DG500 Project

Decommissioning Plan

DG500-MNT-520-PLN-0003

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Note: Revision History only required for critical updates in A-revisions, and for all updates on B-revisions.

Document Holds

Section	Hold Description	By
Ch. 11	Project Management and Verification	PaPo

Note: All Holds shall be clearly marked with [Hold] in the document.

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1 EXECUTIVE SUMMARY

This Decommissioning Plan (DP) has been prepared by Minesto UK Ltd.

Article 60 of UNCLOS sets out countries' requirements in respect of abandoned or disused installations or structures in the Exclusive Economic Zone (EEZ):

> "Any installations or structures which are abandoned or disused shall be removed to ensure safety of navigation, taking into account any generally accepted international standards established in this regard by the competent international organisation. Such removal shall also have due regards to fishing, the protection of the marine environment and the rights and duties of other States. Appropriate publicity shall be given to the depth, position and dimensions of any installations or structures not entirely removed."

Considering DECC's commitments under UNCLOS, and taking account of the IMO standards as well as the work of OSPAR, it is generally accepted that the 'ideal' decommissioning programme involves removing the whole of all disused installations and structures.

The essential features of the proposed decommissioning programme is the complete removal of the DGU unit and all associated components, and anticipates being a relatively straightforward procedure. The DGU unit, tether, bottom joint and foundation will be removed using several installation/decommissioning vessels and ROV, and subsequently transported to shore. The decommissioning process will follow the same relative sequence used in construction, but in reverse and follow standard industry guidance/practices. In regard to the suggested waste hierarchy, the disused installation components will therefore be removed and subsequently taken back to land for re-use, or recycled, incinerated with energy recovery, or disposed at a licensed site. However, in given circumstances, alternative solutions can be proposed, therefore the decommissioning measures have been assessed against these guiding principles:

- Safety for all at all times;
- Consideration of the rights and needs of legitimate users of the sea;
- Minimise environmental impact;
- The 'polluter pays' principle;
- Sustainable development;
- Maximise the reuse of materials;
- Commercial viability; and
- Practical integrity.

A summary of the proposed decommissioning measures is below.

Component	Proposed Decommissioning Measure
DGU – (DG500 Tidal Kite)	Complete removal
Tether	Complete removal
Gravity Base foundation	Complete removal
Connector	Complete removal
Umbilical	Complete removal
MGS Buoy	Complete removal
Pre-moored anchor spread	Complete removal

Table 1.1. Summary of proposed decommissioning measures

The Decommissioning Programme will be reviewed at regular intervals throughout the operational lifetime of the project to ensure that the details and measures are up-to-date, use best practice and are fit for purpose against current legislation and guidance.

The Decommissioning Programme will include the assessment of the proposed measures against the findings of the EIA. If, and when, new technology techniques and environmental information becomes available, these will be incorporated into the assessment.

The measures proposed emphasise a high regard for health and safety and protection of the marine environment. Minesto is committed to minimising the amount of waste material that has to be disposed of from decommissioning the of the Project, with due regard to the waste hierarchy.

Following decommissioning, Minesto will ensure that the seabed is clear of any debris or components that would cause a risk to navigation, the environment or other users of the sea. Minesto is committed to restoring the site, as far as reasonably practicable, to the condition prior to construction.

In order that legitimate marine users are not significantly impacted by the decommissioning activities, Minesto proposes an early and comprehensive consultation process. The decommissioning programme consultation process will begin during the pre-construction period and continue during review processes for this document prior to decommissioning commencing.

Costs and details of financial security arrangements for the decommissioning project are provided by Minesto in confidential appendices to DECC. Before subsequent stages are constructed, the Decommissioning Plan will be reviewed and costs and financial securities provided for that stage.

2 GLOSSARY

AA	Appropriate Assessment
AfL	Agreement For Lease
AHTS	Anchor Handling Tug Support
AIS	Automatic Information System
ALARP	As Low As Reasonably Practicable
AtoN	Aids to Navigation
BPEO	Best Practical Environmental Option
CCTV	Closed Circuit Television
CIfA	Chartered Institute for Archaeologists
COLREGS	Collision Regulations
DECC	Department of Energy & Climate Change
DGU	Deep Green Utility
DSC	Digital Selective Calling
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
ERCOP	Emergency Response Cooperation Plan
ES	Environmental Statement
FLOWW	Fishing Liaison with Offshore Wind and Wet Renewables (Group)
GATHER	Gwynedd Archaeological Trust Historic Environment Record
GBS	Gravity Base Structure
GVA	Gross Value Added
H_S	Significant Wave Height
HRA	Habitats Regulations Assessment
IALA	International Association of Lighthouse Authorities
IMO	International Maritime Organisation
ITT	Invitation To Tender
INNS	Invasive Non-Native Species
LARS	Launch and Recovery System

MBES	Magnetometer and Multibeam Bathymetry
MCA	Maritime and Coastguard Agency
MCAA	Marine & Coastal Access Act (2009)
MGS	Micro Grid System
MMO	Marine Management Organisation
MW	Megawatt
MWD	Mean Wave Direction
nm	Nautical Mile
NMRW	National Monuments Records of Wales
NRA	Navigational Risk Assessment
NRW	Natural Resources Wales
NtoM	Notices to Mariners
OSPAR	Oslo/Paris convention (for the Protection of the Marine Environment of the North-East Atlantic)
PDA	Project Development Area
PTO	Power Take Off
QHSE	Quality, Health, safety & Environment
ROV	Remotely Operated Vehicle
SAR	Search and Rescue
SAC	Special Area of Conservation
SBP	Sub-bottom Profile
SOLAS	Safety of Life at Sea
SPA	Special Protection Area
SPR	Subsea Riser Products Ltd.
SSS	Sidescan Sonar
T_Z	Zero Crossing Wave
TCE	The Crown Estate
UNCLOS	United Nations Conference on the Law of the Sea
UKHO	United Kingdom Hydrographic Office
UXO	Unexploded ordnance
VHF	Very High Frequency

WADZ	West Anglesey Demonstration Zone
WGS 84	World Geodetic System 1984
WSI	Written Scheme of Investigation

3 INTRODUCTION

3.1 Minesto UK Ltd.

Minesto is a marine energy technology company founded in 2007 whose majority owners comprise BGA Invest and Midroc New Technology. Minesto's headquarters is in Gothenburg, Sweden, and the company also has offices in Portaferry on the edge of Strangford Lough, Northern Ireland, and in Anglesey, North Wales.

Minesto has developed a unique, award winning technology for cost efficient electricity generation from low velocity tidal and ocean currents, known as Deep Green. The full scale tidal power plants, known as Deep Green Utility (DGU) units, resemble underwater kites made up of a wing with a small turbine attached to its underside, tethered to a foundation fixed to the seabed. See Figure 3.1 below for Site Creation Overview.

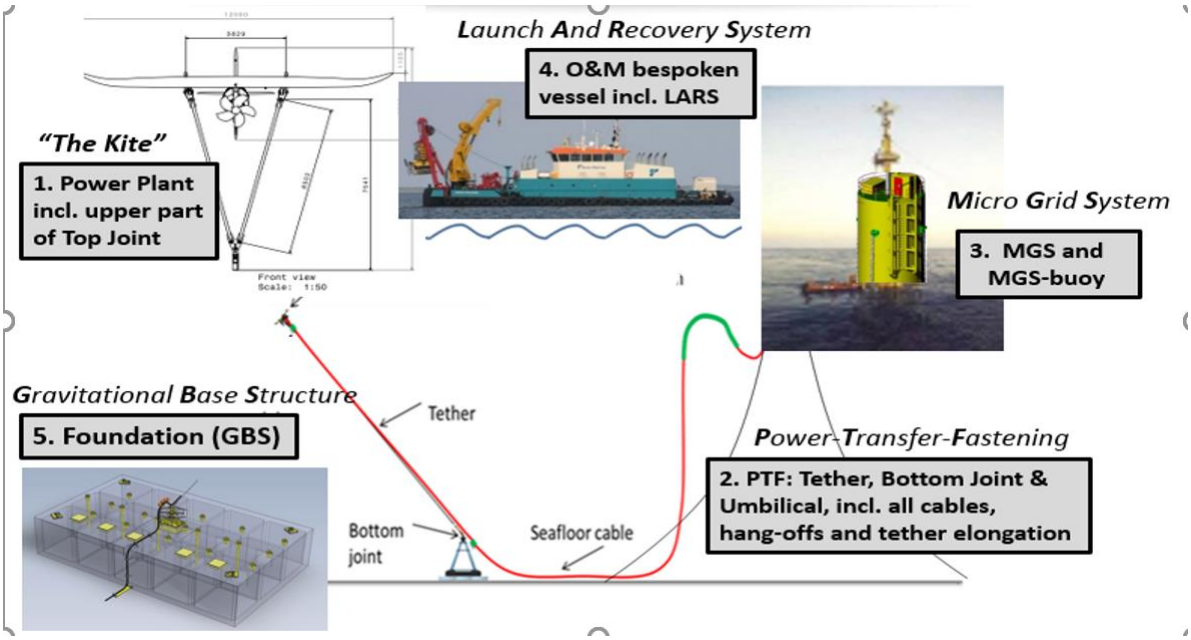

Figure 3.1 Site Creation Overview

The technology takes advantage of hydrodynamic lift created by the wing as water current flow moves past the DGU. In doing so, the DGU is able to move at speeds up to 8 times the velocity of the current, whilst being steered in a figure-of-eight configuration. As the kite moves, water flows through the turbine and electricity is produced in the generator. The acceleration relative to the tidal velocity enables Deep Green to use lower tidal and ocean current velocities (sites with mean peak flows between 0.5 to 2.2 m/s) compared to existing commercial tidal power plants, granting the technology a unique position in the marine renewables industry.

In June 2014 Minesto was awarded an Agreement for Lease (AfL) by The Crown Estate (TCE), for up to a 10 MW Commercial Demonstration installation of an array of tidal devices in an area

known as the Holyhead Deep located 6.5 km west of Holy Island, Anglesey. The AfL is positioned in close proximity to the West Anglesey Demonstration Zone (WADZ) (Figure 3.2).

In June 2016, Minesto submitted a Marine Licence application for the Holyhead Deep Green Project Phase I (referred to as the DG500 Project), which comprises a single 0.5 MW DGU (referred to as DG500) connected to a self-contained buoy equipped with a load-bank to monitor produced energy. The purpose of Phase I is to demonstrate the first full-scale installation of the DGU ahead of a future array of DGUs.

The Phase I Environmental Statement (ES) can be accessed at the following website:

http://minesto.com/holyhead-deep/

The Environmental Impact Assessment (EIA) process and ES (Minesto, 2016) were underpinned by numerous specialist studies.

