Development and demonstration of an automated, modular and environmentally friendly multi-functional platform for open sea farm installations of the Blue Growth Industry

D4.4 – Environmental impact assessment for the installation (NOEL) site report

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LIST OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ANNEXES

LIST OF ACRONYMS AND ABBREVIATIONS

EC	European Commission
GA	Grant Agreement
SCI	Site of Community Importance
WP	Work Package

APPLICABLE DOCUMENTS

[AD1] European Commission, Directorate-General for Research & Innovation, Grant Agreement Number 774426 The Blue Growth Farm (GA-2018-774426), 2018.

[AD2] Technical Annex I to the Grant Agreement Number 774426: "Description of Work", April 2018, Part A and Part B.

REFERENCE DOCUMENTS

[RD 1] BGF Deliverable, 2019, "D2.3 – Preliminary design of the full scale concept (including caisson module connections)", May 31st.

[RD 2] BGF Deliverable, 2019, "D2.5 Preliminary design of the outdoor prototype concepts (including caisson module connections)", May 31st.

[RD 3] BGF Deliverable, 2019, "D2.6: Preliminary design of the scaled wind turbine for installation on the outdoor prototype", January 31st.

[RD 4] BGF Deliverable, 2019, "D5.2: Outdoor prototype detailed design, including transportation and installation engineering report", to be issued.

1 INTRODUCTION

The present report has been produced as the result of the Task 4.3 (WP4) of the Blue Growth Farm contract [AD1], [AD2].

The structure to be installed at NOEL site is a 1/15 scale model of the innovative "Blue Growth Farm" (BGF) structure concept. Since the aim of the project is to develop a new multi-purpose floating platform, including and integrating several facilities for aquaculture, wind/wave energy production, maritime surveillance, etc., large-scale experimental tests are a crucial step for the concept demonstration. Detailed description of the full-scale concept proposed can be found in contractual deliverable D2.3 [RD 1]. The main purposes of the model to be installed at NOEL are:

- providing large-scale experimental data about the dynamic response of the structure under various environmental conditions, with and without any of its sub-systems. This information is crucial for the validation of the numerical model of the structure implemented in WP3, already fed with small-scale experimental data provided in T3.4.
- demonstrating the feasibility of the concept, the efficiency of the multi-technology integration and the correct functioning of each sub-system. This is crucial for the estimation of the maturity of the proposed technology.

The NOEL laboratory (Natural Ocean Engineering Laboratory) is a very peculiar facility placed within the water front of Reggio Calabria (Italy). The local environmental conditions are exceptionally favorable to at-sea experimental activities on marine structures. In detail, local wind blows quite regularly from NNW, acting on a fetch of about 10 km, and coast orientation naturally protects the local water sheet against swells coming from the South. As a consequence, small sea states (significant wave height H_s=0.2-0.8m, peak wave period T_p=2.0-3.6s) made up of pure wind-generated waves occur quite regularly. These sea states are Froude scale models of typical ocean storms, which are one of the most important design conditions for marine structures. These characteristics, along with other advantages and the variety of other wind/wave conditions occurring locally, makes NOEL a unique location for at-sea experiments on marine structures, particularly favorable for the testing of the BGF concept.

The model to be installed is a rectangular-shaped floater with an internal moon-pool, which represents the location of the aquaculture fish cages in the full-scale structure. Similarly to the full-scale, the seafront side of the model will host the wind turbine, equipped with an opportune control system, and the WECs, embodied in the breakwater that protects the internal moon-pool from the incoming waves. The model will be manufactured in steel, which guarantees adequate structural strength and suitably fulfills Froude scale with respect to the concrete full-scale structure. The model will be anchored with 4-points catenary mooring system, which holds the structure in place by providing the necessary horizontal stiffness. The anchors are opportunely placed on the inclined seabed and all the mooring system components are designed to resist the local extreme environmental conditions and fatigue loads. Energy supply and data transmission with the land will be provided through an umbilical cable. Additional information about the model can be found in the contractual deliverable D2.5 [RD 2].

The experiment will last 9 months and then the structure will be safely de-anchored and decommissioned. Experiment will exploit various environmental conditions, including but not limited

to: wind-generated waves, swells, free decay tests in almost still water, sea states misaligned with wind, relatively strong currents, etc. with and without operating wind turbine and the other sub-systems.

1.1 Identification of the document and its structure

The present document is identified as Deliverable D4.4 "D4.4 – Environmental impact assessment for the installation (NOEL) site report" of the Blue Growth Farm Contract [AD1], [AD2].

