of the three export cables shown in Figure 4-6 to Figure 4-8 are preliminary and subject to further route engineering. The final export cable routes will be confirmed in the OfTI CaP.

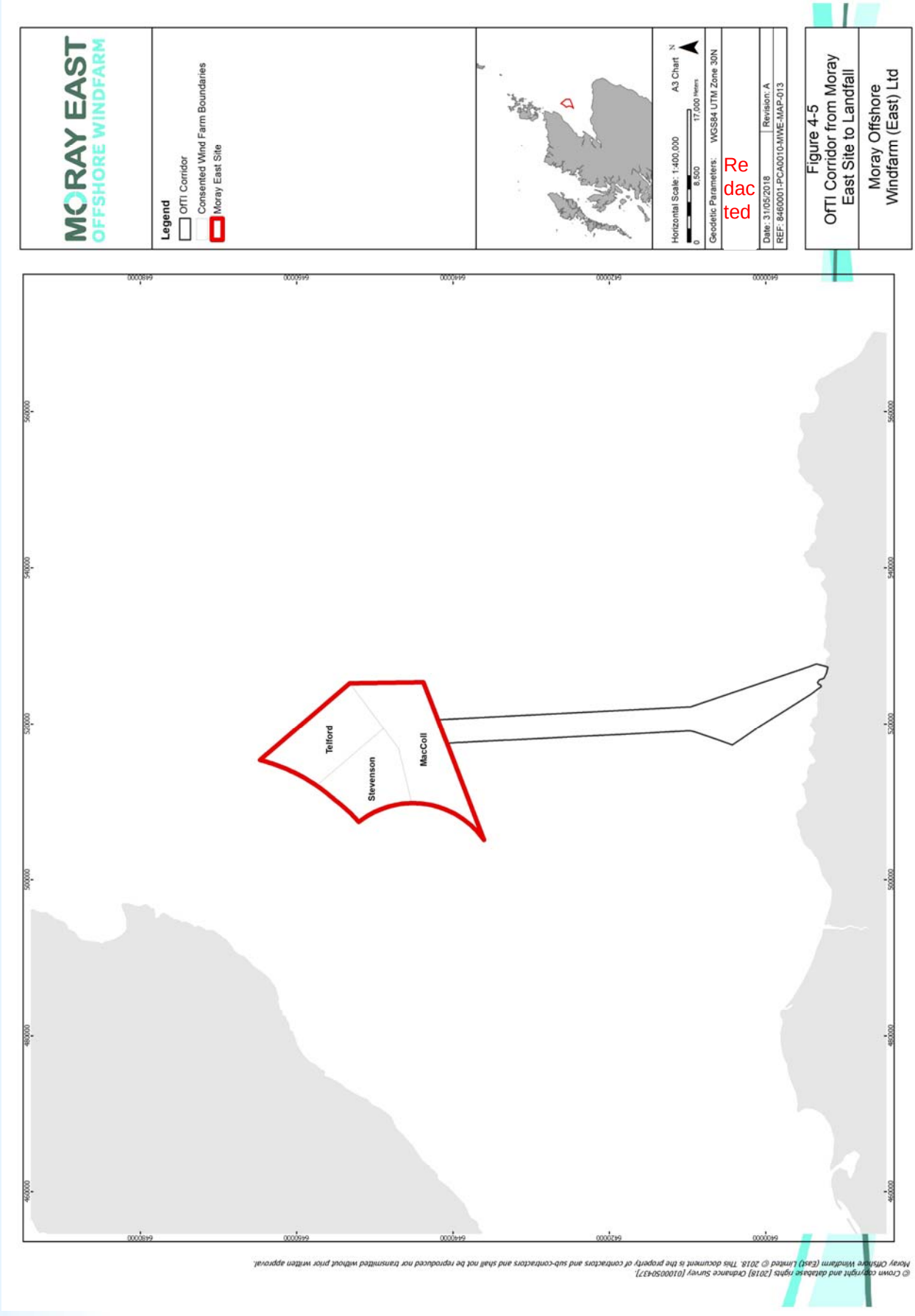