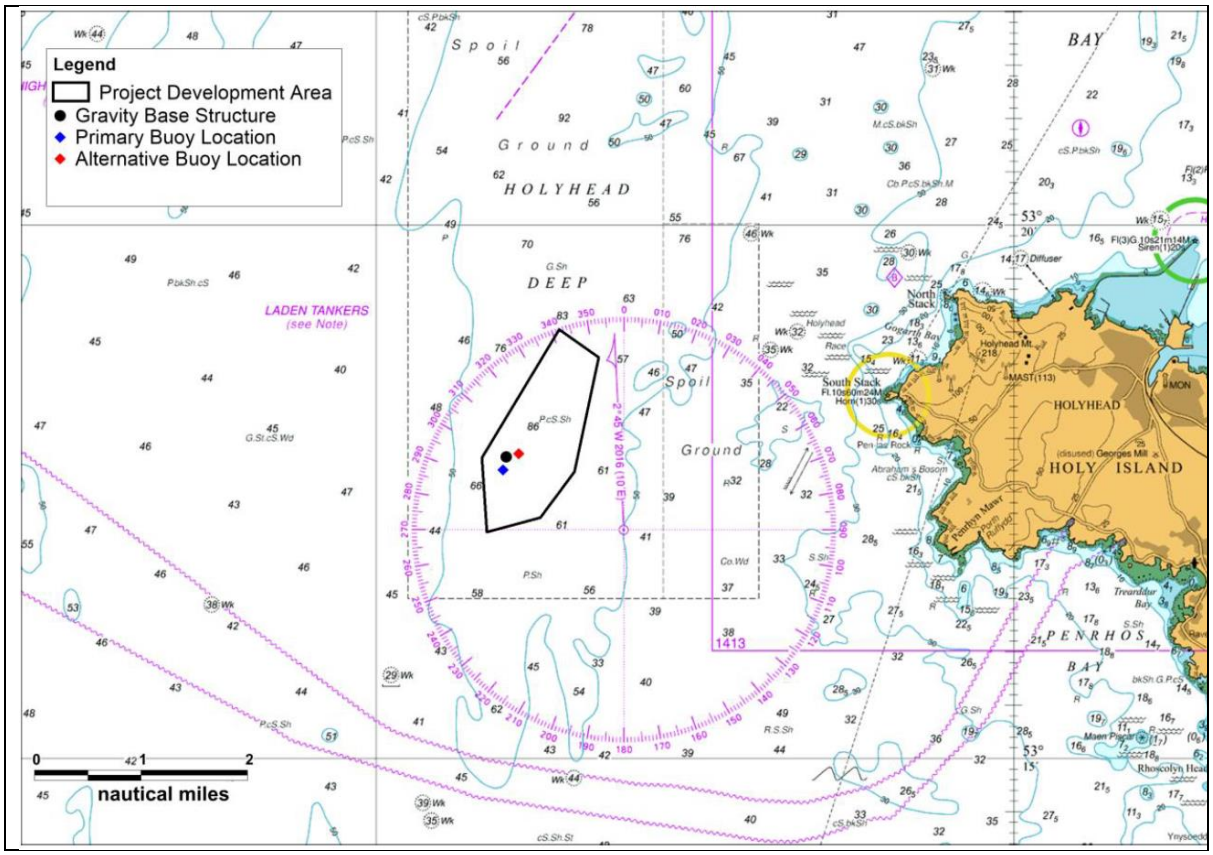

Figure 3.2 Overview of Project area off Holy Island

3.2 Consenting

A Marine Licence under the Marine and Coastal Access Act 2009 (the Marine Act) is required for the construction and operation of the Project. The EIA includes consideration of navigational issues via a Navigational Risk Assessment (NRA) as well as an evaluation of potential impacts on Natura 2000 sites and Marine Conservation Zones (MCZs)

Potential effects of the offshore Project on sites of European nature conservation importance (Special Protection Areas (SPAs) and Special Areas of Conservation (SACs) and Ramsar sites) were also assessed through a Habitats Regulations Assessment (HRA) in line with the requirements of the Habitats Directive and Conservation of Habitats and Species Regulations 2010. This has included consideration of possible SACs (pSACs) and potential SPAs (pSPAs) which went out to consultation in January 2016. Although information collated during the EIA informed the HRA process, the requirements for each assessment vary according to the different legislation. Under the requirements of the Marine and Coastal Access Act (MCAA) (2009); and in a similar vein to the HRA process described above, there was a need to undertake an MCZs assessment during marine licence determination. Information provided in this ES supported that process.

The licences/consents applied for cover the construction and installation, operational and decommissioning periods of the Project.

In addition to this, the Department of Energy and Climate Change (DECC) request production of a Decommissioning Programme which must be approved prior to the commencement of installation. This is a requirement under the Energy Act 2004.

3.3 Companies party to the programme

The following companies are party to the programme:

Company	Ownership Status
Holyhead Towing	Vessel owners
Malin Marine Consultants	Provision of MGS Buoy, & LARS system for the vessel(s)
Ocean Resource Ltd.	Manufacture of GBS Foundation
Subsea Energy Solutions	Manufactures of tether
Minesto AB	Owner of DG500 tidal 'kite'
Nexans	Supplier of umbilical
Subsea Riser Products (SPR)	Suppliers of Rocksteady Mooring Connector

Table 3.1. Companies party to the Programme

4 BACKGROUND INFORMATION

4.1 DGU Specification & Operating Principle

As shown below in Figure 4.1, the DGU will be tethered to the seabed and the tidal current will lift the wing and allow the DGU to fly. The DGU will be controlled by the control system and will fly in an optimized figure-of-eight shaped pattern which allows optimal power production.

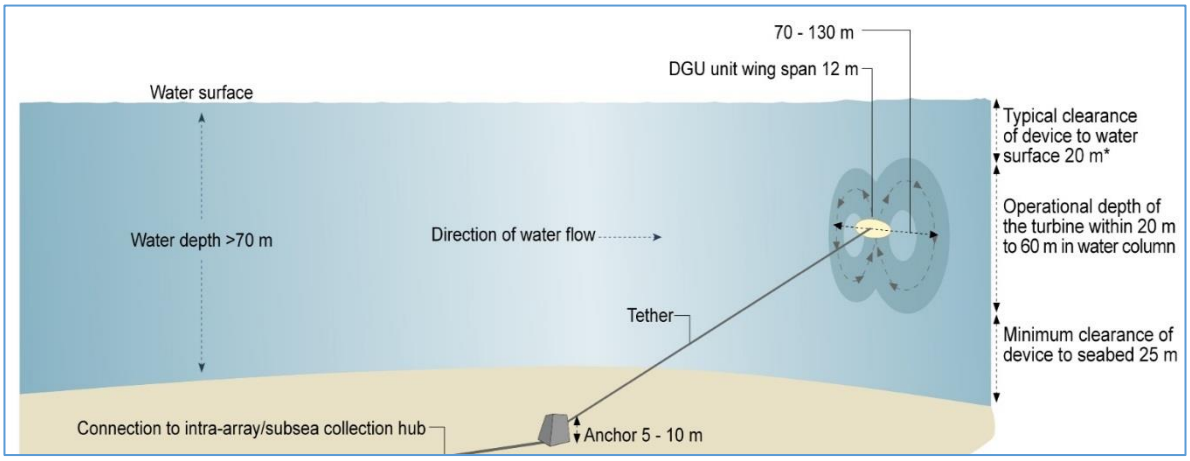

Figure 4.1DGU layout

The DGU will 'fly' in the mid-water column, between 20 m and 60 m below the sea surface, sweeping an area of approximately 70 to 130 m wide. The tether length must exceed the depth of the water column to allow the DGU to be brought to the surface for maintenance; however, the control system will ensure that the unit avoids getting closer than 20 m from the sea surface unless instructed to do so. The DGU will hover in the water column at a controlled depth when the current velocity is not sufficient for power production, or in the event of any malfunction. This depth is regulated by the control system, which, via the DGU pitch systems, will adjust the angle of the wing and the rudders. Depth will also be controlled with the non-active buoyancy system that the tether represents.

The bottom joint attachment point of the foundation will be located approximately 5-10 m above the seabed and the minimum clearance between the wing and the seabed will be approximately 25 m. The unit will tend to be oriented downstream of the predominant tidal axis, plus or minus 20 degrees. It will cut into operation at tidal flows above approximately 0.5 m/s, reaching rated power at approximately 1.6 m/s. At higher tidal flows, the DGU will maintain optimal speed by adjusting the pitch of the wing and elevator to reduce speed. Since the DGU is able to reduce its speed in this way, it does not need to cut out during extreme flow conditions. The units will be operational throughout 75-80% of the tidal cycle, and will float mid-water for the remaining time.

The sea floor umbilical consists of 4 off 3x50mm^2 elements (power elements), 1 off 3x2.5mm^2 element (signal element) and 2 off Fibre Optic elements, and is terminated at an MGS support buoy at the surface and at the bottom joint where the DGU tether is anchored. Between the bottom joint and the top joint the four power elements and the other Fibre Optic element are individually integrated in a tether fairing, ending in connector terminations.

An MGS Buoy will be established on the surface and in close location to the DGU. The buoy has the following purpose;

- Power Supply and Take Off for the DGU via a diesel generator and the subsea umbilical
- Houses the Micro Grid System (MGS) which acts as the load dump and control station for the subsea tidal generator

The MGS Buoy is 15m high (excluding deck house, masts and vents) and 6m in diameter. It will float at a draught of 10m and will appear as in Figure 4.2 below.

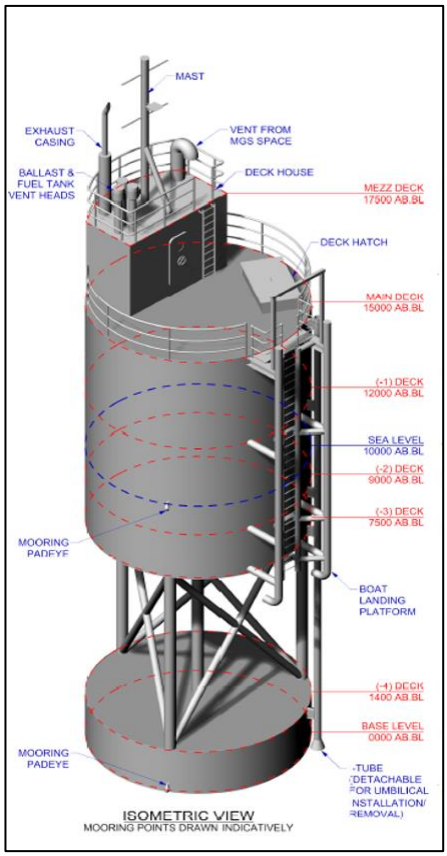

Figure 4.2 MGS Buoy Isometric and Section View

The mooring arrangement for the MGS Buoy comprises the following:

3 off High Holding Power anchors with circa 800m chain and polyester rope, and other fittings

Minesto propose that the site will later be expanded to an array of several DGU's and scheduled to stage increase up to a possible 160 units, 80MW. This will increase the longer term intended use of the Holyhead AfL.

4.2 Environmental Conditions

The Project is located within the Holyhead Deep, a large depression in the seabed where water depths reach a maximum of 97m, in the eastern Irish Sea, 6.5km off the coast of Holy Island, Anglesey. Detailed bathymetry data obtained as part of a geophysical survey campaign undertaken in summer 2015 showed that water depths inside the Project Development Area range from 65m to 91m.

The prevailing winds on Anglesey are from the south and west, (see Figure 4.3 below). The annual mean wind speed in the region is in the range 7.6 - 8.0 m/s to 10.6 - 11.0 m/s in open sea areas, decreasing to 5.1 - 5.5 m/s in coastal areas. Due to the semi-enclosed nature of the Irish Sea, most waves tend to be locally generated from the south-west. A wave modelling study at the PDA has indicated that the 1-year return period significant wave height is approximately 5.2m, and the 100-year return significant wave height is 7.2m.

In terms of currents, the semi-diurnal tide is the dominant physical process in the PDA, flooding into the Irish Sea from the Atlantic Ocean through the North Channel in the north and St. George's Channel in the south. Peak depth-averaged mean spring current speeds can approach 3m/s through the North Channel on the coastal edges, while peak-averaged mean neap currents approach 1.5m/s. Depth-averaged tidal current velocities in the area near Holyhead are generally between 1.75 to 2m/s, although modelling work suggest they may exceed 2.5m/s during spring tidal flow.

The prevailing wind speed and direction for the site location (the PDA, Project Development Area), as taken from Valley in Anglesey, is clearly demonstrated in the Wind Rose in Figure 4.3 below.

