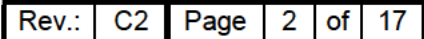
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## O&M Programme


### KINCARDINE OFFSHORE WINDFARM PROJECT

Prepared	Checked	Reviewed	Approved	ECoW Approved
Apr 19, 2019	Apr 19, 2019	Apr 19, 2019	Apr 19, 2019	Apr 19, 2019
Organisation: KOWL	Organisation: KOWL	Organisation: KOWL	Organisation: KOWL	Organisation: KOWL
Name / signature: Redacte  Redacted	Name / signature: Redacted  Redacted	Name / signature: Redacte  Redacted	Name / signature: Redacte  Redacted	Name / signature: Redacted  Redacted

[illegible]


\*Purpose of Issue: for information, for review, for approval

[illegible]

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## ACRONYMS, ABBREVIATIONS and DEFINITIONS

AIS	Automatic Identification System
CD	Chart Datum
CMS	Construction Method Statement
CTV	Crew Transfer Vessels
CWIL	Cobra Wind International Ltd
EMP	Environment Management Plan
GPS	Global Positioning System
KOWL	Kincardine Offshore Wind Ltd
LCE	Large component exchange
LCO	Large component overhauls
MHWS	Mean high water spring
O&M	Operational and Maintenance
OEM	Original Equipment Manufacturer
ROV	Remotely operated vehicle
SMS	Short Message Service
WTG	Wind turbine generator

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## 1. Introduction

### 1.1. Purpose of the Document

This document has been authored to satisfy condition 15 of the Section 36 Consent Licence issued to Kincardine Offshore Windfarm Ltd (KOWL) for the Kincardine Offshore Windfarm (Project). This document provides the current (at the time of writing) operational and maintenance programme (O&M) proposed for the Project, (see Section 1.5 for the wording of the Condition), which requires the submission of a O&M programme no later than six months prior to the commencement of the Development.

### 1.2. Scope of the Document

This document confirms the O&M programme for the Project. This document will be updated prior to the commencement of further Tranches as necessary. The O&M programme includes details of offshore works to provide full details of the Project.

### 1.3. Project Overview


The Project is considered a commercial demonstrator site, which will utilise floating foundation technology, and will be one of the world's first array of floating wind turbines. It has been included within the Survey, Deploy and Monitoring scheme for offshore renewable systems (similar to wave and tidal devices).

The Project is located south-east of Aberdeen approximately 8nm (15km) from the Scottish coastline and where suitable water depth for a floating offshore wind demonstrator development (approximately 60-80m CD) (Appendix A).

The project is split into the following areas:

- The Development Area – the wind farm area including the Wind Turbine Generators (WTG) and inter-array cables.
- The Offshore Export Cable Corridor – the area within which the proposed export cables will be laid, from the perimeter of the Development Area to the onshore area at Mean High Water Spring (MHWS).
- The Onshore Area – the onshore area above MHWS including the underground cables connecting to the onshore substation at Redmoss.

This O&M programme encompasses offshore areas only.

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In April 2016 KOWL submitted applications for consent to construct and operate the Project, which included the Original ES. In September 2016 an addendum (referred to as the ES Addendum), of additional environmental information to the Original ES, was also submitted. In March 2017 consent under Section 36 and Section 36A of the Electricity Act 1989 was granted.


Since consent was granted, there have been several necessary changes to the Project. Therefore, an application for a variation of the Section 36 consent granted by the Scottish Ministers under S36C of the Electricity Act 1989 was applied for in December 2017 (the 'Variation Application').

The table below outlines the application dates, relevant ES Documents and the components of the Project as were included in the Original Application and the Variation Application.