Figure 4-5: Export cable corridor, running from Wind Farm to landfall

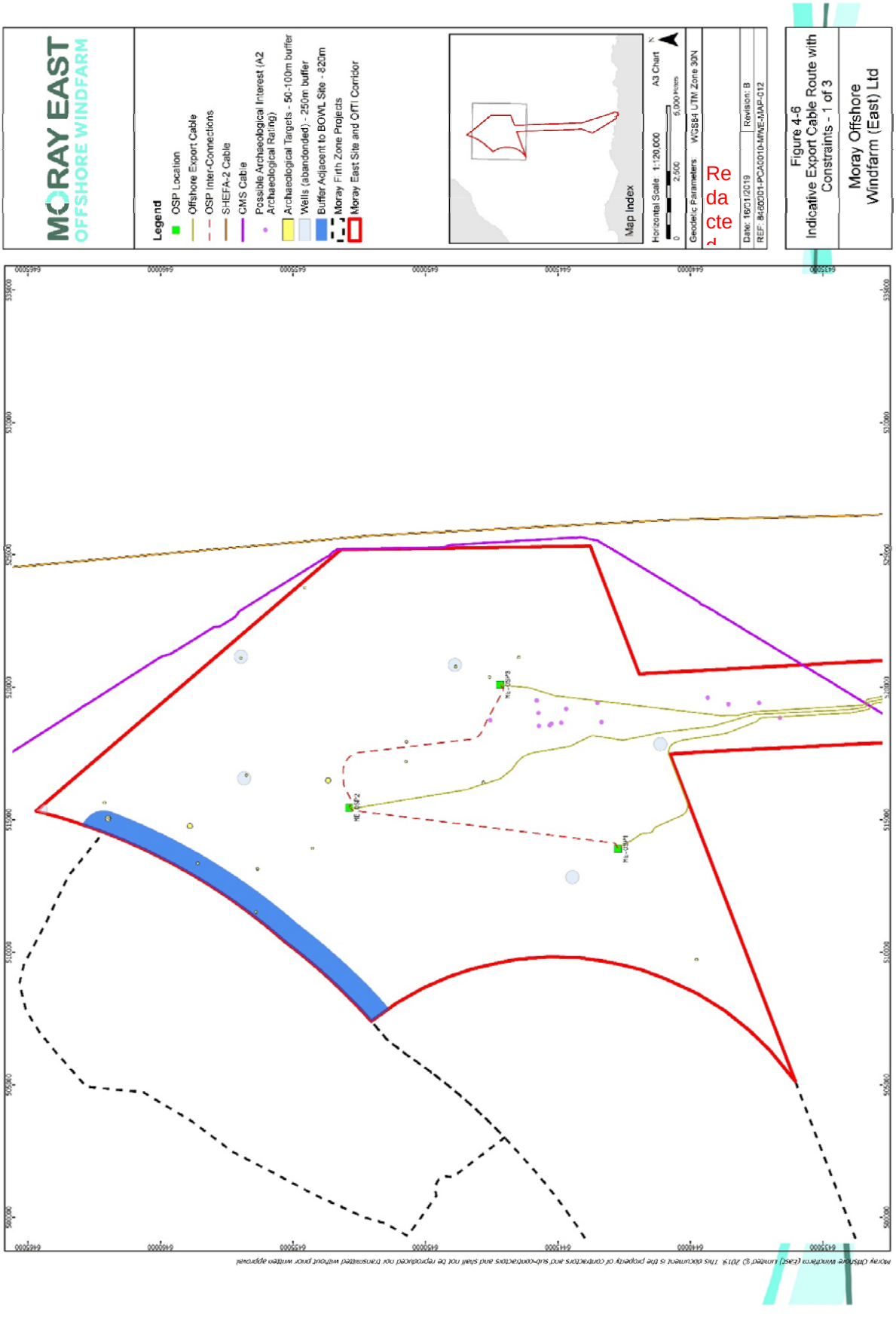

Figure 4-6: Key constraints within the developable area relevant to the export cables and OSP inter-connector cables