The contents of the document are organized according to the following sections:

- Section 1 contains the introduction to the present document;
- Section 2 reports technical description of the aero/hydro prototype for installation at NOEL site;
- Section 3 illustrates technical details of the bathymetry of the concerned site;
- Section 4 presents the reference site maps and the applicable landscape planning;
- Section 5 describes the environmental baseline;
- Section 6 documents the seabed characteristics;
- Section 6 illustrates the aero/hydro prototype installation through rendering and 3D models;
- Section 7 reports information about local benthos;
- Section 8 reports information about local wildlife (birds);
- Section 9 synthetizes interference with human activities at site;
- Section 10 outlines the legal framework;
- Section 11 characterizes the use and protection plan of the concerned area;
- Section 12 synthetizes the expected impacts consequent to the prototype deployment and temporal presence on site;
- Section 13 reports on mitigation actions;
- Section 14 synthetizes the conclusions of the present report;
- Section 15 lists the quoted references.

2 AERO/HYDRO PROTOTYPE FOR EXPERIMENTS AT NOEL

The preliminary design of the aero-hydro outdoor prototype to be installed at NOEL site is described in D2.5 [RD 2]. It represents a scaled model of the full scale structure described in D2.3 [RD 1].

The aero-hydro outdoor prototype geometry is given in Figure 1, whilst the main characteristics are summarized in the following Table 1.

Table 1. Main characteristics of the aero-hydro outdoor scaled prototype

Parameter	Units	Value
Total length	[m]	14.00
Total width	[m]	10.80
Max height above SWL (excluding wind turbine mock-up)	[m]	0.53
Draft	[m]	1.33

The model will be made up of welded steel and will sustain the wind turbine, the WECs and all the sensors necessary to carry out the experimental activity. The cross-section of each side has ideally an inverted T shape, even though aft side has three openings for vessel docking and water exchange and forward side includes active breakwaters, embodying the WEC devices (not equipped with turbines for energy production). Emerged and submerged bridges and reinforcements will be used to house the sensors. Occasionally, temporary scaled models of the fish cages could be installed as described in D2.5 to collect experimental data taking into account their damping contribution.

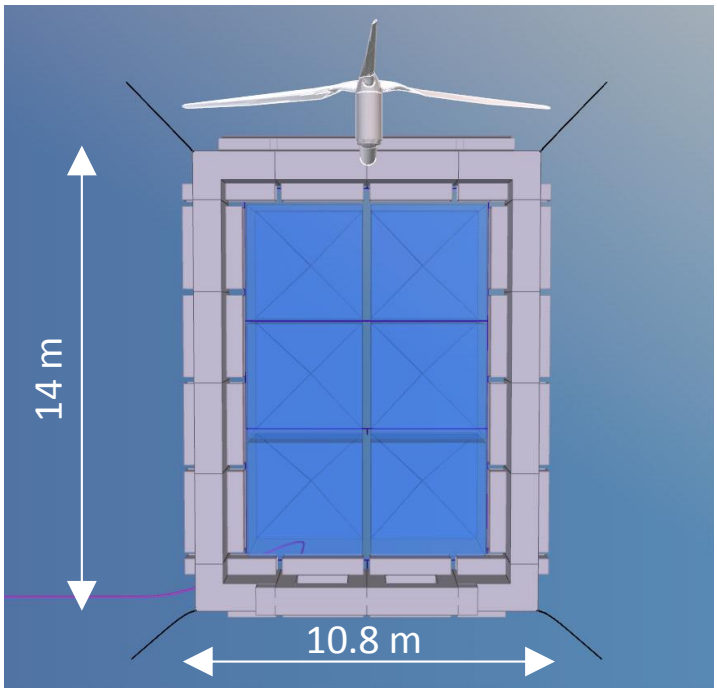


Figure 1. Sketch of the aero-hydro outdoor scaled prototype installation

2.1 Wind Turbine mock-up

The detailed design and characteristics of the wind turbine mock-up to be installed at NOEL site in the aero-hydro outdoor prototype are described in the contractual deliverable D2.6 [RD 3]. It

represents a scaled model of the reference machine (RWT) considered for the full scale structure [RD 1], i.e. DTU 10MW wind turbine.

The main characteristics of the wind turbine to be installed at NOEL are reported in the following Table 2,

Table 2.Main characteristics of the wind turbine to be installed at NOEL

Parameter	Units	Value
Tower height (from SWL to nacelle)	[m]	7.70
Tower external diameter	[m]	0.28
Rotor diameter	[m]	6.86
Maximum height above SWL	[m]	11.13
Rotor area	[m^2]	36.96
Maximum rotor frequency	[rpm]	109.5

whilst a schematic view is provided in Figure 2.