*Table 1-1 Summary of document timelines*

Original Documents	Addendums	Variation	Variation
<b>Date Submitted:</b> <b>March 2016</b>	<b>Date Submitted:</b> <b>September 2016</b>	<b>Date Submitted:</b> <b>November 2017</b>	<b>Date Submitted:</b> <b>April 2018</b>
Original Application	Original Application	S36C Variation Application	S36C Variation Application
Kincardine Offshore Windfarm ES (Original ES)	ES Additional Information Addendum (ES Addendum)	Section 36C Variation ES (Variation ES)	Section 36C Variation ES (Variation ES)
Maximum generation capacity: 50MW	Maximum generation capacity: 50MW	Maximum generation capacity: 50MW	Maximum generation capacity: 50MW
WTGs: 8 x 6MW	WTGs: 8 x 6MW	WTGs: 1 x 2MW and 6 x 8.4MW	Individual turbine capacity removed.
Substructures: semi-submersible	Substructures: semi-spar	Substructures: combination of semi-submersible and semi-spar	Substructures: Semi-submersible.
Cables: 33kv inter-array and export cables	Cables: 33kv inter-array and export cables	Cables: 33kv inter-array and export cables	Cables: 33kv inter-array and export cables



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### Project Components

As noted in the table above, the maximum generation capacity of the windfarm is capped at 50MW, the main difference between the various stages of the applications have been the number and size of the turbines, and the substructure type.

As applied for in the Varied Application, the Project will now consist of the following offshore components:

- WTGs: 1 x 2MW and 5 x 9.5MW.
- Substructures: semi-submersible Windfloat™ design.
- 33kv inter-array and two export cables.

Onshore, the following construction activities will also take place (under permissions granted by Aberdeen City Council):

- Onshore substation.
- Horizontal Directional Drilling landfall and onshore cable route.

The first WTG to be deployed will be a WTG and associated substructure, anchors and mooring lines with a generating capacity not exceeding 2MW ('Turbine 1'), A condition in the existing marine licence requires Third Party Certification or Verification (or suitable alternative as agreed, in writing, with the Licensing Authority) for all WTGs, mooring systems and WTG platform structures prior to the commencement of the works. The initial period sought for such certification / verification / suitable agreed alternative of the WTG platform substructure for Turbine 1 will be limited (expected to be three years or less). This is due to the engineering life of the substructure (ten years from initial substructure construction in 2011). At the expiry of the WTG platform substructure certification, Turbine 1 will only be re-deployed if (i) the platform structure is re-certified following inspection (and only for so long as valid certification is in place) and (ii) if MS-LOT (in consultation with SNH, Historic Environment Scotland, Aberdeen City Council and Aberdeenshire Council) is satisfied that the re-deployment at the proposed location within the Site would not give rise to new or materially different likely significant effects to those identified in the seascape, landscape and visual assessment of the Variation ES. Any further re-certification would follow the same process. If Turbine 1 is not re-deployed within 6 months, it will be decommissioned (in line with condition 5 of the S36 consent on Redundant turbines). It is anticipated this position will be secured by a condition in the marine licence (and if considered necessary, also in the S36 consent).

### Construction Programme Overview

The construction of the Project is anticipated to occur in 'Tranches' in-line with the indicative Programme outlined below. A final Construction Programme for each tranche will be provided to Scottish Ministers prior to commencement of the construction as a requirement of the consent conditions.




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Table 1-2 Indicative construction programme

Tranche	Activities	Indicative Start Dates
Tranche 1	Onshore works and HDD drilling	March 2018
	Mooring installation Turbine Location 1	May 2018
	Export Cable 1 installation	June 2018
	Installation of 2MW turbine to Location 1	June 2018
Tranche 2	Export Cable 2 installation	April 2019
	Mooring installation Turbine Locations 5-7	April 2019
	Installation of inter-array cables Locations 5-7	Aug 2019
	Installation of turbines to Locations 5-7	Aug 2019
Tranche 3	Mooring installation Turbine Locations 1-3	March 2020
	Installation of inter-array cables Locations 1-3 and 8	June 2020
	Move 2MW to Location 8 (dependent on recertification and consultation as noted above)	June 2020
	Installation of turbines to Locations 1-3	June 2020


#### 1.4. Approach to Amending and Updating this O&M Programme

This is the first iteration of the O&M (submitted pre-installation of the initial turbine on site). The nature of the O&M process proposed for Project, means that updates to this document will be required as the Project progresses which is in line with the approach agreed with MS-LOT.

Where the need for an update or amendment is identified following approval from Marine Scotland Licensing Operations Team (MS-LOT) of the O&M programme, either through a consultation response, or due to practicalities arising as the Project progresses, KOWL will communicate the suggested update/amendment to MS-LOT prior to editing the approved document. If the suggested change is accepted by MS-LOT, the O&M programme will be redrafted, and submitted for re-approval.