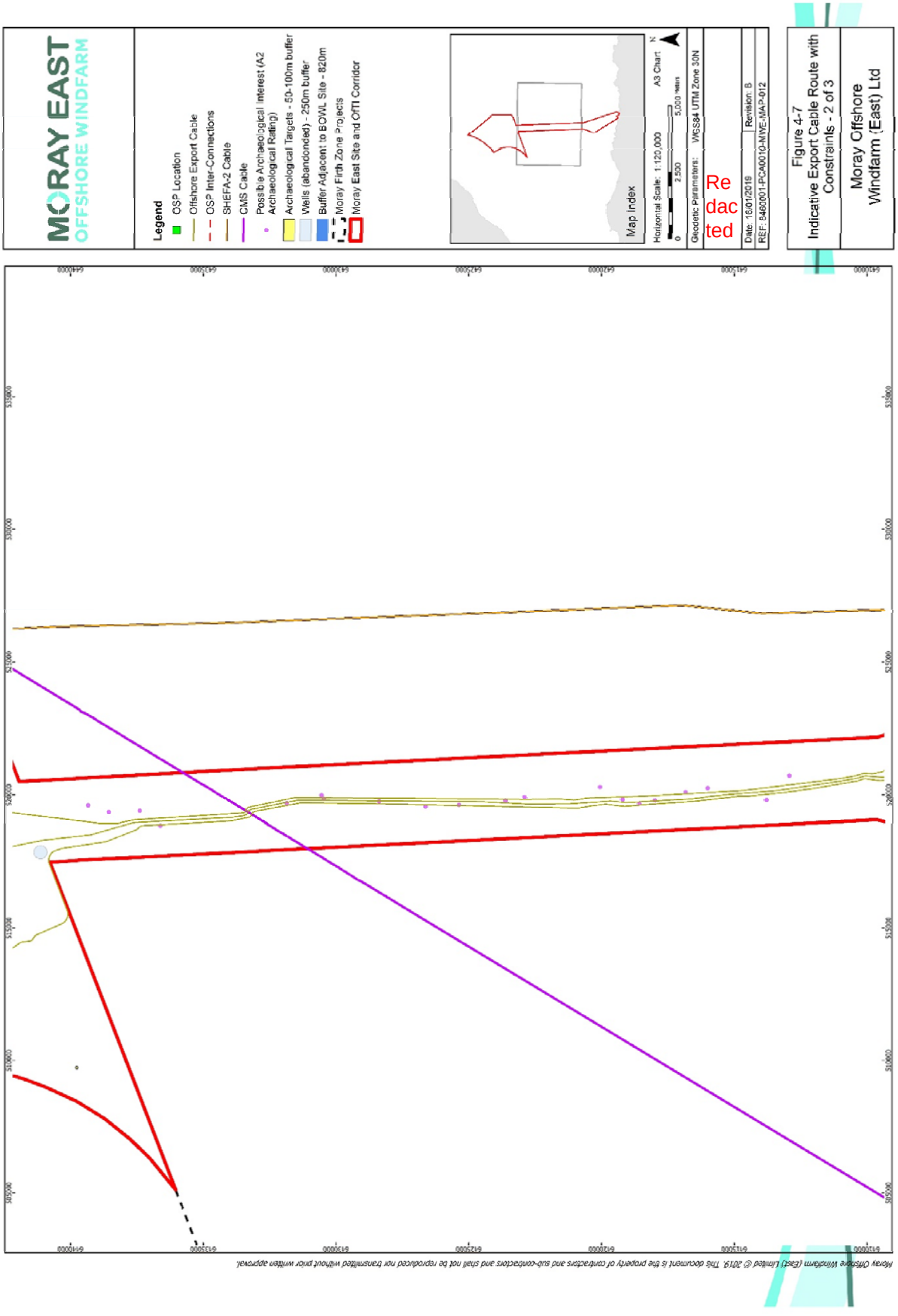

Figure 4-7: Key constraints relevant to the export cables (northern section of export cable corridor)