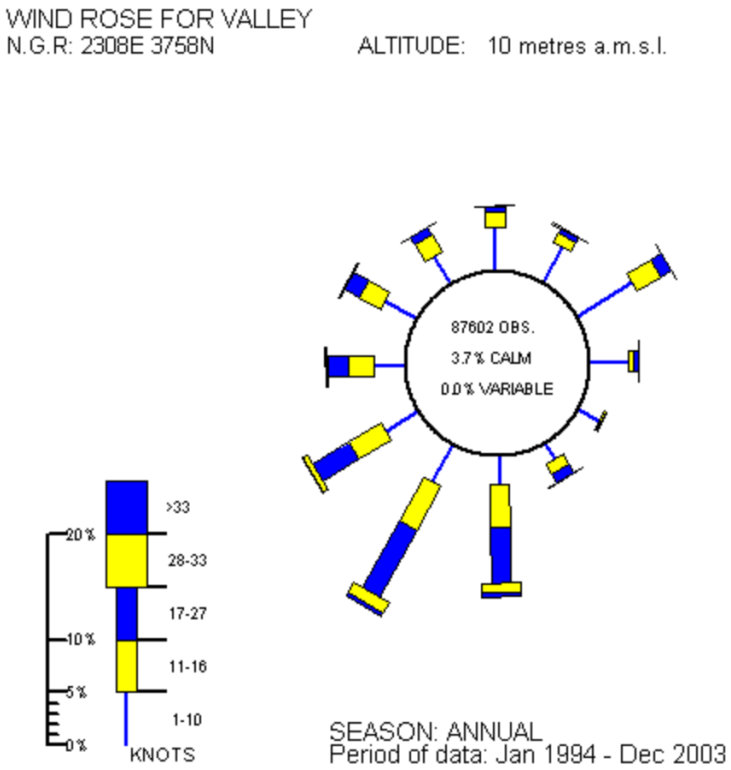

Figure 4.3 Wind Rose for Valley, Anglesey

The current rose for direction and speed at 4, 20 and 40 metres above the site seabed during low water slack (blue) and high water slack (red) appears in figure 4.4 below.

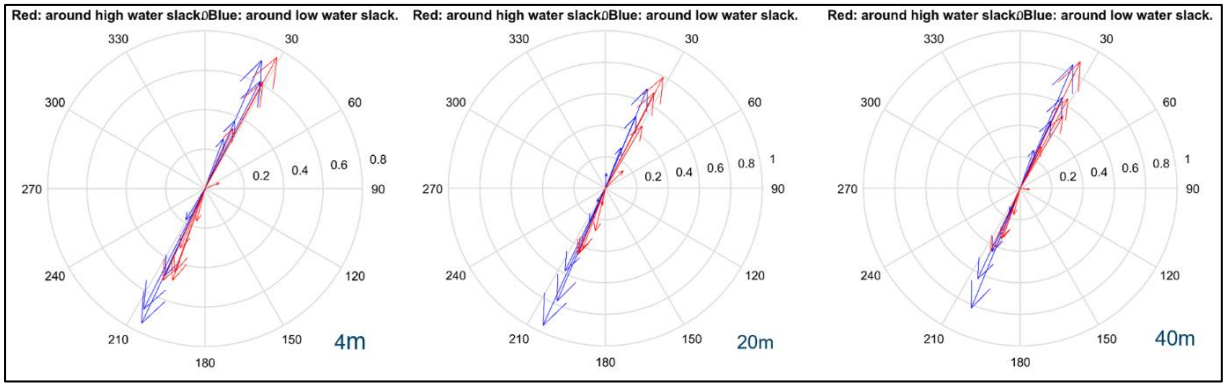

Figure 4.4 Tidal Rose for the site

The 10-year hindcast spectral wave model data between 2003 and 2013 for the Agreement for Lease area in the Anglesey Deep area is shown in figure 4.5 below. It can be seen that it is synonymous with the predominant south westerly winds. The appropriate wave heights are expressed in the colours depicted in the associated legend. The direction and percentage occurrence are also clearly shown.

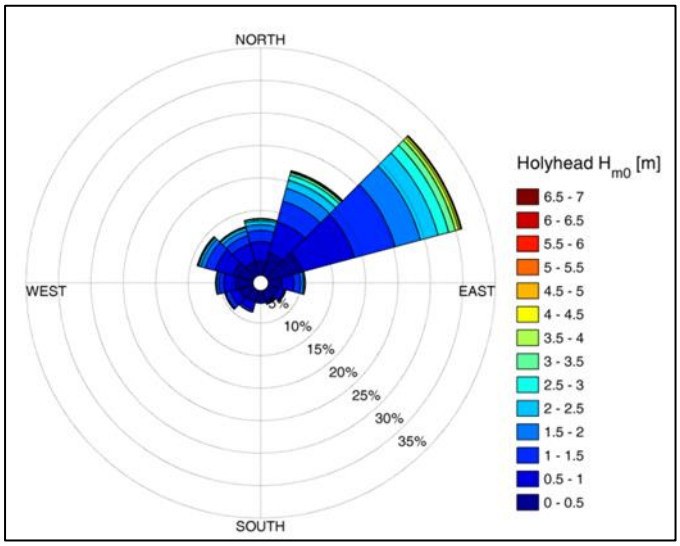

Figure 4.5 10-year hindcast spectral wave model data expressed as a wave rose

4.3 Marine Traffic Surveillance

Marine traffic surveillance conducted in March 2015 is shown in Figure 4.6 below. It clearly shows the Project Development Area is located within an area of least traffic.

Document Title: Decommissioning Plan			Date: 2017-04-07
Document Number: DG500-MNT-520-PLN-0003	Revision: B01	Project: DG500	Author: Paul Potter

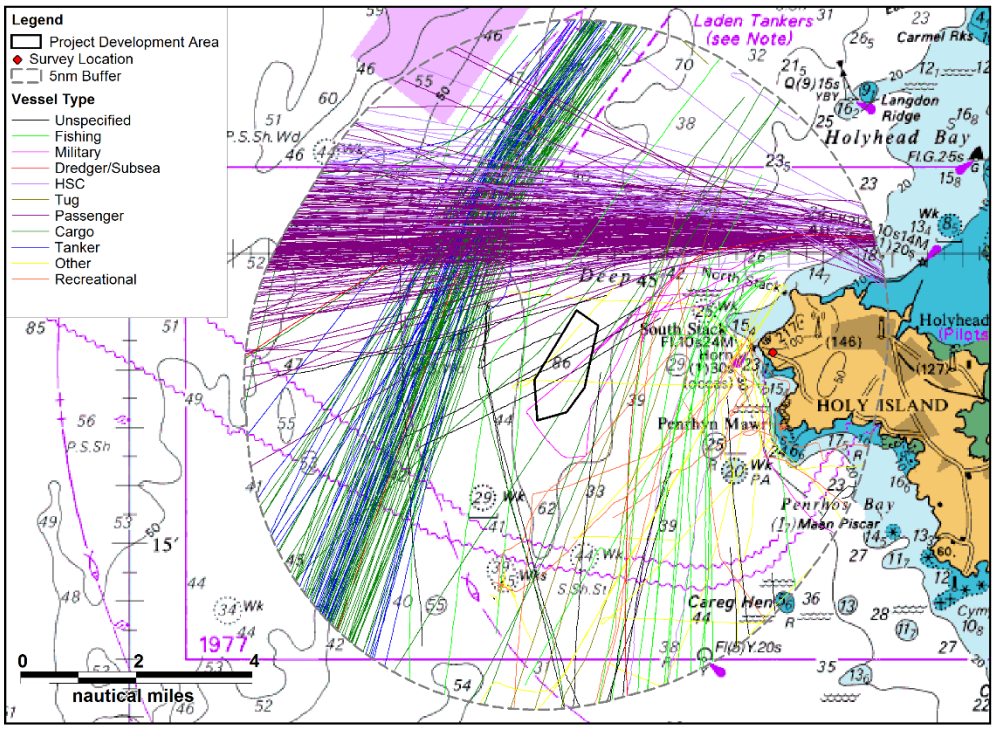

Figure 4.6 Marine Traffic – March 2015

5 DESCRIPTION OF ITEMS TO BE DECOMMISSIONED

5.1 Layout of the Facilities and Site location

The layout of the Development is shown in Section 3.1 (Figure 3.1)

5.2 Development Elements

The development consists of the following elements:

- DGU – (DG500 Tidal Kite)
- Tether
- Gravity Base foundation
- Connector
- Umbilical
- MGS Buoy
- Pre-moored anchor spread

5.2.1 The DGU

The total DGU weight is approximately 15 tonnes and the construction consists of a wing, struts and a nacelle. The nacelle includes the power take-off (PTO) system, with the turbine at the front and the rudders and elevators at the end. The wing, the nacelle and the struts are attached to the tether (Figure 5.1). The power take-off system, where the electricity is produced, consists of the generator and electrical transmission systems inside the nacelle and is driven by the turbine.

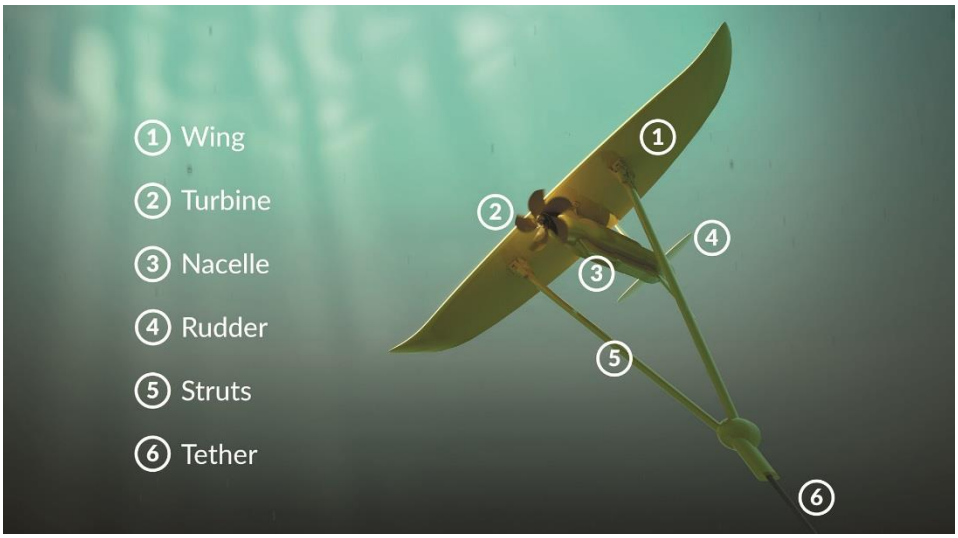

Figure 5.1 The Deep Green DGU

The DGU's wing has been designed to provide the requisite hydrodynamic properties, whilst also providing a stiff and lightweight structure in order to withstand and control high loads with a sufficient fatigue life. The wing is constructed from composite materials and includes some electrical components. The wing has a wingspan of 12 m and is 3.3 m across at its widest point.

The wing is attached to the nacelle and the lift forces are distributed via the two struts. The turbine is positioned on the front of the nacelle and will have a diameter of between 1 m and 2 m. During maximum tidal flow Minesto anticipate the DGU to make 3 full figure-of-eight rotations per minute, moving at a maximum speed of approximately 10 m/s. The maximum swept area of the turbine blades will be 3.14 m^2.

The front part of the nacelle houses the generator and is equipped with a liquid based cooling system. The rest of the power electronics used for converting and filtering the electricity is installed in the nacelle from where the electricity is transported via the power cables over to the wing and struts and down to the seafloor umbilical. The rear part of the nacelle includes an enclosed hydraulic system, used for operating the rudders and the pitch mechanisms. This hydraulic system contains approximately 100 litres of biodegradable oil.

