1 INTRODUCTION

TGS-NOPEC Geophysical Company (TGS), an energy data and intelligence company, has retained EOLOS Floating LiDAR Solutions S.L. to collect scientific information to support offshore wind development for the offshore Norwegian Coastal Administration. TGS is conducting studies to evaluate the wind resource and environmental conditions at offshore wind development site Utsira Nord.

On behalf of TGS, EOLOS SW.L. will plan for and install one or two monitoring buoy(s) to measure meteorological, oceanographic and biological conditions in the Utsira Nord location to inform engineering design and planning efforts for proposed offshore wind farm(s).

The project consists of deploying an EOLOS FLS200 floating data buoy with LiDAR (light detection and ranging) technology to gather wind and ocean data at one location to inform engineering design and planning efforts for a proposed wind farm.

The buoy(s) will be deployed within an area identified as within the Norwegian Trough and close to the 12nm line.

TGS is considering three optimal buoy deployment locations within the Norwegian Trough at Utsira Nord. These locations, labeled (A, B & C) on **Figures 1** and **2**, in the North Sea. The Sites (A, B & C) are along coastal depth contour of about 270m.

Table 1 provides the name and coordinates of the deployment locations.

Table 1 Proposed Buoy Deployment Locations (WGS84)

LOCATION LABEL	LATITUDE	LONGITUDE	LOCATION (DISTANCE FROM SHORE)	WATER DEPTH (M)
Site A	59° 27’ 07.21” N	004° 36’ 51.470” E	51.5km Røvær Is.	271
Site B	59° 15’ 29.91” N	004° 31’ 16.46” E	38.1km Utsira Is.	264
Site C	59° 06’ 58.87” N	004° 42’ 05.71” E	54.2km Mainland	279

This potential deployment location is depicted on **Figures 1** and **2**.