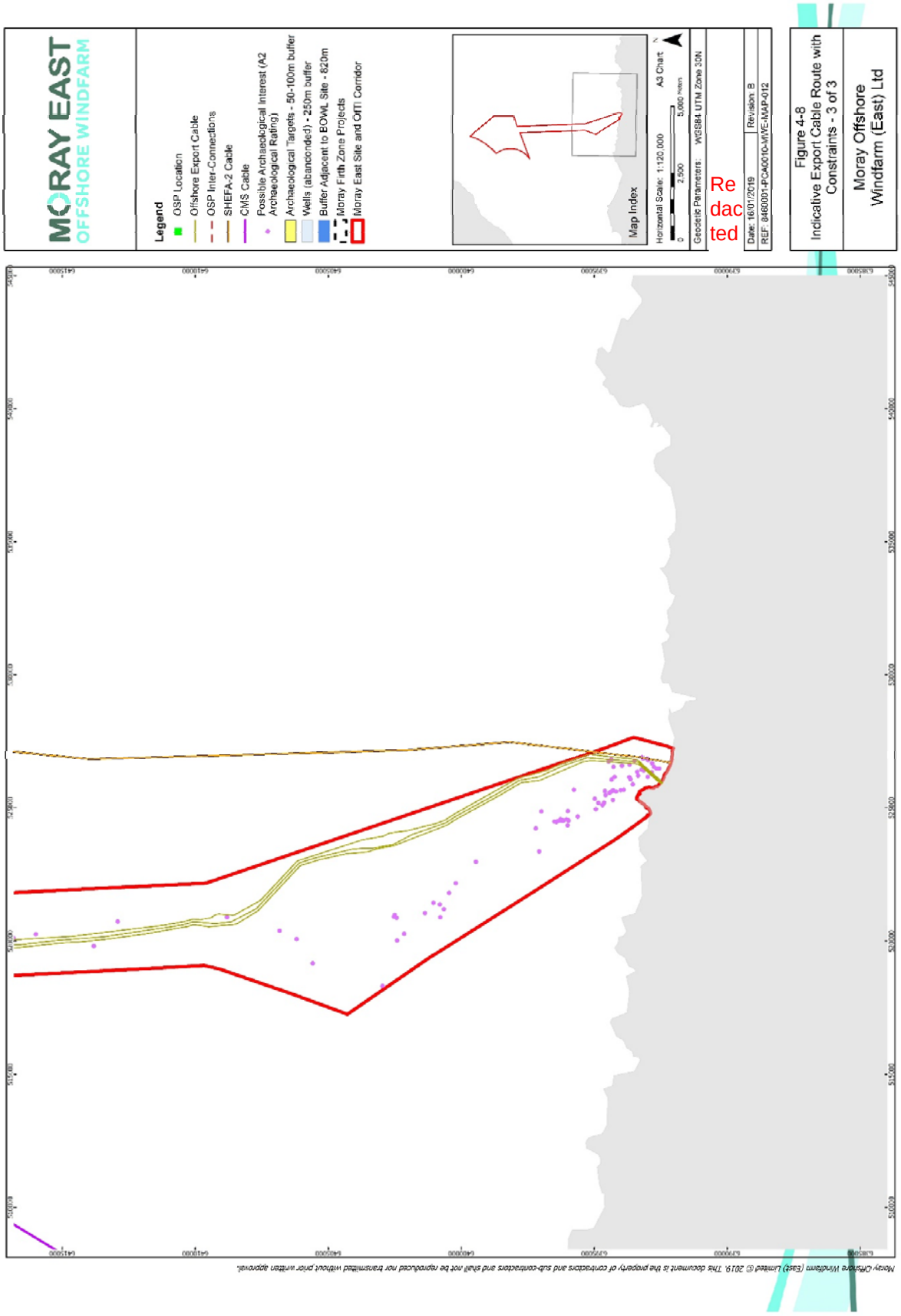

Figure 4-8: Key constraints relevant to the export cables (southern section of export cables corridor)

5 Compliance with the Application

5.1 Introduction

In addition to the consent conditions presented in Table 1-1, Condition 7 of the Section 36 Consents states:

> *The Development must be constructed and operated in accordance with the terms of the Application and related documents, including the accompanying ES, the Additional Ornithological Information and Annex 1 of this letter, except in so far as amended by the terms of this section 36 consent.*

Sections 5.2 and 5.3 below set out information from the Moray East ES 2012 / Moray East Modified TI ES 2014 with regard to:

- Compliance with the specification and layout assessed; and
- Delivery of the stated design-related mitigation.

5.2 Compliance with the Specification and Layout Assessed in the Moray East ES 2012 and Moray East Modified TI ES 2014

The Moray East ES 2012 and Moray East Modified TI ES 2014 described a range of specification and layout options that could be applied during the design, construction and operational life of the Development. This took the form of a Design Envelope incorporating a number of options.

Since the Section 36 Consents and OfTI Licences were originally granted, the design of the Development has been substantially refined to that described in this DSLP (and in other relevant Consent Plans). In order to demonstrate compliance of this refined design, Appendix 1 provides a tabulated comparison of project design parameters as presented in the Moray East ES 2012 and Moray East Modified TI ES 2014 and this DSLP and how they were used in the context of the EIAs.

5.3 Delivery of Design-related Mitigation Proposed in the Moray East ES 2012 and Moray East Modified TI ES 2014

The Moray East ES 2012 and Moray East Modified TI ES 2014 detailed a number of mitigation commitments specific to the design of the Development. Measures are presented in full in Appendix 2, which also identifies where each commitment has been addressed within the DSLP.