5.2.2 The Tether

The tether, which connects the wing, nacelle and the struts with the foundation, has been designed to serve two functions: first, to connect the DGU to the foundation using a load carrying cable made of Dyneema®, and second, to allow power transfer and signal cables to pass from the DGU to the foundation.

The tether consists of a streamlined fairing, which has been designed to minimise the overall drag of the DGU. Within the fairing are channels for the load carrying, power transfer and signal cables. The tether system has been designed with a high safety margin, which ensures it can hold much larger forces than it will ever be exposed to during operation. The tether will be designed to avoid dragging on the seabed and tangling by using distributed buoyancy, which allows it to float above the seabed at all time.

It is possible that the DGU will need to be removed from site for extended periods, during which time the tether would be suspended beneath a buoy and allowed to move within the same swept area as the DGU, which is 0.049 km^2 (which is limited by the length of the tether).

The tether is connected to the foundation via the bottom joint. The bottom joint enables the DGU to follow its optimal production trajectory. To lock the bottom joint to the foundation a hydraulic system is used which contains approximately 6 litres of water based glycol.

5.3 Foundation Description

The coordinates of the Gravity Base Structure (GBS) are:

Latitude: 53° 17’ 49.8” N

Longitude: 004° 47’ 57.6” E

Co-ordinates with respect to WGS 84 co-ordinating system:-

-4.7992663°E
53.297189°N

Gravity Base Heading: 106^0 / 196^0

Water Depth / sediment depth (m): 79.2 / 27

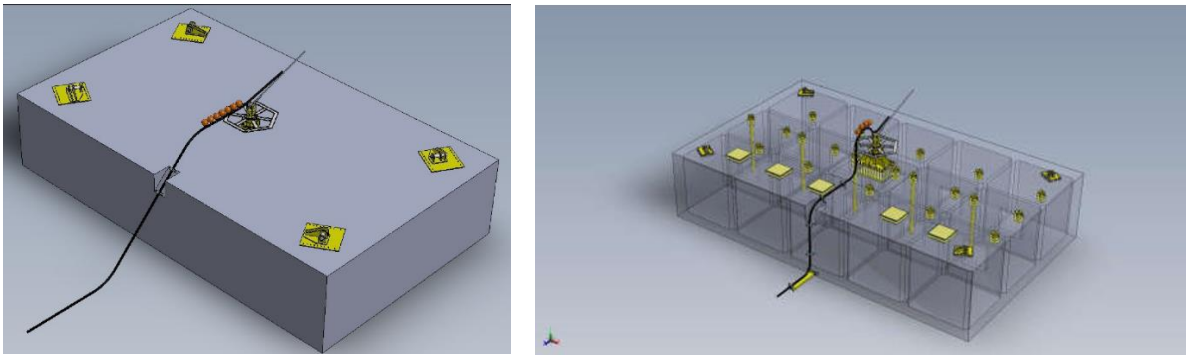

Figure 5.2. Gravity Base foundation

Item/Condition	Weight (tonnes)
GBS in air	1172
GBS in water	670

GBS	Length	Width	Height
Max Dimensions	21.25m	12.75m	4.50m

In general the materials of construction will be as follows:

Concrete: Grade C 35/45 to BS EN 206-1: 2013 specified for durability and adequate density.

Reinforcing Steel: Grade B500C steel.

Structural Steel Components:

All structural steel components are designated using S355 J2 steel in accordance with EN 10025: 2004 – Hot Rolled products of Structural Steel unless otherwise specified.

5.4 Cable Connection Foundation

The Rocksteady Subsea Mooring Connector sits on top of the GBS and connects the umbilical to the DGU (kite), via the Tether. It comprises two main forgings: a male stab, which houses the locking fingers and locking device, and a simple female receptacle with an internal load shoulder. The connector allows the kite to 'swim' with the tide and articulates round as the tide changes.

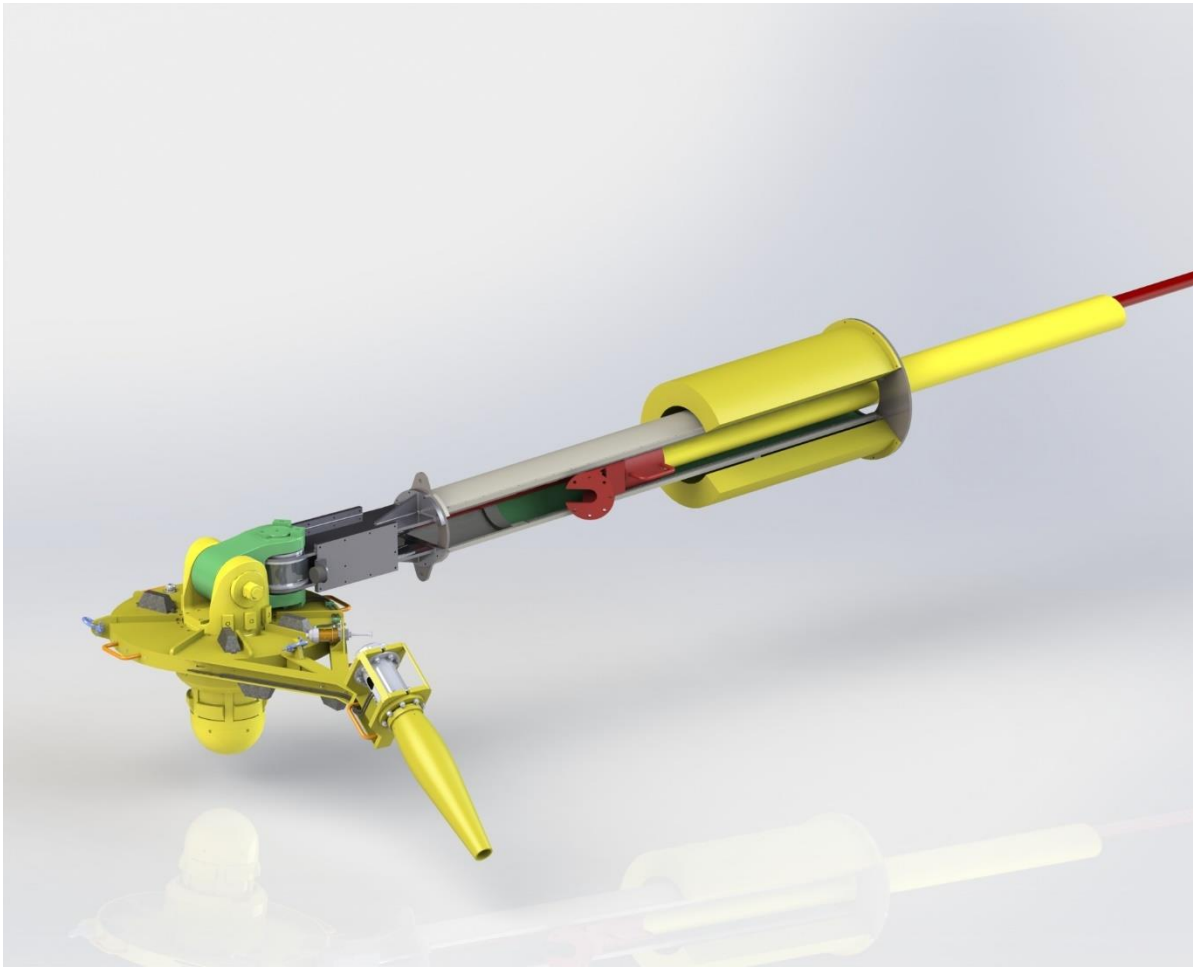

Figure 5.3 Tether connection to GBS – Rocksteady Connector

The connector is hydraulically mated using a 'hot stab' technology from a deployed ROV. This allows the spring loaded fingers of the male connector to engage into the female receptacle.

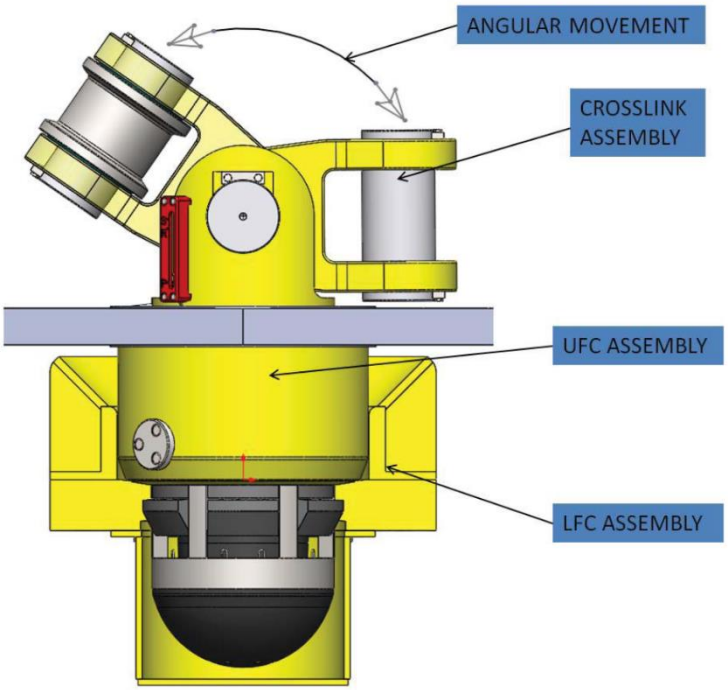

Figure 5.4 Assembly cutaway of Rocksteady Connector

The individual weights of the assembly are:

Item	Weight (kg)
Cross link assembly	336
Male stab assembly	1302
Cable support assembly	418
Lower flange assembly	860
Total	**2916**

The assembly sits a total of 1.1m above the GBS and has a total diameter dimension 2.5m.

5.5 Subsea Cables

The sea floor umbilical runs between the MGS buoy and top joint at the DGU (kite), with a transition through a bottom joint at the Rocksteady Connector situated on the GBS foundation on the sea floor. It consists of 4 off 3x50mm^2 elements (power elements), 1 off 3x2.5mm^2 element (signal element) and 2 off fibre optic elements, and has a total length of 500m.

Between the top joint and the bottom joint the four power elements and the other fibre optic elements are individually integrated in a tether fairing, ending in connector terminations.

The design life of the umbilical system is 20 years.

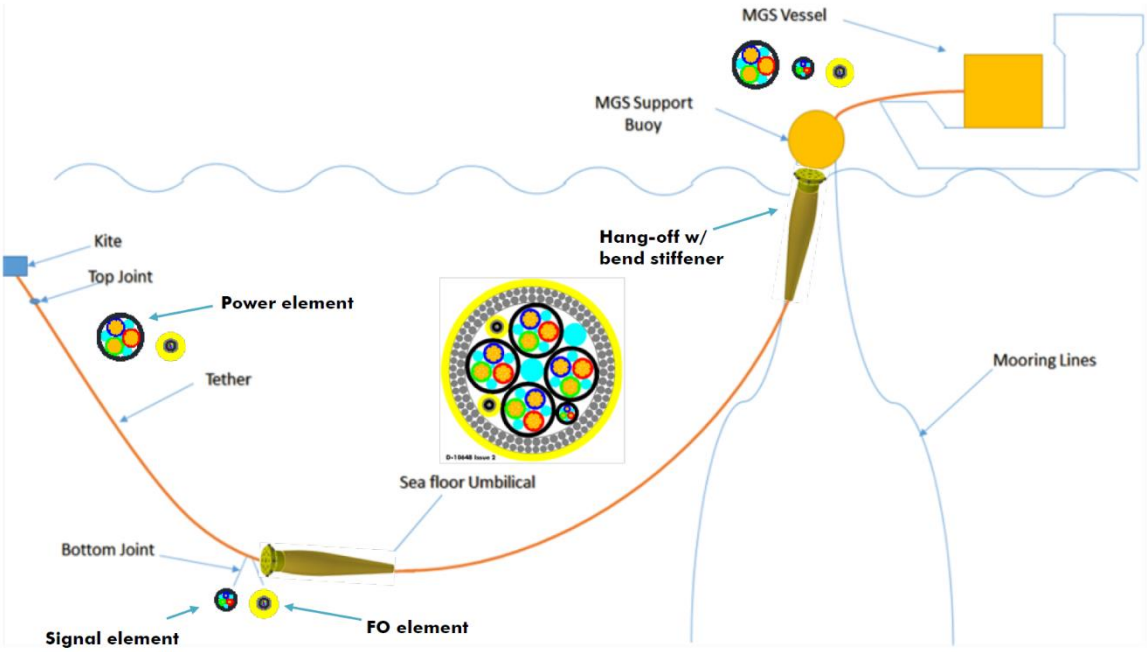

Figure 5.5 Umbilical layout

5.6 MGS Buoy

The MGS Buoy (Figure 5.6) is located approximately 215 meters from the centre of the foundation in the eastern direction aligned at an angle of 196/016 deg in line with the tidal stream. This gives the approximate co-ordinates of the Buoy as shown below.