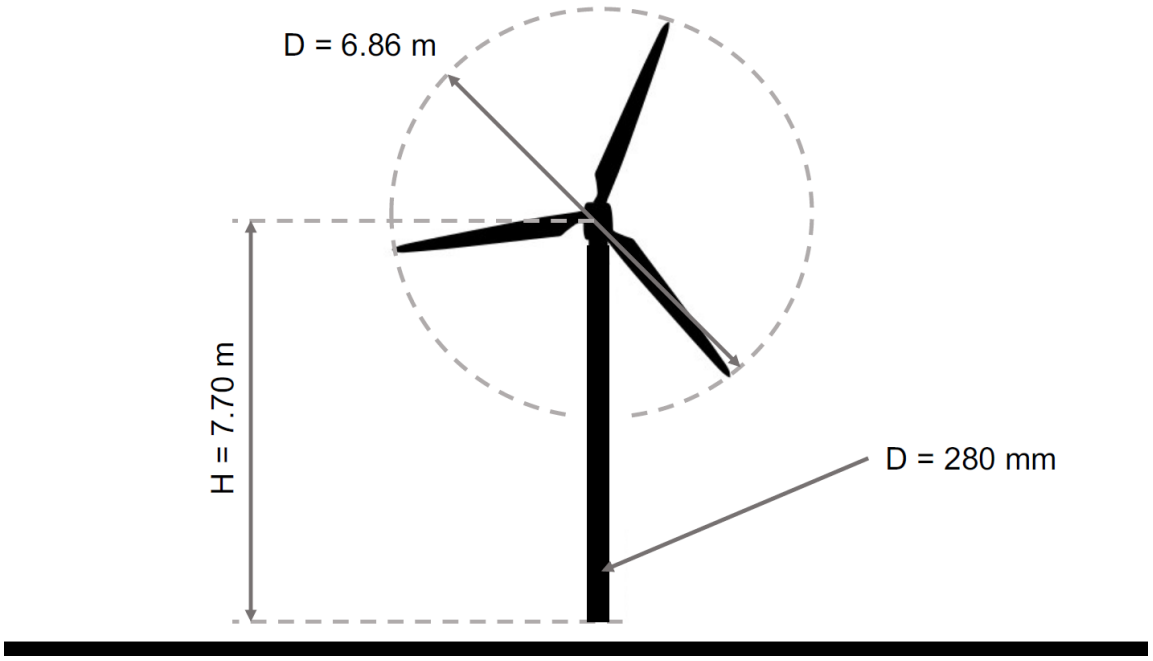


Figure 2. Sketch of the wind turbine

The tower is designed as an aluminium tube, while the blades are made up of composite material and will be reinforced similarly to the full-scale ones. The maximum rotor speed is used for wind velocity between rated and cut-off. The control strategy will be a traditional variable speed variable pitch (VS-VP) one. In general, the controller acts on blade pitch angle or generator torque, depending on the load conditions to regulate power production and rotor speed. The energy produced will be measured and dissipated on board. Finally, the turbine can be shut down from land through an additional manual safety control system. No energy production delivered to the grid is expected.

2.2 Mooring system

The mooring system has been designed to withstand the 5-Year return period environmental loads extremes. Intact condition and single line failure condition were investigated by performing dynamic analysis with random waves and current. The mooring system to be used is composed of 4 mooring lines connected at each corner of the platform to anchors. As a consequence of the NOEL bathymetry and the allowable footprint, the mooring system is composed of different type of mooring lines and specific lengths (Table 3), whose properties are summarized in Table 4.

Table 3. Mooring arrangement description

Mooring Line Number	Total length (m)	Line arrangement (from fairlead)
Shore line 1	100	55 m of 24 mm studless chain 45 m of 100 mm studless chain
Shore line 2	103	53 m of 24 mm studless chain 50 m of 100 mm studless chain
offshore line 3	155	10 m of 24 mm studless chain 50 m of synthetic mooring rope 25 m of 24 mm studless chain 70 m of 100 mm studless chain
offshore line 4	155	10 m of 24 mm studless chain 50 m of synthetic mooring rope 25 m of 24 mm studless chain 70 m of 100 mm studless chain