It is anticipated that the OMP will be reviewed at least at the following times:


- 6 months prior to Commencement Tranche 2;

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#### 1.5. Consent Condition

Table 1-3 Licence conditions relevant to the O&M Programme

Licence	Condition Number	Name	Details	Where Addressed in this Document
S36	15	Operation and Maintenance Programme	The OMP must set out the procedures and good working practices for operations and the maintenance of the WTG's, subststructures, and inter-array cable network of the Development. Environmental sensitivities which may affect the timing of the operation and maintenance activities must be considered in the OMP.	The O&M document outlines the O&M requirements for the WTGs, subststructures, and inter-array cables for the Development (section 2). The EMP interaction with the O&M is noted in section 3, Emergency response and HS is section 4 and section 5 the Environmental sensitivity to O&M activities.

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## 2. Operation and Maintenance Programme

### 2.1. O&M Approach for KOWL

The Kincardine Floating Offshore Wind operation and maintenance will be performed by a specialist offshore contactor working in collaboration with Principal Power Ltd (designers of semi-sub unit).

This chapter aims to give a holistic overview of the operation and maintenance programme for KOWL.

The operation and maintenance of a wind turbine placed on a floating foundation using the Kincardine concept is comparable to a bottom fixed turbine for all normal maintenance tasks. Operational experience from the Windfloat turbine has verified this assumption.

Repairing failures of main WTG components, and the work related to the substructure and mooring system differs from that of a bottom fixed WTG. Inspection and maintenance of the substructures and mooring systems will be conducted on a campaign basis, using relevant competency within Cobra and the floater supplier, Principle Power Inc. The replacement of main components involves towing the unit back to shore, and therefore requires careful planning is required.

### 2.2. Roles and Responsibilities

Kincardine Floating Offshore Windfarm O&M Supervisor – (KOWL) Ricardo Valverde

- Team Leader O&M – Ricardo Valverde (Spanish/local)
- O&M Technician – TBC (local)
- Control Room – TBC
- Marine and Logistics – TBC
- HSE Support – TBC
- Administrative support –KOWL


### 2.3. O&M Strategy

In a floating offshore wind farm, the O&M activities must cover the needs of the wind turbine generators, the floater structure (including mooring system), and includes inter-array cables, export cables, and onshore electrical infrastructure (Substation and onshore cable).

Given the complicated logistics required in this type of facility, good planning of the logistics involved is essential for the optimisation of service and maintenance activities. A basic principle is the scheduling of off-shore activities related to the floater and planned O&M for WTGs service and maintenance.

The strategy benefits from the advantages of this type of floating structures that allow the towing of the whole unit (floater and WTG) to shore for major interventions. Based on this:

- Preventive maintenance: will be carried out using CTVs for technicians and equipment transfer.
- Large Components overhauls (LCO) (preventive replacement before end of operational design lifetime): the Floating Unit will be towed back to Harbour.
- Corrective maintenance: will be carried out using CTVs in case of Remote Resets, Minor and Medium repairs. In case of Major repairs, these will be carried out using CTVs when the

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defected Large Component can be repaired on site. In case a Large Component Exchange (LCE) is required, the Floating Unit will be towed back via tug boats to an appropriate harbour.

A general guideline will be to replace components offshore, take the defective component back to shore, and repair there if possible. This will minimize the time spent by technicians off-shore.

As for resources, dedicated technicians will be stationed in Aberdeen. CTVs and associated harbour services will be provided by a specialised company with vessels also based in Aberdeen.

#### 2.4. Wind Turbine Maintenance (2MW)

The first WTG to be operational is the Vestas 2MW V80 that was used in the Windfloat 1 project off the coast of Portugal. The unit operated successfully for five years and was decommissioned at the finalization of the project.

The WTG has undergone an extensive inspection and retrofit program that restores operational life expectancy to its components and adapts it to the new site (different voltage and operating conditions).

The planning assumptions for the Vestas 2MW V80 turbine are six days scheduled maintenance and ten days unscheduled maintenance per year.

All preventive maintenance and most corrective maintenance and potential overhauls will be carried out by CWIL's experienced technicians. Third party specialists, including the OEM, will be contracted as required (e.g. towing or lifting for major overhauls).