6 Updated Scour Protection Dimensions

Since submission of the previous version of the DSLP (version 2 dated August 2018) a significant amount of design engineering has been carried out on the requirement for scour protection around WTG and OSP foundations. Although the requirement for scour protection had not been identified in version 2 of the DSLP, detailed analysis of seabed conditions and design of pile foundations identified that scour protection will be required to ensure structural integrity those identified assets. Table 6-1 below provides a comparison of the Moray East ES 2012 and the Modified TI ES 2014 assessments (taking into account the consented design parameters) and the proposed scour protection parameters for the Moray East Offshore Wind Farm and OfTI. It should be noted that it is assumed scour protection will be required around all the OSPs, but only likely to be required for up to ten WTGs.

Table 6-1 Parameters relevant to the scour protection assessments

Relevant Parameter	Consented Parameters		Revised Parameters	
	WTGs	OSPs	WTGs	OSPs
Scour protection dimensions per foundation (including piles)	16 m diameter x 4 piles	16 m diameter x 4 piles	Area as per Figure 6-1	Area as per Figure 6-1
Scour protection area per foundation, including piles (m^2)	804	1,206	1,700	1,700
Total Wind Farm / OfTI scour protection area, including piles (m^2)	149,588 (186 WTGs)	2,413 (2 OSPs)[7]	17,000[8] (10 WTGs)	5,100 (3 OSPs)
Worst Case Scenario (WCS) scour protection area per foundation, including foundations (m^2)	7,088[9]	7,539[10]	1,700	1,700
WCS total Wind Farm / OfTI scour protection area, including foundations (m^2)	14,338,368 (186 WTGs)	15,078 (2 OSPs)	17,000[8] (10 WTGs)	5,100 (3 OSPs)
Worst case scenario for Moray East site (WTGs and OSPs) (m^2)	**14,353,446**		**22,100**	

[7] The presence of scour protection was only assessed for the OSPs covered under the OfTI Marine Licence. No scour protection was considered required for the OSP covered under the OSP Marine Licence.
[8] The design work for the WTG scour protection is still ongoing. It is considered it will be a similar design to the OSP scour protection and it is currently considered that no more than ten WTG will require scour protection.
[9] The WCS on WTG foundation type with regards to permanent habitat loss (as assessed within the Moray East ES 2012) was the gravity base structure (GBS) foundation plus scour protection. The dimensions of the GBS WCS including scour protection was assessed as 95 m diameter.
[10] The WCS on OSP foundation type with regards to permanent habitat loss (as assessed within the Moray East ES 2012) was suction caisson foundations plus scour protection. The dimensions each suction caisson including scour protection was assessed as 40 m diameter. Each foundation would have up to six suction caissons.