Item	Co-ordinates (LAT/LONG) – WGS 84	Co-ordinates (Northern and Eastern)
MGS Buoy	-4.795951644°E, 53.2977288°N	380309.37 5906896.34

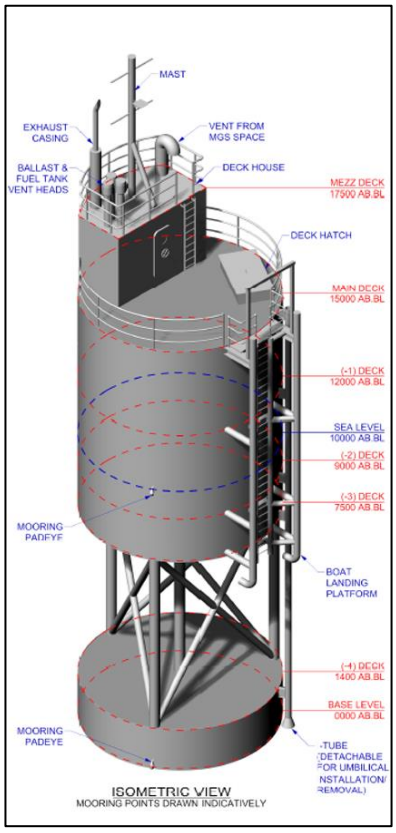

Figure 5.6 Micro Grid Structure (MGS) Buoy

Basic specifications of the MGS Buoy appear in table 5.1below:-

Item	Description
Dimensions	15m x 6m (diam)
Maximum Draft	10m
Internal Area/Space	44.6m²

Table 5.1. Basic specifications of the MGS Buoy

The MGS Buoy anchor mooring spread appears in Figure 5.7 below.

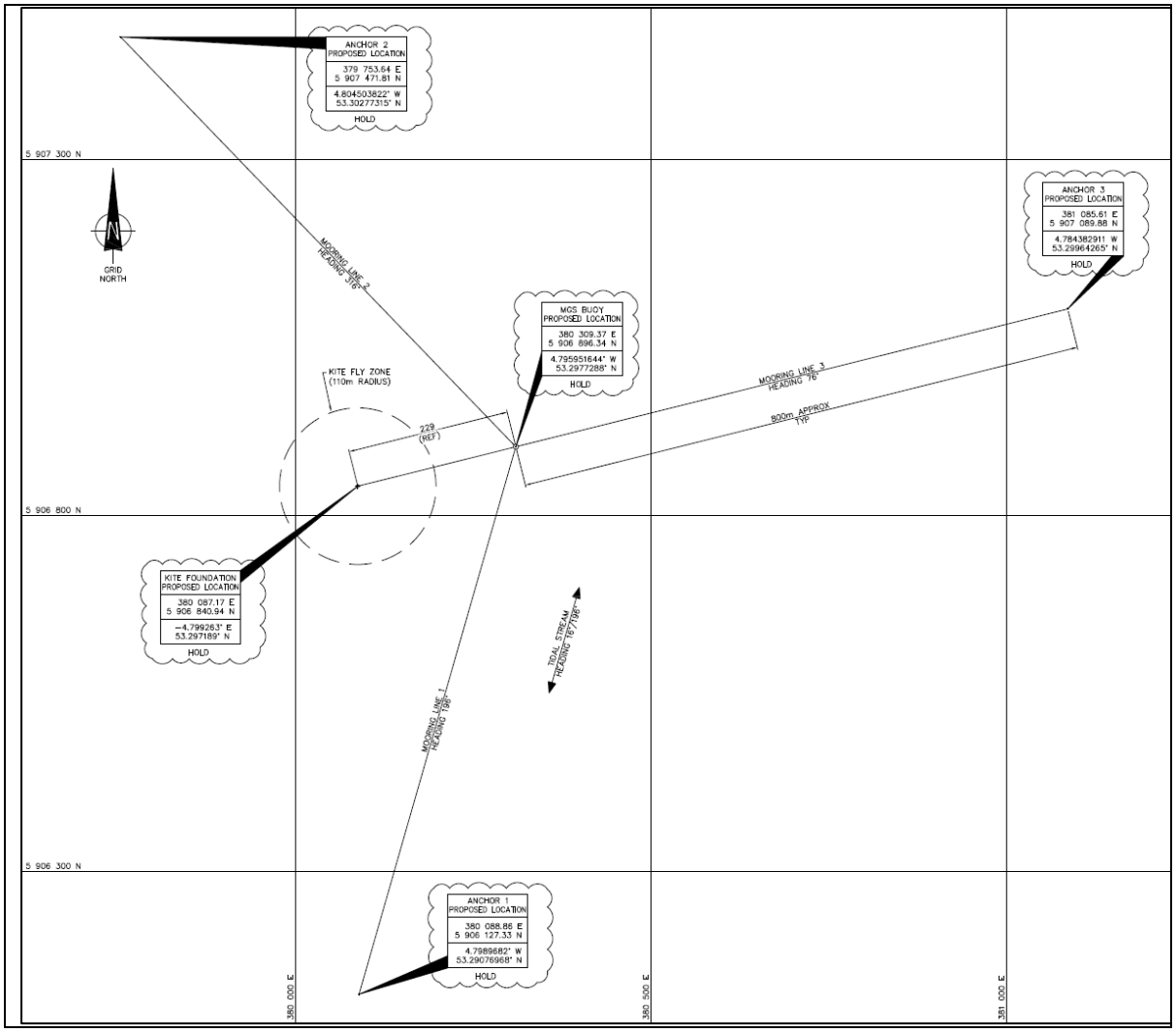

Figure 5.7 MGS Buoy anchor mooring spread

The MGS Buoy will be moored using 3 off High Holding Power anchors with circa 800m chain and polyester rope, and other fittings

6 DESCRIPTION OF PROPOSED DECOMMISSIONING MEASURES

6.1 Guiding Principles

The guiding principles of the decommissioning programme are summarized in Table 6.1 below:

Guiding Principle	Proposed Decommissioning Measure
Safety for all at all times	The safest option. It uses the same standard procedures as used in the installation phase, with minimum intervention required.
Consideration of the rights and needs of legitimate users of the sea	Complete removal of the installation will aid site clearance. Standard procedures used will be used to notify other sea users during decommissioning.
Minimise environmental impact	DG500 site equipment will be disassembled in a controlled environment. Reduces risk of spillage of potential pollutants into the marine environment.
The 'polluter pays' principle	Consistent. Complete removal from the marine environment and waste hierarchy covered by the owner/operator.
Sustainable development	Supports site clearance so that the natural environment is not significantly diminished, and future generations can continue to make use of the marine environment.
Maximise the reuse of materials	All components and materials brought back onshore or recycled and available for potential re-use of material
Commercial viability	Minimum offshore operations and all components are recovered onshore for potential re-use.
Practical integrity	The same standard procedures as used in the installation phase, with minimum intervention required.

Table 6.1 Decommissioning Guiding Principles

This section describes the proposed measures to be taken for decommissioning the installation, and increased levels of detail will be provided over time and coincide with the various reviews of the document. Throughout the tender phase, all vendors and/or installation contractors have been requested to submit decommissioning proposals when Invitations to Tender (ITT) have been distributed so as to demonstrate that decommissioning has been fully considered and factored into design decisions, and to ensure that a viable decommissioning strategy has been developed.

6.2 Proposed method of removal

The method of removal will have regard to:

- Best Practicable Environmental Option (BPEO) (i.e. the option which provides the most benefit or least damage to the environment as a whole, at an acceptable cost, in both the long and short term;
- Safety of surface and subsurface navigation; - other users of the sea;
- Health and Safety considerations.

The proposed decommissioning methods of each project component will follow the listed descriptions below:-

- **Tether**

The system will be de-energised before the tether is disconnected from the GBS once the DGU has been removed from the sea and recovered on to the LARS vessel. It will then be released and either temporarily wet-stowed on the seabed for later recovery after disconnecting it from the Connector, or temporarily buoyed until recovery operations commence.

- **GBS**

The construction vessel will be mobilised either in Holyhead or at an alternative nominated port. It will proceed to the GBS location and recover the GBS in a reverse procedure order to that in which it was installed via the vessel. It will then be towed clear of the site and decommissioned in the agreed method.

- **Connector**

The construction vessel will deploy rigging and ROV down to the Connector on the GBS. The ROV will assist with rigging the Connector to the vessel wire via a 'hot-stab' function. Once connected, the wire will raise the Connector from the GBS

- **Umbilical**

The umbilical will be disconnected from the MGS Buoy and the external J-tube, containing the umbilical, will be lifted from the MGS Buoy using the construction vessel crane. Once swung on board the vessel, the umbilical will be wound onto a drum on the deck of the construction vessel as the vessel moved over to the GBS position. The umbilical will then be disconnected from the Connector via the 'hot-stab' function

Any fluid leakage will be water based subsea control fluid only.

- **MGS Buoy**

The MGS Buoy will be disconnected from the 3-point anchor mooring spread using AHTS vessels and towed clear of the site. It will then be decommissioned in the agreed method.

- **Mooring Spread**

AHTS vessels will grapple for the three anchors of the mooring spread and recover them individually on to the deck of the vessels and removed from site.

6.3 Proposed Waste Management Solutions

Minesto consider that the key requirement of the decommissioning phase is that waste management must be carried out in accordance with all relevant legislation at the time. Therefore the company will favour the disused installation being removed and possibly reused, recycled, incinerated with energy recovery, or disposed of (at a licensed site) on land. Regard will be considered to the waste hierarchy, which suggests that reuse should be considered first, followed by recycling, incineration with energy recovery and, lastly, disposal.

The following table demonstrates how Minesto see the appropriate installation components being utilized at decommissioning:

Component	Waste Management Solution
GBS Foundation	Re-used elsewhere
Rocksteady Connector	Re-used elsewhere
Tether	Recycled
Umbilical	Recycled
DGU (Kite)	Re-used elsewhere
MGS Buoy	Re-used elsewhere
Anchor spread	Recycled

Table 6.2. Waste Management Solution

When items are brought ashore for decommissioning, where appropriate, the following undertakings will be carried out:

- All lubricants and coolants will be removed. These will be disposed of in accordance with the correct regulations;
- All metal components will be removed to be re-used or recycled (or sold to be re-used and recycled);
- When the umbilical is returned to onshore it will be disassembled and recycled

6.4 Details of any items which may be left in situ following decommissioning

Minesto consider that no items of the DG500 installation will be left on the seabed following decommissioning.