The monitoring and alarm handling for the 2MW V80 WTG will be done by the CWIL specific control room in Aberdeen, as well as a dedicated 24/7/365 control centre contracted to a third party that already centralizes these services for many wind farms owned by multiples parties.

#### 2.5. Wind Turbine Maintenance (9.5MW)

The planning assumptions for the larger WTGs are six days scheduled maintenance and on average ten days unscheduled maintenance per year. This would make a total of 96 days a year for the bigger WTGs. Adding up the smaller WTG the total would be 112 days of maintenance per year for all the WTGs in the Kincardine offshore wind farm.


KOWL shall get a full service agreement contract with the selected WTG manufacturer for a minimum of five years, with a preference for a 10+5 years agreement.

The scope of this contract should cover the maintenance of the turbines, tower internals, high voltage switchgear, SCADA and instrumentation and the statutory certification of lifting equipment, anchor/rescue points, fall arrest and pressurized systems. It shall also include a defect notification period, covering spare parts, of the same duration.

The OEM will also take care of the monitoring and alarm handling for the wind turbines, always with the backup of the third party control centre contracted as described above for the 2MW WTG.

After the initial period of 5, 10, or 15 years, KOWL will re-assess the situation and decide either to continue with service from the OEM, or do it with its own resources.



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## 2.6. Floater (substructure) Maintenance (2MW)

The first floater to be operational is the Windfloat 1 designed by Principle Power Inc. that was used in the project of the same name off the coast of Portugal. The unit operated successfully for five years and was decommissioned at the finalization of the project.

The planning assumptions for the Windfloat 1 are three days scheduled maintenance and four days unscheduled maintenance per year. As explained above, offshore activities related to the floater will as much as possible be scheduled on the same visits planned for WTGs service and maintenance.

KOWL shall obtain a full service agreement contract with Principle Power Inc. for a minimum of five years to undertake the required O&M elements.

The scope of this contract should cover the maintenance of the floater structure and its internals, including but not limited to motor control cabinet, ballast and bilge pumps, diesel generator, transformer, crane, marking system, mooring winch, mooring system arrangement and export cable arrangement. It shall also include a defect notification period, covering spare parts, of the same duration.

Principle Power Inc. will also take care of the monitoring and alarm handling for the floaters, always with the backup of the third party control centre contracted as described above for the WTGs.

After the initial period of three years, KOWL will re-assess the 2MW unit and decide to either continue with service from the OEM, or do it with its own resources.

## 2.7. Floater (structure) Maintenance (9.5MW)

The five larger WTGs will be installed on Windfloat 2 floaters also designed by Principle Power Inc, which have similar O&M requirements to the Windfloat 1.

The planning assumptions for each Windfloat 2 are three days scheduled maintenance and four days unscheduled maintenance per year, adding to a total of 56 days a year. As explained above, off-shore activities related to the floater will as much as possible be scheduled on the same visits planned for WTGs service and maintenance.

KOWL shall get a full-service agreement contract with Principle Power Inc. for a minimum of five years.

The scope of this contract should cover the maintenance of the floater structure and its internals, including but not limited to motor control cabinet, ballast and bilge pumps, UPS, transformer, crane, marking system, mooring winch, mooring system arrangement and export cable arrangement. It shall also include a defect notification period, covering spare parts, of the same duration.

Principle Power Inc. will also take care of the monitoring and alarm handling for the floaters, always with the backup of the third-party control centre contracted as described above for the WTGs.

After the initial period of four to five years, KOWL will re-assess the situation and decide to either continue with service from the OEM, or do it with its own resources.

## 2.8. Export/Inter-array Cable Inspections

As part of the O&M requirements for the export cable and inter-array cables there will be an ongoing O&M requirement to ensure that the cables are buried along the entire length to reduce the possible

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snagging/damage of the cable through other marine user activities (anchoring and trawling). The initial O&M phase will require more frequent surveys of both the export cables and the inter-array cables to ensure cable burial depth is maintained. Once a baseline of burial is obtained and verified cable inspections will be reduced during the later periods of the windfarm to approximately one per two years.