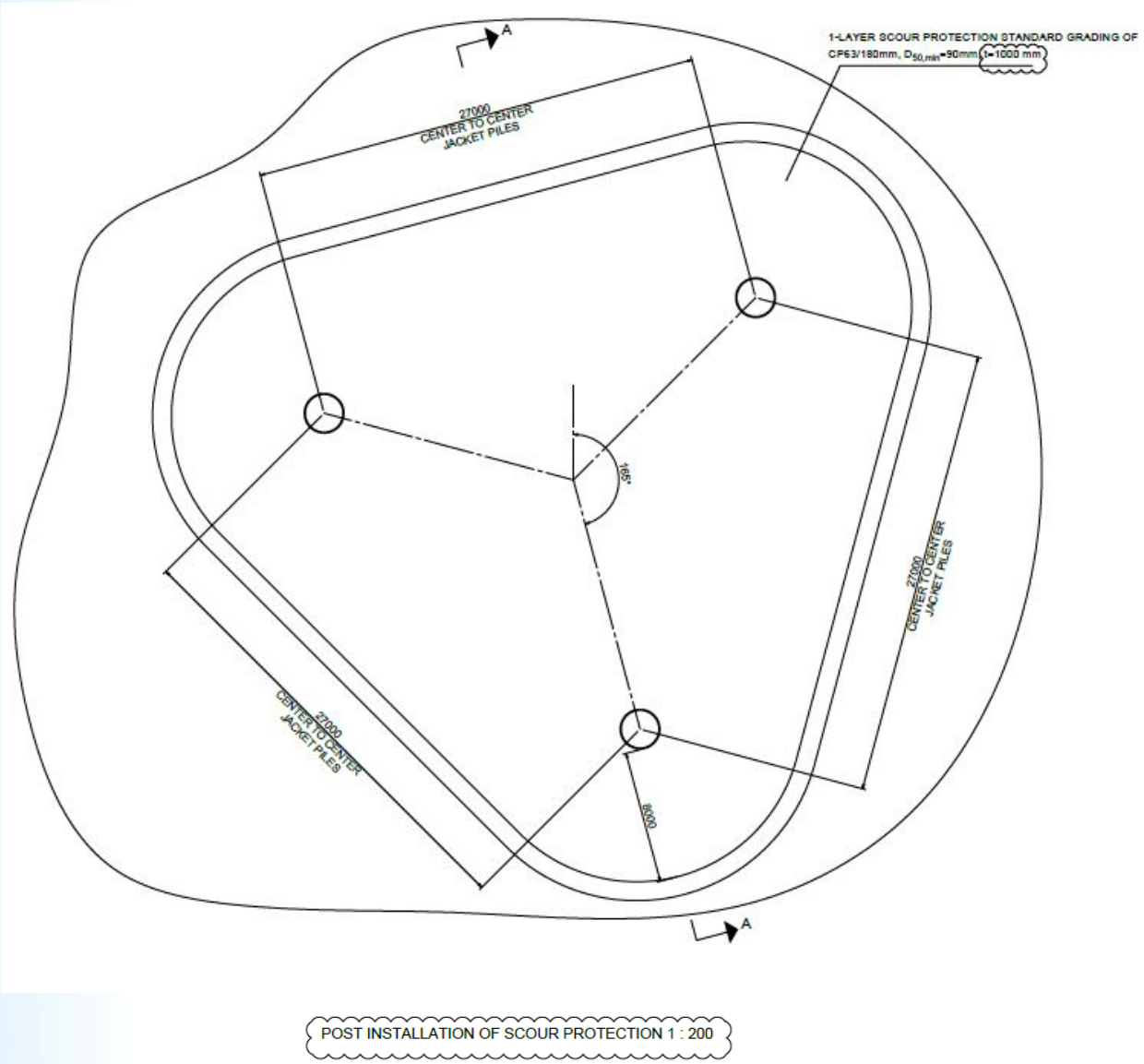

Figure 6-1: Scour protection design

As can be seen from Table 6-1 above, and despite a slight increase in the individual scour protection dimensions around piles in the current design, the revised scour protection parameters are within the consented parameters for scour protection for the WTGs (14,338,368 m^2 consented vs 17,000 m^2 for the final design) and OSPs (15,078 m^2 consented vs 5,100 m^2 for the final design). Therefore, it can be concluded no change in the assessment conclusions made in the Moray East ES 2012 and Modified TI ES 2014.

As noted above only a small number of substructures are likely to require scour protection. Moray East has not applied for 50 m safety zones around the WTG or OSPs during the operational phase of the Wind Farm, however the scour protection will be placed around the substructures (within approximately 10.4 m of the piles) and it is assumed no fishing will take place within this distance to the structures. Although Moray East did not apply for operational safety zones around the WTGs or OSPs, mandatory 500 m safety zones will be applied around all “major maintenance” work being undertaken.

Appendix 1 Comparison of ES/Modified TI ES Rochdale Envelope and DSLP Design Parameters

Table 1: Wind Farm Consented Design Parameters and Final Design Parameters

Parameter	Consented Parameter Range	Final Design Parameter
Wind Turbine Generators (WTGs)		
Number in MacColl Number in Telford Number in Stevenson	62 WTGs 62 WTGs 62 WTGs	46 WTGs 24 WTGs 30 WTGs
Rating	6-10 MW (as varied)	9.525 MW
Hub height (LAT)[11]	97 – 118 m	113 – 117 m
Maximum tip height (HAT)[11]	204 m	199 m
Rotor diameter	6 MW model – 150 m to 155 m 7 – 10 MW model – up to 172 m	164 m
Blade width range	6 MW model – 5.5 m 7-10 MW model – 5.8 m	5.4 m
Minimum air draft (at LAT)[11]	22 m	31 m
Rotational speed range	6 MW model – 4 to 13 rpm 7-10 MW model – 4.2 to 12.8 rpm	6.5 – 12.8 rpm
Spacing Downwind Crosswind	 1,200 – 1,720 m 1,050 – 1,376 m	 1,547 m 1,128 m
Substructure & foundation for WTGs: **Concrete gravity base foundations with ballast and a gravel / grout bed**		
Work platform size (at base on turbine)	45 x 45 m	N/A [GBS not selected]
Base width	65 m	N/A [GBS not selected]
Gravel / grout bed diameter	75 m	N/A [GBS not selected]
Excavated bed + scour protection diameter	95 m	N/A [GBS not selected]
Maximum dredger affected diameter	125 m	N/A [GBS not selected]
Maximum bed excavation depth	5 m	N/A [GBS not selected]
Maximum gravel bed depth	2.5 m	N/A [GBS not selected]

[11] Please note difference between LAT and HAT is considered to be approximately 4.7 m.