7 ENVIRONMENTAL IMPACT ASSESSMENT (INCLUDING MEASURES TO MITIGATE ENVIRONMENTAL IMPACT)

An Environmental Statement was produced on behalf of Minesto by Xodus Group in June 2016 for the Phase 1 (0.5 MW) Deep Green Holyhead Deep Project in support of the Marine Licence application. This took cognisance of Environmental Impact Assessment Revision A01, (Document No: L-100194-S14-EIAS-001), issued for use on 16th June 2016.

The EIA regulations require the EIA process to assess impacts from decommissioning activities and as such the EIA undertaken to support the Marine Licence application included consideration of potential impacts from decommissioning. The assessment was based on a 'worst case' approach, considering the greatest potential project impact. As such the infrastructure and decommissioning methods described in this document are consistent with or lower than the magnitude considered in the EIA.

Each EIA specialist considered the potential impacts as a result of the proposed decommissioning activities (based on the high level detail available at the present time) and in general, the same conclusion has been drawn by all specialists that the impacts are broadly similar to those identified for the construction and installation stage of the Project. These impacts are summarised in Table 7.1 together with an indication of where variances in impact might be experienced for activities associated with decommissioning. The impact assessment presented below does not take account that Minesto is working towards an application for a larger array at the Holyhead Deep site. It assumes that the Project will be completely decommissioned at the end of the 5-year operational period. However, should the application for a larger array be successful, then the DG500 Project will become part of the larger array.

As the Project nears the decommissioning stage and once more detail is available on the specific activities associated with decommissioning, more detailed assessment of environmental impacts (if necessary) will be undertaken as part of the decommissioning licencing process.

Topic	**Potential impacts during construction / installation and significance of impacts after mitigation measures applied (Minesto 2016)**	**Potential variance / additional impacts during decommissioning**
Physical processes	Effect of DGU foundation on water quality – Not significant	The likelihood and magnitude of impact from decommissioning activities is expected to be the same or less as that considered for construction and installation activities. The impact predicted during construction and installation is not considered significant, therefore any water quality

Topic	Potential impacts during construction / installation and significance of impacts after mitigation measures applied (Minesto 2016)	Potential variance / additional impacts during decommissioning
		impact arising from decommissioning activities is also considered to not be significant.
Benthic ecology	Direct physical disturbance and loss of benthic habitats and species – Not significant Release of drill cuttings and fluid impacting benthic communities inside – Not significant Pollution of water and sediment environment through disturbance of existing contaminated sediments – Not significant Introduction of invasive non-native species – Not significant Pollution from accidental events – Not significant	The likelihood and magnitude of impact from decommissioning activities is expected to be the same or less as those considered for construction and installation activities. None of the impacts predicted during construction and installation are considered significant, therefore impacts arising from decommissioning activities are also considered to not be significant.
Marine mammals and megafauna	Turbidity impacts on grey seals and cetaceans - Not significant Noise impacts on grey seals and cetaceans – Not significant Pollution from accidental events impacts on grey seals and cetaceans - Not significant	The likelihood and magnitude of impact from decommissioning activities is expected to be the same or less as those considered for construction and installation activities. None of the impacts predicted during construction and installation are considered significant, therefore impacts arising from decommissioning activities are also considered to not be significant. In addition, The removal of the DGU and associated infrastructure and associated vessel activity will remove the mechanism of impact for collision, disturbance, barrier effects, EMF, indirect effects via prey species, pollution, operating noise emissions and loss of habitat.

Topic	Potential impacts during construction / installation and significance of impacts after mitigation measures applied (Minesto 2016)	Potential variance / additional impacts during decommissioning
		The GBS foundation will not require cutting during decommissioning and therefore not cause an additional noise source.
Offshore ornithology	Disturbance from vessels – Not significant Pollution from accidental events– Not significant	The likelihood and magnitude of impact from decommissioning activities is expected to be the same or less as those considered for construction and installation activities. None of the impacts predicted during construction and installation are considered significant, therefore impacts arising from decommissioning activities are also considered to not be significant. In addition, the removal of the DGU and associated infrastructure and associated vessel activity will remove the mechanism of impact for collision, disturbance and pollution.
Fisheries	Loss of access to fishing grounds due to construction safety zones – Not significant	The likelihood and magnitude of impact from decommissioning activities is expected to be the same or less as that considered for construction and installation activities. The loss of access to small areas of sea during construction are not considered significant, therefore the impact arising from decommissioning activities is also considered to not be significant. In addition, the removal of the DGU and offshore infrastructure at decommissioning will mean the primary risk to fishermen during the operation of the project (i.e. snagging risk with infrastructure in the water column and on the seabed) will be removed, and fishermen will regain access to this area of the sea. This is a positive impact, however

Topic	Potential impacts during construction / installation and significance of impacts after mitigation measures applied (Minesto 2016)	Potential variance / additional impacts during decommissioning
		worth noting that fishing activity in the specific area of the Project is low.
Navigation and shipping	Increased passing vessel to vessel collision risk – Not significant Passing vessel collision with works vessels – Not significant Restricted SAR capability and oil spill response – Not significant Dropped object – Not significant Man overboard – Not significant	Impacts during decommissioning are considered to be the same as those experienced during the construction and installation phase of the Project, except that the Project will be well-known to all vessels using the area by that time. None of the impacts predicted during construction and installation are considered significant, therefore impacts arising from decommissioning activities are also considered to not be significant. In addition, the removal of the DGU and associated offshore infrastructure, and associated vessel activity at decommissioning will mean that risks to shipping and navigation from the presence of the Project will be removed.
Marine archaeology and cultural heritage	Impact to known and potential submerged prehistoric features – Not significant Impact to potential seabed features: maritime sites and aviation sites - Not significant Impact to setting of terrestrial heritage assets – Not significant Impact to seascape character – Not significant	Potential direct impacts on marine archaeology or cultural heritage during decommissioning will be very limited on the basis that any wrecks or anomalies of archaeological importance will have either been avoided as part of Project design and therefore will not be directly impacted during decommissioning, or where avoidance was not possible will have been investigated and recorded prior to installation. Where avoidance was not possible, wreck sites or anomalies will have already been impacted by the Project. None of the impacts predicted on the setting of terrestrial heritage assets or seascape character during construction and installation are considered significant, therefore impacts arising from decommissioning activities are also considered to not be significant.

Topic	Potential impacts during construction / installation and significance of impacts after mitigation measures applied (Minesto 2016)	Potential variance / additional impacts during decommissioning
		In addition, the removal of all offshore infrastructure, including the MGS buoy and associated vessel activity, that will have been present in the seascape and visible from terrestrial heritage assets, will remove any long term impact due to the presence of the Project.
Seascape, landscape and visual impact assessment	Effects on seascape/landscape character and resource and on designations - Not significant Effects of the buoy on visual amenity – Not significant	The likelihood and magnitude of impact from decommissioning activities is expected to be the same or less as that considered for construction and installation activities. None of the impacts predicted during construction and installation are considered significant, therefore impacts arising from decommissioning activities are also considered to not be significant. In addition, the removal of all offshore infrastructure, including the MGS buoy and associated vessel activity, that will have been present in the seascape and visible from terrestrial receptors, will remove any long term impact due to the presence of the Project.
Socio-economic	Direct, indirect and induced impacts on employment and GVA – Positive impact Impacts on tourism and recreation – Not significant	Potential socio-economic impacts are expected to be similar, if not slightly less significant than those experienced during the construction and installation phase of the Project. Impacts on tourism and recreation will be similar to those that are likely to occur during installation with respect to temporary displacement of marine activities e.g. sea angling, diving and sight-seeing. These have been estimated to be not significant.
Hydrocarbon and chemical releases	Oil spills from vessels – Not significant	The likelihood and magnitude of impact from decommissioning activities is expected to be the same or less as that

Topic	Potential impacts during construction / installation and significance of impacts after mitigation measures applied (Minesto 2016)	Potential variance / additional impacts during decommissioning
	Leak of fluid associated with DGU unit – Not significant	considered for construction and installation activities. None of the impacts predicted during construction and installation are considered significant, therefore impacts arising from decommissioning activities are also considered to not be significant. In addition, the removal of the Project and associated vessel activity will remove potential pollution sources from the marine environment.
Other sea users	Loss of access to Holyhead Deep disposal site IS040 – Not significant Inadvertent interaction with UXO – Not significant	The likelihood and magnitude of impact from decommissioning activities is expected to be the same or less as that considered for construction and installation activities. None of the impacts predicted during construction and installation were considered significant, therefore impacts arising from decommissioning activities are also considered to not be significant. In addition, the removal of the Project and associated vessel activity will remove a potential impact mechanism on other sea users.

Table 7.1. Summary of decommissioning impacts

A final review of the decommissioning programme will be undertaken towards the end of the life of the DG500 Tidal Kite installation to finalise the decommissioning measures proposed. During this occasion, aims will:

- Identify and assess potential impacts on the environment, including exposure of biota to contaminants associated with the installation, other biological impacts arising from physical effects, conflicts with the conservation of species, with the protection of their habitats, or with mariculture, and interference with other legitimate uses of the sea;
- Identify and assess potential impacts on amenities, the activities of communities and on future uses of the environment;

- Describe the measures envisaged to avoid, reduce and, if possible, remedy any significant adverse effects indicated.

The decommissioning process will be the reverse of the installation procedure and will require the same equipment and vessels. The likelihood and magnitude of impact of decommissioning activities will therefore be the same or less than during the installation activities and do not warrant additional assessment.

Prior to decommissioning taking place, a further assessment of the potential impact mechanisms would be undertaken and identification of appropriate measures to mitigate any potential impact (which would include adherence to the guidelines relevant at the time). As such, it would be expected that any potential impact would be insignificant.

7.1 Umbilical scour and post-decommissioning survey

Minesto will undertake routine post-installation monitoring of the umbilical and other seabed infrastructure which are proposed on an annual basis for the duration of the 0.5 MW project. This will most likely be achieved via visual observations using a remotely operated underwater vehicle (ROV). The potential existence and extent of scour will be determined visually at a set of specified locations, which will be revisited each year in order to provide a time-series of scour monitoring data for the umbilical and other seabed infrastructure, including the foundation.

The post decommissioning survey is expected to follow a similar survey methodology as the pre-installation geophysical and environmental survey. The exact survey methodology will be agreed with NRW prior to survey taking place.

7.2 Potential impacts on marine archaeology and cultural heritage

Minesto were required to produce a Marine Archaeology and Cultural Heritage Written Scheme of Investigation (WSI) for Consenting purposes.

The main themes relevant to marine archaeology and cultural heritage assessments are:

- *Submerged prehistory; and*
- *Seabed features, including maritime sites and aviation sites.*

The principal sources consulted during the archaeological assessment were as follows:

- *Geophysical survey data comprising sidescan sonar (SSS), sub-bottom profiler (SBP), magnetometer and multibeam bathymetry (MBES), acquired by Bibby HydroMap in 2015 and their associated survey reports;*
- *The United Kingdom Hydrographic Office (UKHO) data for charted wrecks and obstructions;*
- *Records from the National Monuments Records of Wales (NMRW);*
- *Statutory designation datasets maintained by Cadw;*
- *Records from Gwynedd Archaeological Trust Historic Environment Record (GATHER);*
- *Online historic environment resources, such as Coflein and Archwilio;*
- *Relevant Admiralty Charts of the approaches to Holyhead and the wider region;*

Potential impacts on marine archaeology and cultural heritage during decommissioning will be very limited on the basis that any anomalies of archaeological significance will have either been avoided as part of Project design (siting of the DGU foundation) and will therefore not be directly impacted during decommissioning, or where avoidance was not possible, these anomalies will have been investigated and recorded prior to installation. Where currently unknown features were discovered, and mitigation to offset direct impacts was employed (i.e. preservation by record), these anomalies will have already been impacted by the Project. There is the potential for impacts on remaining sites of archaeological importance from other means e.g. moored vessels during decommissioning. However, these impacts will be the same or less than those discussed for the construction and installation phase of the Project and with appropriate mitigation, therefore they will not be significant.