## 2.9. Mooring Inspections

As part of the O&M requirements for the mooring systems and anchors there will be an ongoing O&M requirement to ensure that the anchors are buried to the required depth and the mooring lines are checked (via load cells on the mooring systems) for fishing gear entanglement. Monitoring of potential fishing gear snags will be undertaken through the load cells and visual ROV inspections of the mooring will be undertaken as part of the standard survey of the mooring system. Once a baseline of potential fishing gear entanglements has been collated monitoring and inspections will be reduced during the later periods of the windfarm to approximately one per two years.

The position of the sub-structures will be monitored using GPS - one installed on each column. This system is used to monitor the position and yaw. This information is relayed to the Project's onshore substation. The control system calculates the drift from the installation point. If the drift is higher than the threshold value the control system issues alarms using email and SMS systems.

Additionally, each substructure will be equipped with an Automatic Identification System (AIS) that will broadcast location. This information can be read by near-by vessels or shore based AIS stations and vessels.

## 2.10. Electrical Infrastructure Maintenance

The maintenance for the electrical infrastructure in Aberdeen will be tendered to local service providers. The contract will be monitored by KOWL's O&M contractor CWIL.

## 2.11. Heavy Component Exchange (Port)

Standard components and spare parts up to a two-ton limit will be handled using the platform crane and crew transfer vessels. Only main components such as blades, hub, transformer, generator and main bearing, yaw bearing, and blade bearing are excluded.

As explained above in the overall O&M strategy, the replacement of these main components involves towing the unit back to shore, and therefore requires careful planning. A suitable harbour will be designated for the performance of these tasks.


## 2.12. O&M Base

The local base will cover office facilities for maintenance planning and reporting, spare parts storage and quay facilities for loading and unloading the crew transfer vessel.

A suitable office and warehouse building including offices, control room, changing rooms, shower, wet room, spare parts storage, waste handling, and lifting equipment will be provided in the vicinity of the on-shore substation at Redmoss.

Crew Transfer Vessels (CTVs) and harbour services will be hired from a local contractor, based in Aberdeen. It will cover all days needed and planned for preventive maintenance (with a reasonable notice of about a week) plus provisions for urgent services.



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### 2.13. Onshore Support Services and Monitoring

Onshore support services will be run through the KOWL office in Aberdeen and monitoring services will be undertaken by a specialist external contractor.

### 3. Integration of EMP to O&M

The EMP will act as the baseline document for the O&M phase of the KOWL Project and will be subject to amendments as the Project moves from the construction phase to the O&M phase. O&M plans will include the following overarching aims, objectives and targets set for the entire Project in the EMP.

The key objective is to ensure risk of adverse impacts is mitigated and all environmental commitments and conditions are met throughout the O&M programme and lifetime of the Project.

Project specific targets include but are not limited to the targets specified in Table 3-1.

*Table 3-1 Project Waste Targets*

Target*	Measurement	Records
Minimise waste to landfill	Data from waste transfer notes (WTNs)	Site waste management plan (SWMP)
Minimise pollution events	Reports via Environmental Clerk of Work (ECoW) and Project Manager	Incident Report
100% environmental awareness	Induction and briefing	Tool box talks and introduction records
Minimise nuisance complaints	Stakeholder feedback	Records of complaints

The Project Environmental Clerk of Works (ECoW) will work with the O&M manager to identify opportunities for sustainable innovations during the operational phase of the project.


### 4. Emergency Response and HSE Incident Approach

The project team will assess the potential for emergency situations and ensure measures, and appropriate equipment, is in place.

An Emergency Response and Cooperation Plan (ERCoP) has been for the Project (KOWL-PL-0004-008). The Plan will be evaluated at intervals not exceeding six months and results recorded. The types of environmental drills and tests, appropriate for the Project, will be detailed in the plan.

As a minimum, these will cover, but will not be limited to, the following:

- Identification of potential emergency situations i.e., oil spillage, discovery of wildlife or archaeological features;
- Emergency control arrangements; and
- Emergency contact numbers.

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Local emergency services will be informed of planned high-risk site activities.

The ERCoP will be held in the Project Filing System Section xx and displayed on the site notice board. As required the Project manager will distribute revised copies of the ERCoP to the Maritime and Coastguard Agency (MCA), and the Project Manager will issue paper copies to all the vessels working on the project. The ERCoP will be distributed as per the contact list in Table 4-1. Distribution and control will be maintained by the KOWL Project Manager.