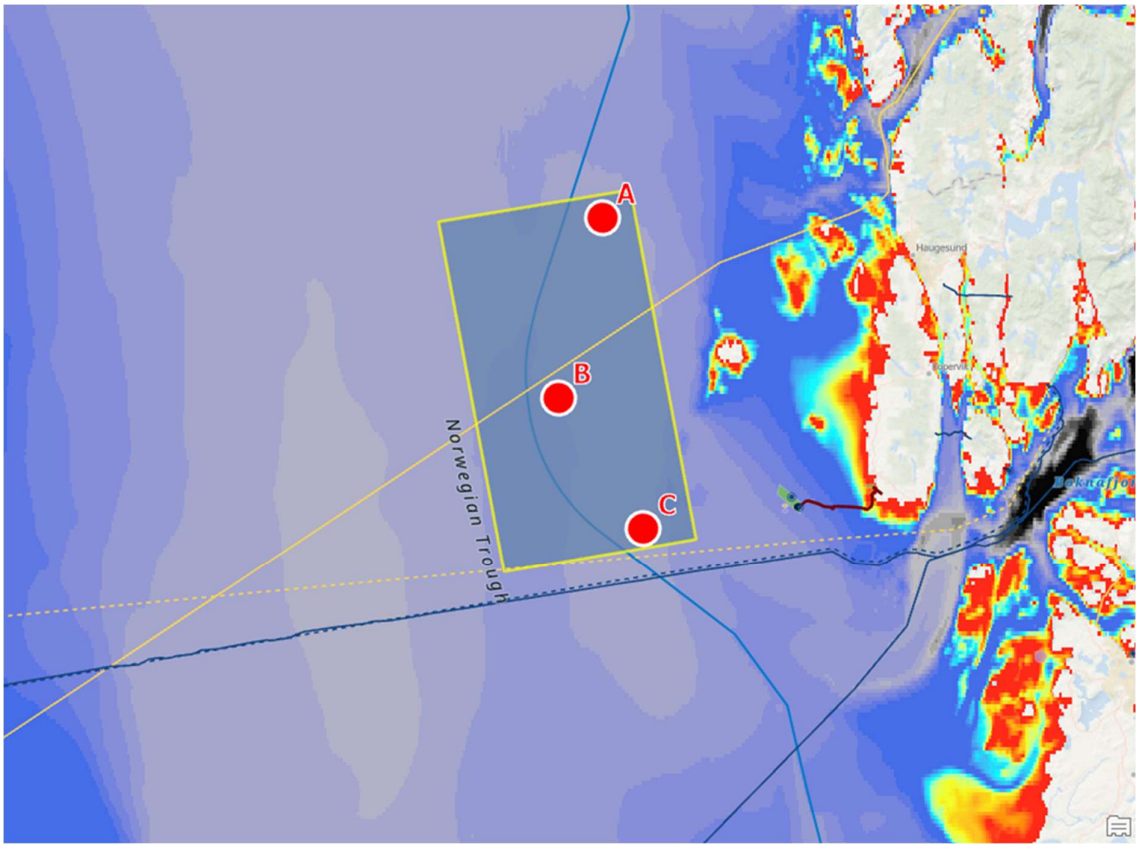


Figure 1

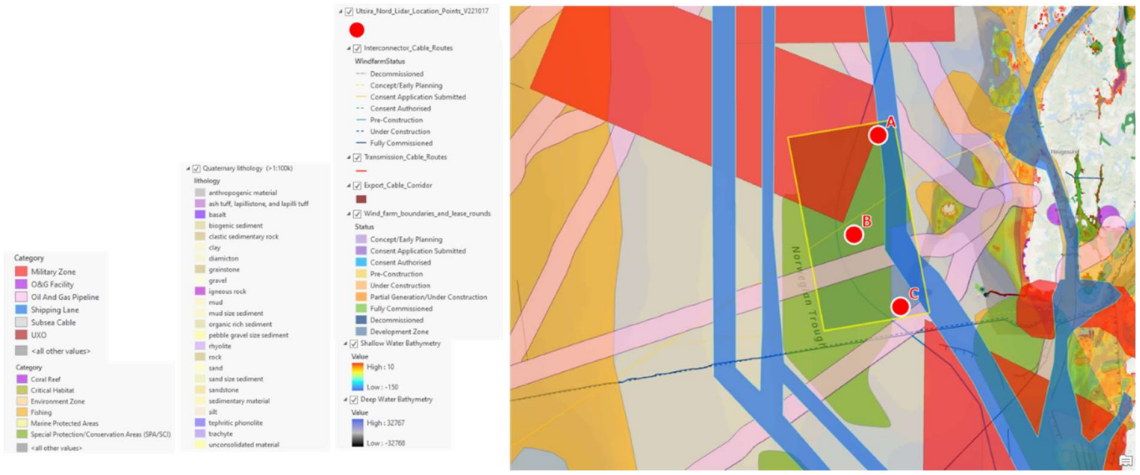


Figure 2

2 PROJECT DESCRIPTION

The proposed project calls for one EOLOS FLS200 wind resource assessment buoy (4412kg) to be deployed.

The buoy will be secured in position by a mooring system consisting of a 5000kg anchor (1.8 m sq) on the seafloor and chain (sample mooring design drawing is included in **Figure 5**).

The buoy will sit on the water surface and will collect data for approximately one year, then it will be fully recovered. There will be no adverse environmental impacts from deploying and operating the buoy. The buoy system will not affect water quality or quantity, or harm marine life.

The scientific measuring devices on the buoy include the LiDAR wind measurement system, surface weather sensors, ocean wave and current sensors, as well as devices to detect bird and bat vocalizations. All systems will be powered by solar-charged batteries, small wind turbines, and when necessary, a backup hydrogen fuel cell. No generators or other devices requiring petroleum will be used on the buoy. Regular scheduled inspections and maintenance of the buoy will be performed at 3-month intervals.