During the course of decommissioning of the Project, any discoveries of unexpected archaeological discoveries will be address by the implementation of the *Protocol for Archaeological Discoveries: Offshore Renewables Project.*

7.3 Use of explosives

Minesto considers that it will not be necessary to use explosives during the decommissioning phase.

8 CONSULTATIONS WITH INTERESTED PARTIES

A summary of the consultations undertaken with interested parties appears below.

Relevant correspondence appears in Appendix B.

Since the award of the Agreement for Lease from the Crown Estate in June 2014, Minesto has been actively consulting a wide range of statutory and non-statutory stakeholders and interested parties on the Project. All consultation has been carried out in line with relevant legislation.

Minesto is committed to the highest environmental standards and best practice throughout the entire Project lifecycle and as part of this, recognises the importance of early consultation that continues throughout the Project in order to integrate public and stakeholder concerns and opinions into the Project decision making process. Consequently, consultation with both statutory and non-statutory stakeholders has been an integral aspect of the Environmental Impact Assessment (EIA) and associated Navigational Risk Assessment (NRA), the Safety Zone and ERCOP work and Habitats Regulations Assessment (HRA) process since the commencement of the Project.

The primary aim of the consultation process is to facilitate two way communications about the Project to all relevant stakeholders. In order that legitimate marine users are not significantly impacted by the decommissioning activities, Minesto proposes early and comprehensive consultation. Minesto proposes to seek consultation with below listed organisations on the Decommissioning Programme and continue that consultation during the Project and during the critical review process for this document prior to decommissioning commencing. The decommissioning programme consultation process will begin during the pre-construction period and the first draft of the document will go out for consultation for a 30 day period. The Decommissioning Programme will be sent to the stakeholders listed below and uploaded on to the Minesto website (www.minesto.com) for the general public. The feedback will be considered and the document adjusted as necessary prior to being submitted to DECC for approval.

The following list of consultees has been advised by DECC:

- Cefas
- Natural Resources Wales
- Maritime & Coastguard Agency
- Trinity House
- Royal Yachting Association
- Local Biodiversity Officer Isle of Anglesey County Council
- Local Planning Authority Isle of Anglesey County Council
- Local Port (Holyhead Stena Line)
- Local Harbour Authority (Stena Line Ports Ltd)
- Royal Society for the Protection of Birds (RSPB)
- Fisheries / Marine Enforcement Officers
- Cadw

- Chamber of Shipping
- NERL Safeguarding
- Health and Safety Executive

9 COSTS

The costs associated with the decommissioning of DG500 take into account all decommissioning requirements.

Costs are calculated to the highest level of accuracy, using all available knowledge.

Minesto's technology and processes will undergo continuous refinement as part of the company's ongoing development. Consequently, the associated tasks and related decommissioning costs may be subject to change. All changes will be included as part of any updated decommissioning plan.

Costs and Financial Security arrangements for Phase 1, the DG500 project are supplied in confidential appendices C and D.

10 SCHEDULE

The DG500 Project is due to be decommissioned in 2022 following the issue of the Marine License The Project is planned to be issued for a five year period. Minesto are planning to start the installation in Q3 2017.

Project phases	2017				2018				2019	2020	2021	2022
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4				
Assembly & Final validation												
Installation of subsea system												
Installation and commissioning												
Test and Operation												
Decommissioning												

Table 10.1 DG500 Project Schedule

It is hoped that decommissioning will be conducted in reasonable weather. Therefore a period within Q3 – Q4 2022 will be programmed for decommissioning as below:

- Umbilical & tether 2 days
- MGS Buoy 1 day
- MGS Buoy anchor spread 1 day
- GBS Foundation 2 days
- Video survey of seabed 0.5 days

This time will include time to tow equipment to harbour.

An allowance of 1 day has been allocated to the re-location of material.

The Decommissioning Plan will be regularly reviewed, and at each review period the Project schedule will be evaluated and updated.

The Project schedule will be largely influenced by the development of industry knowledge on decommissioning activities and synergies with other industries. Lessons learnt from these will be used to refine the schedule.

The decommissioning programme could also be influenced by market factors, vessel availability, new environmental data and climatic conditions. This could mean that decommissioning activities change or are delayed, at which point Minesto will consult the regulatory bodies.

If scour protection is likely to be used, the site will be monitored to determine if it will be more desirable to leave it there during the decommissioning phase, to preserve any marine habitat established over the life of the installation, where they do not have a detrimental impact on the environment.

11 PROJECT MANAGEMENT AND VERIFICATION

HOLD: Only included when final review of programme takes place towards end of installation's life.

12 SEA-BED CLEARANCE

Following the decommission of the DG500 Project, Minesto will ensure that the seabed is clear from any identified debris or components that would cause a risk to navigation, the environment or other users of the sea that are a result of the Project and have not been accounted for in the Decommissioning Programme.

Minesto propose to use side-scan sonar surveys if considered prudent. The surveys will be carried out by an independent company to provide evidence that the site is clear, and the survey report made available to all relevant regulatory bodies.

The area that the survey will cover will be considered as part of the review process for this document. It is noted that the standard for oil and gas is 500m radius around any installation.

If the survey shows anomalous targets on the seabed then these will be further investigated by remotely operated vehicle (ROV) mounted with a camera. Any debris that is confirmed will be removed. Subject to the outcome of the relevant Appropriate Assessment, there are various forms of evidence which may be presented. In the case of the Project site, over-trawling may be suitable, or the presence of an independent observer during site clearance operations will be considered.

Should archaeological material subsequently be found on site, it will be retained, processed and recorded in accordance with the ClfA's Standard and Guidance for Archaeological Field Evaluations, and Standard and guidance for the collection, documentation , conservation and research of archaeological material. Finds are the property of The Crown Estate and will therefore be processed as indicated in the Marine Archaeology and Cultural Heritage Written Scheme of Investigation.

The area covered for debris clearance will be decided on a case-by-case basis, taking account of the guidance for oil and gas installations which specifies a 500m radius around any installation as the minimum area to be covered for debris clearance. (It is recognised, though, that the nature and size of the Minesto site will differ from that of an oil and gas installation.)

Removal techniques are likely to evolve as experience is gained and technology advances. The method of removal will have regards to Best Practicable Environmental Option (BPEO), such that the choice made will involve balancing the reduction in environmental risk with the practicability and cost of reducing the risk.

Appropriate navigational markings will be used during the removal process to address any risks to mariners which may be posed by the decommissioning operation. Advice on appropriate markings will be sought from Trinity House.

13 RESTORATION OF THE SITE

It is proposed that after decommissioning the site will be restored, as far as possible and desirable, to the condition that it was in prior to construction of the installation.

Any material that can be re-used (e.g. mechanical or electrical components) will be transported from the site and stored by Minesto for internal re-use. Material that can be recycled (such as steel and cable) will be recycled.

14 POST-DECOMMISSIONING MONITORING, MAINTENANCE AND MANAGEMENT OF THE SITE

Since all components of the Development are to be removed during decommissioning, it is not proposed that any further post-decommissioning monitoring of the site will take place under Section 105 of the Energy Act 2004.

15 SUPPORTING STUDIES

The key supporting studies are the ES and the HRA Report. Table 15.1 below shows the DG500 Power Kite Environmental Statement and supporting studies to the Environmental Statement.

Topic	Author	Supporting studies
EIA co-ordination Chapters 1 – 8	Xodus – overall EIA co-ordinator	EIA Scoping Report (Minesto) NRW Scoping Opinion (NRW) Habitats Regulations Appraisal Report (HRA) (Xodus)
Physical Processes	Xodus	Geophysical Survey Results Report (Bibby HydroMap, 2015b), Xodus Holyhead Deep Disposal Site Characterisation Report (Xodus, 2014a)
Benthic Ecology	Xodus	Geophysical Survey Results Report (Bibby HydroMap, 2015b), Habitat Assessment Report (CMACS Ltd, 2015a), Environmental Baseline Report (CMACS Ltd, 2015b)
Marine Mammals and Megafauna	Xodus	Underwater Noise Modelling (Xodus, 2015b), Collision Risk Simulation Modelling: Marine Mammals and DG DGU at Holyhead Deep (SMRU Consulting, 2015)
Offshore Ornithology	Natural Research (Projects) Ltd (NRP)	Offshore Ornithology Baseline (Xodus, 2014b), Seabird Population Information and Collision Risk to Diving Seabirds (NRP, 2016)
Fisheries	Xodus	Fish and Shellfish Ecology Technical Report (Xodus, 2015a), Evaluation of Economic Impacts on Fishing (AWJ Marine, 2015), Navigational Risk Assessment Minesto DG Holyhead Deep Project (Anatec, 2015b), Underwater Noise Modelling (Xodus, 2015b)
Shipping and Navigation	Anatec Ltd	Maritime Traffic Survey – Summer 2014 (Anatec, 2014), Maritime Traffic Survey – Spring 2015 (Anatec, 2015a), Navigational Risk Assessment Minesto DG Holyhead Deep Project (Anatec, 2015b)
Marine Archaeology and Cultural Heritage	Wessex Archaeology Ltd	Offshore Marine Archaeological Desk-Based Assessment (Wessex Archaeology, 2015), Geophysical Survey Operations Report (Bibby HydroMap, 2015a), Geophysical Survey Results Report (Bibby HydroMap, 2015b) Marine Archaeology and Cultural Heritage Written Scheme of Investigation (Wessex Archaeology Ltd, 2016)
Seascape, Landscape and Visual	SLR Consulting Ltd	None
Socio-economics	Xodus	Evaluation of Economic Impacts on Fishing report (AWJ Marine, 2015), Navigational Risk Assessment Minesto DG Holyhead Deep Project (Anatec, 2015b)
Hydrocarbon and Chemical Releases	Xodus	Navigational Risk Assessment Minesto DG Holyhead Deep Project (Anatec, 2015b)
Other Sea Users	Xodus	Xodus Holyhead Deep Disposal Site Characterisation Report (Xodus, 2014a)

Table 15.1 DG500 Power Kite ES contributors and supporting studies to the ES

16 POLICY AND LEGISLATIVE FRAMEWORK

The rationale for decommissioning, as well as policy approaches, international obligations, provisions, compliance & development of this Decommissioning Plan embellish the following:

- The Energy Act 2004 (Sections 105 to 114) & Part 2, Chapter 3
- The Energy Act 2008 amendments
- UNCLOS 1982
- Guidelines and Standards for the Removal of Offshore Installations and Structures on the Continental Shelf and in the Exclusive Economic Zone, IMO, 19 October 1989
- The OPAR Convention. (OSPA Decision 98/3 on the Disposal of Disused Offshore Installations)
- The Crown Estate
- Department of Energy and Climate Change DECC
- The single Marine Licence that now replaces the previous Coast Protection Act (CPA) 1949 and the Food and Environment Protection Act (FEPA) 1985
- Water Resources Act 1991
- Conservation of Habitats and Species Regulations 2010
- Part II of the Environmental Protection Act 1990
- Hazardous Waste Regulations 2005
- London Convention 1972 and the 1996 Protocol relating to the prevention of marine pollution by dumping of wastes
- The Electricity Act 1989 (Section 36B)
- Control of Pollution Act 1974 (Section 30A(1))
  Control of Pollution (Amendment) Act 1989
- Marine Management Organisation (MMO)
- Water Resources Act 1991
- Continental Shelf Act 1964
- The Electricity Works (Environmental Impact Assessment)(England and Wales) Regulations 2000
- EU Habitats and Birds Directives (Directives 92/43/EEC on the conservation of natural habitats and 79/409/EEC on the conservation of wild birds)
- Conservation (Natural Habitats etc.) Regulations 1994
- Offshore Marine Conservation (Natural Habitats etc.) Regulations
- Environmental Protection Act 1990 – Part II
- Waste Management Licensing Regulations 1994 + amendments
- Waste Framework Directive (2006/12/EC) – Article 4
- Department for Environment, Food and Rural Affairs (Defra)
- The Environment Agency
- The Environmental Permitting Programme (EPP), September 2006
- Waste Duty of Care (DoC) as set out in the Environmental Protection Act 1990, Section 34
- Control of Pollution (Amendment) Act 1989 (Sections 1 & 2)
- Pollution Prevention and Control Regulations 2000
- Health and Safety at Work etc. Act 1974