Parameter	Consented Parameter Range	Final Design Parameter
Substructure & foundation for WTGs: Steel lattice jackets with pin piles		
Jacket base width	60 m	30 m
Number of legs / piles	3 – 4	3
Maximum diameter of piles	2.5 m	2.5 m
Maximum length of piles	60 m	60 m
Maximum number of simultaneous piling events	6 (2 simultaneous piling events per wind farm)	2 (for the whole of the Moray East site)
Maximum scour protection around each leg plus pile diameter	16 m	As per Figure 6-1 (please see Section 6 above for details)
Inter-array cabling		
Indicative number of strings per site	7–12	15 across the three sites (i.e. across the whole Moray East Offshore Wind Farm)
Capacity of each string	Up to 80 MW (as varied)	up to 66.675 MW[5]
Configuration of strings	Branched or looped	Branched
Voltage of cabling	33 or 66 kV	66 kV
Entry / exit method to WTGs and OSPs	J–tube	J-tube
Target burial depth in seabed	1 m	Provided within the Wind Farm CaP
Protection where burial not achieved	Rock placement, concrete mattresses / concrete tunnels / grout bags, Proprietary steel / plastic ducting / protecting sleeves.	Provided within the Wind Farm CaP.
Meteorological Mast		
Number to installed as part of the proposed project	1	N/A [no additional met mast to be installed]
Meteorological Mast: mast style and substructure & foundation		
Option 1 – Steel lattice met mast on a monopile	- Indicative diameter of monopole = 4.5 m - Mast tip height at LAT = up to 110 m	N/A [no additional met mast to be installed]
Option 2 – Steel lattice met mast on a ballasted concrete gravity base with gravel / grout bed	- Dimensions are expected to be no greater than those of the gravity base for a WTG - Mast tip height at LAT = up to 110 m	N/A [no additional met mast to be installed]
Option 3 – Steel lattice met mast on a steel lattice jacket with pin piles	- Dimensions are expected to be no greater than those of the jacket substructure for a WTG	N/A [no additional met mast to be installed]

Parameter	Consented Parameter Range	Final Design Parameter
	- Mast tip height at LAT = up to 110 m	
Option 4 – LIDAR on a floating spar with moorings which are weighted or anchored to the seabed	- Indicative spar diameter = 1-2 m - Indicative spar height from top to bottom = c. 35 m - Indicative work platform diameter = 3 m - Indicative height above sea level = 10 m	N/A [no additional met mast to be installed]

Table 2: OfTI Consented Design Parameters and Final Design Parameters

Parameter	Consented Parameter Range	Final Design Parameter
AC OSPs		
Maximum number required	2 AC OSPs or 4 distributed OSPs (as per the OfTI Licences)	3 distributed OSPs
Indicative topside width x length	100 m x 100 m	33 m (width) x 30.7 m (length)
Indicative maximum height above LAT	70 m	35 m
Substructure & foundation for OSPs: **Steel lattice jackets with pin piles or suction caissons; or** **Steel lattice jack–up with pin piles or suction caissons**		
Jacket base width	Up to 100 m	30 m
Number of legs (Jacket) and foundations: piles / suction caissons	Up to 6 legs with 6 piles / 6 suction caissons	N/A
Number of legs (Jack up) and pile foundations	4 legs with 16 piles in total	3 legs with 3 piles in total
Maximum diameter of piles	3 m	2.5 m
Length of piles	60 m	60 m
Scour protection around each leg plus pile diameter	16 m	As per Figure 6-1 (please see Section 6 above for details)
Diameter of suction caissons	20 m	N/A
Scour protection around each leg plus suction caisson diameter	40 m	N/A
OfTI cabling within the three consented wind farm areas		
Voltage	220 kV	220kV (offshore export cables) and 66kV (OSP-OSP inter-connector cables)
Maximum length (including inter-platform cabling)	70 km	Provided within the Wind Farm CaP and OfTI CaP.
Export cabling (offshore)		
Cable configuration	12 cables in four triplecore (offshore) arrangements	3 cables each in triplecore (offshore) arrangement
Cable bundle separation distance	4 x water depth	Provided within OfTI CaP