This is a temporary mooring with an estimated chain sweep area of 25,434 m sq total. Superficial surface seafloor disturbance is expected when buoy and mooring system is retrieved. Preliminary design of this specific mooring system was completed by EOLOS Solutions, S.L., and verified by using Mooring Analysis software.

For navigational aids, the buoy will be fitted with radar reflectors, lighting and lettering as laid down by the Norwegian Ministry of Transport and Communications on 15 September 2016 pursuant to Act no. 21 of 4 June 2010 on Offshore Renewable Energy Production through issue of Aids to Navigation (AToN) permit.

The buoy will also be fitted with an Automatic Identification System (AIS) to broadcast its position, and to receive data on vessels passing within the deployment site vicinity. A global positioning system (GPS) will transmit alert messages to the EOLOS operations team if the buoy becomes separated from its mooring.

Pre-planned activities will be reported to the Norwegian Notices to Mariners (NtM) on email to: efs@kartverket.no.

Data collected by the buoy will be transmitted to EOLOS offices via a satellite communications system. A subset of the real-time environmental data collected by the buoy will be made available via the TGS website.

Deploying the buoy to the chosen project site will require a mid-sized vessel with a winch/A-frame system to lift buoy system off the vessel deck and to install the mooring system. The buoy and mooring will remain in situ at the designated site collecting data until the entire system is recovered by a surface vessel and relocated to another site or permanently removed.

During installation the vessel's A-frame will first lift the buoy to the water and secure it alongside the vessel. The anchor weight will then be lifted and lowered slowly to the permitted coordinates on the seabed while paying out mooring chain. Once all the chain has been installed, the buoy will be released from the vessel to float freely and begin data collection.

The buoy system will not produce any hazardous air or water pollutants or introduce hazardous chemicals or solid wastes.

Based on the mooring modeling results, the mooring system will be composed of the following elements:

- Chain: 32mm steel – 135m
- Hardware (shackles and links): 32mm steel
- Anchor: 5000kg max weight, max dimensions 120 x 90 x 70 cm

The anchor footprint on the seabed will be approximately 1.8. sq. metres, while approximately 30 meters of 32mm chain will lay on the bottom. A diagram of the buoy layout, buoy dimensions and mooring system are provided in **Figures 3, 4 & 5.**

The buoy is scheduled to be installed April 2023. It is expected that the installation work will require one day onsite to complete.

Based on the technical approaches for the planned installation activities, the following statements can be made regarding the proposed project:

- No utilities will be affected by the proposed installation activities.

- No navigational access impediments will result from the proposed installation activities; and
- No special site access or laydown areas will be required as all construction materials will be stored on the vessel pending their use.