- Construction (Design and Management) Regulations 2015
- The Construction (Health, Safety and Welfare) Regulations 1996
- Provision and Use of Work Equipment Regulations 1998 (PUWER)
- Lifting Operations and Lifting Equipment Regulations 1998 (LOLER)
- Management of Health and Safety at Work Regulations 1999

17 APPENDICES

Appendix A. Mitigation

Where potentially significant impacts have been identified (in the case of the Environmental Impact Assessment), mitigation measures have been proposed. The same proposals will invariable exist for decommissioning purposes, and they have therefore been similarly summarised in Table A1 below:

Revision	Document Update
Physical processes	None.
Benthic ecology	The following mitigation measures are proposed to minimise the risk associated with the introduction of Invasive Non-Native Species (INNS) as to ensure Project activities do not significantly impact the Project area or wider region: • All vessels associated with Project operations will comply with all relevant guidance (including IMO guidelines) regarding ballast water and transfer of INNS; • Should it be necessary for the installation vessel(s) to utilise ballast water, appropriate measures and procedures shall be strictly enforced; and • Once the source of vessels to be used in the Project is known, it will be considered whether a full INNS risk assessment is necessary to identify whether any further mitigation measures are necessary to ensure there are no significant impacts. This would likely be managed through the contractor tendering process, making an INNS risk assessment a requirement of vessel contractors wishing to work on the Project. The mitigation measure detailed in the Hydrocarbon and Chemical Spills and Shipping and Navigation sections of this table will minimise the risk and uncertainty associated with accidental spills to ensure that Project activities do not significantly impact the benthic receptors in the Project area or wider region.
Marine mammals and megafauna	The mitigation measure detailed in the Hydrocarbon and Chemical Spills and Shipping and Navigation sections of this table will minimise the risk and uncertainty associated with accidental spills to ensure that Project activities do not significantly impact the marine mammals in the Project area or wider region.
Offshore ornithology	The mitigation measure detailed in the Hydrocarbon and Chemical Spills and Shipping and Navigation sections of this table will minimise the risk and uncertainty associated with accidental spills to ensure that Project activities do not significantly impact the marine mammals in the Project area or wider region.
Fisheries	Although no significant impacts relating to loss of access to fishing grounds have been predicted, the following mitigation have been proposed in order to ensure impacts remain insignificant:

	• Details of the Project will be included in UK Hydrographic Office Notices to Mariners, updated Admiralty Charts, updated Kingfisher Information Service fishermen's awareness charts and FishSAFE; • The area of risk will be appropriately marked on charts, Notice to Mariners (NtoM) and potentially at sea through the use of buoys; • Throughout decommissioning Minesto will maintain ongoing consultation and liaison with the fishing community in accordance with the FLOWW Best Practice Guidance for Offshore Renewable Developments: Recommendations for Fisheries Liaison; and Additional mitigation measures for all shipping and navigation issues have been identified. • During decommissioning fishing grounds will potentially be re-opened.
Shipping and navigation	The Project design has incorporated a significant amount of industry standard embedded mitigation measures to reduce shipping and navigation impacts during decommissioning. These are summarised below: • Application and use of navigational safety zones up to 500 m during construction /decommissioning; • Compliance with IMO conventions including COLREGs and SOLAS; • Emergency response and co-operation plan; • Charting of the PDA; • International Association of Lighthouse Authorities (IALA) Guidance and Aids to Navigation; • Marine pollution contingency planning; • Compliance with MGN 371; • Monitoring by AIS; • Personal Protective Equipment; • QHSE documentation; • Scour protection; • Promulgation of information; • Use of guard vessel(s) during construction and decommissioning; and • VHF DSC.

	In addition to the above, the further mitigation measures were specified during the EIA process for Shipping and Navigation. These are summarised below. The following mitigation measures have been proposed in order to reduce the risk of vessel collisions during the decommissioning phase: During decommissioning, enhanced planning of work activities, including pre-defined routeing of construction vessels to / from the construction site and designation of dedicated waiting / anchorage areas for construction vessels; Port liaison; Vessel selection and auditing; and Works vessel co-ordination. The following mitigation measures are proposed to reduce the risk associated with restricted search and rescue and oil spill response capability: • Provision of means of rescuing personnel from water, e.g., support vessel and/or fast response craft; • Monitoring of marine traffic during construction and installation; and • Ability to control depth of DGU. The following mitigation measures are proposed to reduce the risk of man overboard incidents: • Means of rescuing personnel from water, e.g., support vessel and/or fast response craft; and • Use of personal locator beacons. The following mitigation measures are proposed to reduce the risk of collisions/allisions with the MGS buoy: • Monitoring of marine traffic by MGS Buoy when manned (e.g., radar / AIS / lookout); • Advanced promulgation of information; • Local fisheries stakeholder engagement; • MGS buoy safety zone (subject to further consultation); • Availability of towage capability in the local area will be reviewed as part of the ERCoP; • Use of AIS Aid to Navigation to mark MGS buoy; and • Use of radar reflectors to increase return echo of MGS buoy.

	• The following mitigation measures are proposed to reduce the risk of allisions with the DGU: • Ability to lower position of DGU using in-built buoyancy control system; • Monitoring of marine traffic by MGS buoy when manned (e.g., radar / AIS / lookout); • Use of radar reflectors to increase return echo of MGS buoy (during commission and decommission phase); • Availability of towage capability in the local area will be reviewed as part of the ERCoP. • Advanced promulgation of information; and • Use of virtual AIS to indicate position of DGUs (if agreed with Trinity House). The following mitigation measures are proposed to reduce the risk of fishing gear and or anchoring interaction with subsea equipment: • Advanced promulgation of information; • MGS Buoy safety zone (subject to further consultation); • Local fisheries stakeholder engagement; and • Provision of final position (co-ordinates) of subsea equipment to local fishermen. The following mitigation measures are proposed to reduce the risk associated with loss of station of the decommissioning vessel(s): • AIS AtoN (Aids to Navigation)for tracking vessel(s); and • The following mitigation measure is proposed to reduce the risk of loss of a DGU unit: • Emergency response plan will be in place for this scenario covering alerting, response and retrieval of the device. The following mitigation measures are proposed to reduce the risk of unauthorised entry to the MGS buoy: • Monitoring of marine traffic when MGS buoy is manned; • Cameras, e.g., webcam / CCTV; and • Use of warning signs to deter against unauthorised entry. The following mitigation measures are proposed to reduce the risk of potential cumulative impacts: • During construction and decommissioning activities, it is important that project developers liaise regularly regarding project progression in order to identify potential overlap in

	activities resulting in the aforementioned cumulative impacts. Joint consultation and promulgation of information to stakeholders should also be undertaken, if construction / decommissioning activities are deemed to overlap and if projects will be using the same base ports. • During operational and maintenance activities, it is important that the use of route planning for operation and maintenance vessels (such as construction traffic corridors / designated waiting and anchorage areas) is implemented. These would be defined by Minesto as part of the construction planning process and consideration given to the potential impact on the operation of Holyhead Harbour.
Marine archaeology and cultural heritage	It is unlikely that any discoveries of previously undiscovered archaeological interest will occur as these would likely have been discovered during installation. The following measures are designed to mitigate any predicted adverse effects upon submerged prehistory receptors from direct impacts. The measures are designed to reduce or offset any damage/disturbance as a result of the proposed Project upon known sites, and to establish the presence of unknown sites. • Adopt the Protocol for Archaeological Discoveries: Offshore Renewables Projects for the duration of the Project; a system for reporting and investigating unexpected archaeological discoveries encountered during the course of the Project; and • If paleoenvironment material is recovered during any proposed borehole or vibrocores sampling, corresponding logs and samples of interest should be geoarchaeologically assessed by a suitably qualified marine archaeologist. A five-stage approach should be implemented: Stage1 - Geoarchaeological desk-based assessment; Stage 2 - Geoarchaeological description and interpretation; Stage 3 - Sub-sampling and paleoenvironment assessment; Stage 4 – Analysis and dating; and Stage 5 - Final reporting and potential publication. The following measures are designed to mitigate any predicted adverse effects upon seabed receptors from direct impacts. The measures are designed to reduce or offset any damage/disturbance as a result of the proposed Project upon known sites, and to establish the presence of unknown sites. • Any further archaeological work will be detailed by a Written Scheme of Investigation (WSI) prepared prior to the Project starting; • Avoidance of geophysical anomalies is recommended in the first instance; Preservation by record (i.e. archaeological excavation and recording prior to an impact occurring) is recommended for

	offsetting disturbances to archaeological sites or material where preservation in situ is not practicable. Sites that have been destabilised, but not destroyed, may be re-stabilised and subject to detailed analysis; and • Adopt the Protocol for Archaeological Discoveries: Offshore Renewables Projects for the duration of the Project.
Landscape, seascape and visual	Advantage, as MGS Buoy will be removed.
Socio-economic	None.
Hydrocarbon and chemical spills	The following mitigation measures will be implemented in order to reduce the risk of and impact from vessel spills: • An Emergency Response Co-oporation Plan (ERCoP) will be prepared for the Project in line with guidance set out by the MCA in MGN 371. This will be submitted to MCA for comment and approval; • Notices to Mariners will be issued advising other vessels in the area of activities within the Project area; • Vessels associated with all Project operations will comply with IMO/MCA codes for prevention of oil pollution and any vessels over 400 GT will have on board SOPEPs; • Vessels associated with all Project operations and barge will carry on-board oil and chemical spill mop up kits; • Where possible vessels with a proven track record for operating in similar conditions will be employed; and • Vessel activities associated with installation, operation, routine maintenance and decommissioning will occur in suitable conditions to reduce the chance of an oil spill resulting from the influence of unfavourable weather conditions. The following mitigation measures will be implemented in order to reduce the risk of leaks from the DGU: • Only recognised marine standard fluids and substances will be used in the DGU systems; • Hydraulic fluids and coolant will be mostly biodegradable and be of low aquatic toxicity; and • Sensors in the DGU designed to monitor its operational status would detect any serious loss of fluid pressure and leaks, alerting maintenance operatives so that they can carry out repairs and prevent further leaks.
Other sea users	During the decommissioning process, the following mitigation measures will be implemented to reduce potential impacts associated with interactions with other sea users during operation of the Project:

	• Re-designation of the Holyhead Deep disposal site boundary so it does not overlap with the PDA; • Ongoing liaison with Stena Line and other users of the Holyhead Deep disposal site to ensure that any disruptions are minimised; and • Ongoing liaison with Morlais during Project development. The following mitigation measures will be implemented to reduce potential impacts associated inadvertent interactions with UXO: • UXO desk study; and • Based on the desk study, examine measures for reducing the risk from inadvertent interaction with munitions and UXO to personnel and the Project As Low As Reasonably Practicable (ALARP).

Table A1 Mitigation

Appendix B. Stakeholder consultation feedback

This section will be updated with relevant correspondence when it is received.

Appendix C. Decommissioning Costs

These details are hidden from general view but are available to DECC

Appendix D. Financial Security

These details are hidden from general view but are available to DECC