*Table 4-1: Emergency Response Cooperation Plan Distribution List*

Organisation	Contact	Telephone (Office Hours)	24 Hour Telephone / Mobile	Email / Address for Provision of Updated ERCoP
Redacted	Redacted	Redacted	Redacted	Redacted
Coastguard Operations Centre (CGOC) Aberdeen	Duty Watch Manager	01224 592334	01224 212862	Aberdeen.coastguard@mcga.gov.uk
Project Manager	Redacted	Redacted	Redacted	Redacted

The Project manager will also distribute revised copies of the ERCoP to any contractors. It is then the responsibility of any Contractor to distribute the Project's ERCoP to their sub-contractors and all vessels involved in the operation.

## 5. Environmental Sensitivity

As part of the Projects ES consenting process no O&M phases were identified to be at risk of consideration for environmental sensitivity periods. However, KOWL will seek to ensure that all activities are undertaken in an appropriate manner and in compliance with the EMP. During the 25-year lifespan of the Project the O&M strategy may be adapted to deal with environmental change where required.

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**Appendix A**  
KOWL-DR-0001-015 - Field Layout Consent and WTG Position Check

# LEGEND

## PLANNED TURBINE LOCATIONS

REF	WGS-84	N	W
KIN-01*	57° 00' 19.095"	01° 52' 52.181"	
KIN-02	56° 59' 50.109"	01° 52' 25.710"	
KIN-03	56° 59' 21.214"	01° 51' 59.269"	
KIN-04	57° 01' 06.828"	01° 51' 18.166"	
KIN-05	57° 00' 37.897"	01° 50' 51.666"	
KIN-06*	57° 00' 08.931"	01° 50' 25.179"	

\* CURRENT 2MW TURBINE AT KIN-01 LOCATION  
WILL BE REMOVED AND REDEPLOYED AT  
KIN-06 LOCATION

## REF WGS84 UTM30N

NORTHINGS	EASTINGS
KIN-01	6318532.87
KIN-02	6317645.51
KIN-03	6316758.16
KIN-04	6320034.94
KIN-05	6319147.58
KIN-06	6318260.23

EXISTING EXPORT CABLE ROUTE  
PROPOSED 2ND EXPORT CABLE ROUTE

REV	DESCRIPTION	DATE
A4	ISSUED FOR COMMENT	03/04/2019
A3	ISSUED FOR COMMENT	01/04/2019
A2	ISSUED FOR COMMENT	29/01/2019
A1	ISSUED FOR COMMENT	29/01/2019