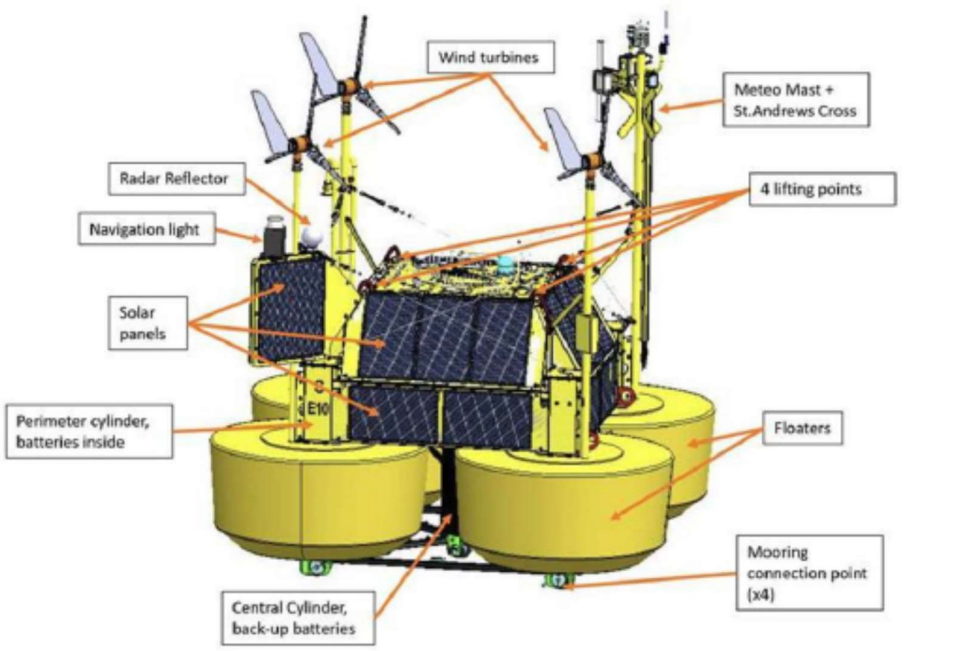


Figure 3. The EOLOS Floating LiDAR Buoy

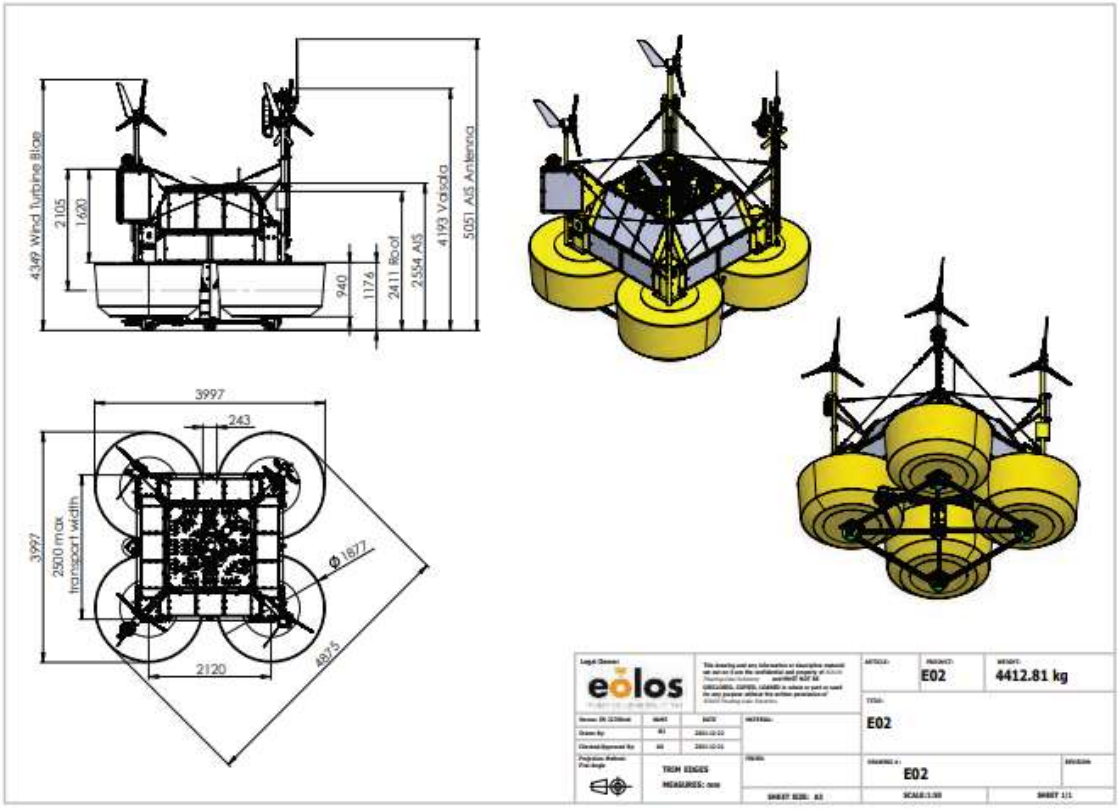


Figure 4. EOLOS FLS200 Buoy Dimensions

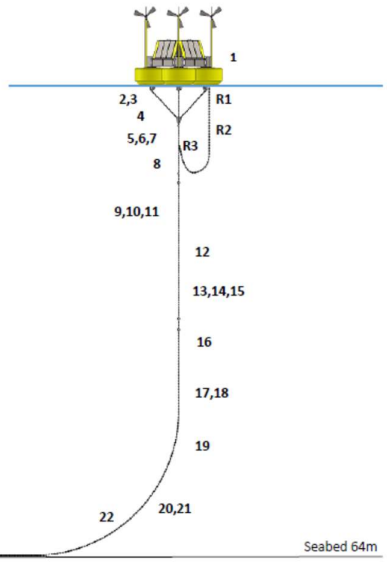
MOORING DESIGN - FLS200 AT TGS SITE Ii

PROPOSED MOORING COMPONENT LIST

DATE	5 October, 2022	**LATITUDE**	36 43' 30.269"N
REVISION		**LONGITUDE**	74 46' 44.350" W
CREATED BY	SPO	**WATER DEPTH**	64m
MOORING LENGTH	150.5m	**MOORING SCOPE**	2.35:1

Item #	DESCRIPTION	SIZE	WLL[1]	LENGTH	NOTES
	Mooring				
1	FLS-200	FLS-200			Eolos Surface Buoy
2	(4) Isolation shackle and pin	1-1/4" (32mm)			Custome Made
3	(4) Shackle (bow)	1-1/4" (32mm)	12T		Green Pin G-4163
4	(4) Bridle chain	1" (26mm)		3m	OLC
5	(4) Shackle (bow)	1-1/4" (32mm)	12T		Green Pin G-4163
6	Master Link Assembly	1-1/2" (38mm)	30.5T		Crosby A-345
7	Shackle (bow)	1-3/8" (35mm)	13.5T		Green Pin G-4163
8	Chain	1" (26mm)		10m	OLC
9	Shackle (bow)	1-3/8" (35mm)	13.5T		Green Pin G-4163
10	Swivel	1-1/2" (38mm)			Crosby G-402
11	Shackle (bow)	1-1/2" (38mm)	17T		Green Pin G-4163