Parameter	Consented Parameter Range	Final Design Parameter
Voltage of cabling	220 kV (AC)	220kV
Entry / exit method from OSPs	J–tube	J-tube
Target burial depth in seabed	1 m	Provided within OfTI CaP.
Protection where target burial not achieved	Concrete mattresses or rock placement	Where the minimum Depth of Lowering (DoL) cannot be achieved, then appropriate means of additional protection will be employed. Likely protection measure will be rock placement. Further details provided within OfTI CaP.
Trench affected width	6 m per cable	Provided within OfTI CaP.
Cable corridor length (from three consented wind farm areas)	Approximately 52 km	Approximately 52 km (cable length within corridor to be confirmed within CaP)
Cable corridor width	Up to 1,200 m	Up to 1,200 m (further details provided within OfTI CaP)

Appendix 2 ES and Modified TI ES Mitigation Commitments

Source	Chapter	Details of Commitment	Section in DSLP
Moray East ES 2012	Appendix 1.3 A – Draft EMP	Wind farm infrastructure will not be sited within 50 m of existing abandoned well heads	3.2.5
Moray East ES 2012	Archaeology and Visual Receptors, Appendix 1.3 A – Draft EMP	Where cultural heritage assets may potentially be subject to direct or secondary effects, infrastructure will be micro–sited and temporary exclusion zones will be implemented during construction and operation and maintenance to prevent invasive activities, such as WTG and cable installation and maintenance, and anchoring or deployment of jack–up legs. Exclusion zones of at least 100 m will be established around sites identified as being of high sensitivity in this assessment (HW 1001, 1002, 1004, 157; 158 and 159); while an exclusion zone of a minimum 50 m will be established around those of medium sensitivity (HW1014, 1015, HW 36; 44; 52; 61; 71; 72; 73; 74; 75; 76; 77; 78; 80; 100; 102; 108, 117,1015 and 1016). As per construction, decommissioning activities will avoid cultural heritage assets through the implementation of temporary exclusion zones. In order to mitigate the risk of damage to any previously unrecorded archaeological remains, a WSI and PAD will be employed during decommissioning.	3.2.5
Moray East ES 2012	Commercial Fisheries	All infrastructure installed during the construction phase will be marked and lit, in line with standard industry practice.	3.2.2, 4.5
Moray East ES Modified TI ES 2014	Archaeology and Cultural Heritage	In view of their potential archaeological significance, development exclusion zones will be placed around WA 2000-2008. Although these receptors have been classified as ”Dead” or have substantial positional uncertainties, remains may still be present; either fragmentary or buried within the modified OfTI ASA. A minimum exclusion zone of 50 m around each of these receptors will be implemented, pending further clarification on the presence or not of any remains through the assessment of the marine geophysical data. The WSI will also set out Exclusion Zones in relation to the OSPs located within the consented wind farm area in cognisance with the baseline previously assessed (MORL ES, 2012).	4.6.3
Moray East ES Modified TI ES 2014	Archaeology and Cultural Heritage	It is proposed that all exclusion zones will be marked on the scheme masterplans, including contract documents. The final modified OfTI will take account of these buffers, which may evolve as the project progresses subject to scheme design and survey requirements. If effects cannot be	4.6.3

Source	Chapter	Details of Commitment	Section in DSLP
		avoided measures to reduce, remedy or offset disturbance will be set out in a Written Scheme of Investigation (WSI) agreed with HS as outlined below.	
Moray East OSP ER 2017	Introduction	Although the number of OSPs is higher than the original permitted design, the actual footprint and overall design parameters of four distributed OSPs are still within the original project parameters assessed in 2014 for the two AC OSPs. This is on the assumption that the two OSPs permitted under the modified OfTI ML 2014 are no larger than the two OSPs for which consent is sought under the current ML application.	4.4, Appendix 1
Moray East OSP ER 2017	Project Envelope	In terms of the Modified OfTI ML 2014 the two AC OSPs can be installed within any of the Telford, Stevenson and MacColl offshore wind farm sites. The two additional distributed OSPs would also be located within the same area.	4.3 (total number of OSPs subsequently refined to 3)

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