CLIENT KINCARDINE OFFSHORE WINDFARM LIMITED

PROJECT KINCARDINE OFFSHORE WINDFARM PROJECT

TITLE FIELD LAYOUT CONSENT AND

WTG POSITION CHECK

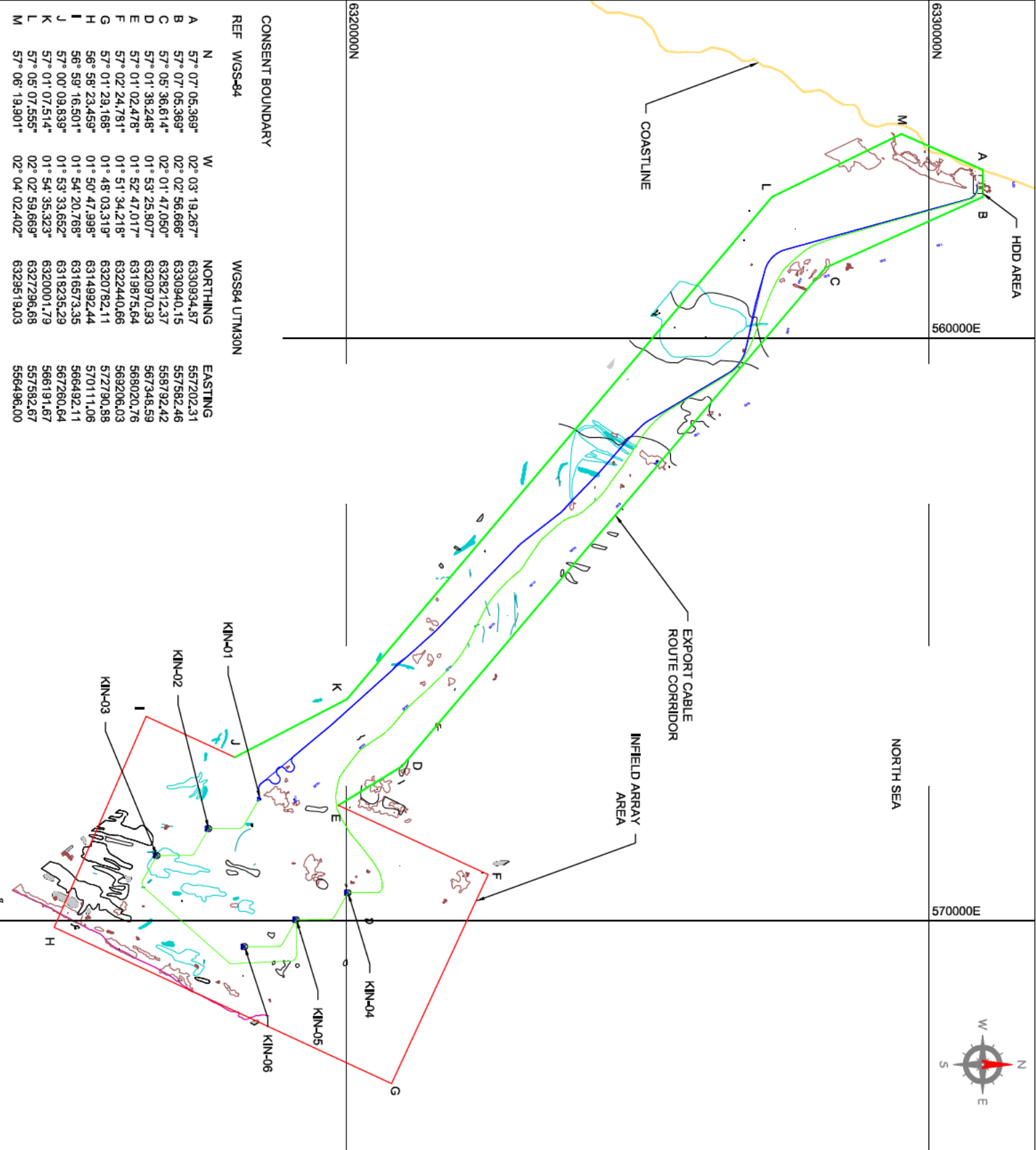
CLIENT DRAWING NUMBER	SHEET	SHEET SIZE
	1 OF 1	A3

SCALE UNCL. W3G DRAWING NUMBER

1:60 KOWL-DR-0001-015

REV A4

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## CONSENT BOUNDARY

REF WGS-84 WGS84 UTM30N

N	W	NORTHING	EASTING
A 57° 07' 06.369"	02° 03' 19.267"	6330934.87	557202.31
B 57° 07' 05.369"	02° 02' 56.666"	6330940.15	557582.46
C 57° 01' 36.614"	02° 01' 47.050"	6328212.37	558792.42
D 57° 01' 36.248"	01° 53' 25.807"	6320970.93	567348.59
E 57° 01' 02.478"	01° 52' 47.017"	6319875.64	568020.76
F 57° 02' 24.781"	01° 51' 34.218"	6322440.66	569206.03
G 57° 01' 29.168"	01° 48' 03.319"	6320782.11	572790.88
H 56° 58' 23.459"	01° 50' 47.998"	6314992.44	570111.06
I 56° 58' 16.501"	01° 54' 20.768"	6316573.35	566492.11
J 57° 00' 09.839"	01° 53' 33.662"	6318235.29	567280.64
K 57° 01' 07.514"	01° 54' 35.323"	6320001.79	566191.67
L 57° 05' 07.555"	02° 02' 59.669"	6327296.68	557582.67
M 57° 06' 19.901"	02° 04' 02.402"	6329519.03	556496.00

# KOWL-REP-0001-001 O&M Programme Rev C2

Final Audit Report

2019-04-19

Created:	2019-04-19
By:	Redacted
Status:	Signed
Transaction ID:	CBJCHBCAABAA4Mh3ya6RpQLSak-dgbJwwOLdOy5fl7qD

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