12	Chain	1-1/2" (38mm)		27.5m	OLC
13	Shackle (bow)	1-1/2" (38mm)	17T		Green Pin G-4163
14	Swivel	1-1/2" (38mm)			Crosby G-402
15	Shackle (bow)	1-1/2" (38mm)	17T		Green Pin G-4163
16	Chain	1-1/2" (38mm)		27.5m	OLC
17	Shackle (bow)	1-1/2" (38mm)	17T		Green Pin G-4163
18	Shackle (bow)	1-1/2" (38mm)	17T		Green Pin G-4163
19	Chain	1-1/2" (38mm)		27.5m	OLC
20	Shackle (bow)	1-1/2" (38mm)	17T		Green Pin G-4163
21	Shackle (bow)	1-1/2" (38mm)	17T		Green Pin G-4163
22	Chain	1-1/2" (38mm)		27.5m	OLC
23	Shackle (bow)	1-1/2" (38mm)	17T		Green Pin G-4163
24	Shackle (bow)	1-1/2" (38mm)	17T		Green Pin G-4163
25	Chain	1-1/2" (38mm)		27.5m	OLC
26	Shackle (bow)	1-1/2" (38mm)	17T		Green Pin G-4163
27	Shackle (bow)	1-3/4" (44mm)	25T		Green Pin G-4163
28	5,000 kg Anchor	5,000 kg			5.5T Cast Iron Sinker
	Recovery Line				
1	Shackle (bow, hung on FLS-200 hook)	7/8" (23mm)	6.5T		Green Pin G-4163
2	Chain	3/4" 19mm)		12m	OLC
3	Shackle (bow, secured to 10m mooring chain)	7/8" (23mm)	6.5T		Green Pin G-4163

1 - Working Load Limit



TGS Site Ii

Figure 5. Sample mooring configuration