Properties	24mm diameter chain	10mm diameter chain	Nylon mooring rope	70 mm diameter chain
Nominal diameter	24 mm	100mm	58mm	70mm
Dry mass per unit length	0.011 t/m	0.199 t/m	0.003 t/m	0.098 t/m
Breaking load (R4)	68 t	1005 t	66 t	526 t
Axial stiffness	4.92E+07 N	8.54E+08 N	Variable	4.18E+08 N
Transversal added mass coefficient	1	1	1	1
Longitudinal added mass coefficient	0.5	0.5	1	0.5
Transversal drag coefficient	2.4	2.4	1.2	2.4
Soil friction coefficient	1	1	NA	1

Table 4. Mooring line components properties

Based on the maximum tensions found at the anchor points from the dynamic mooring analysis and the soil parameters (soil characteristics, bathymetry slope), drag anchors have been selected and dimensioned to meet the loadings and soil conditions. The configuration of the mooring system is presented in Figure 3. , whilst the characteristics of the anchor system are given in Table 5.

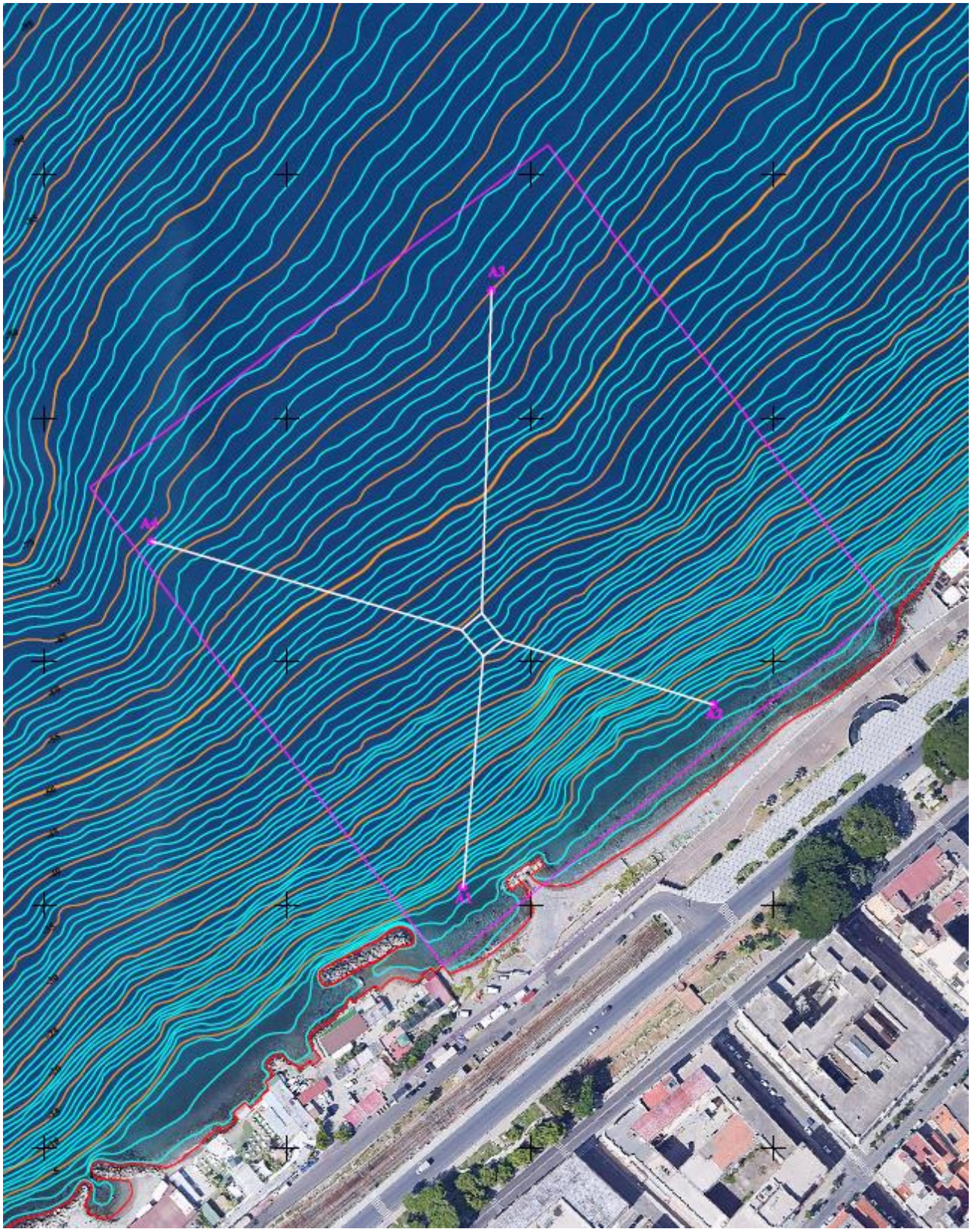


Figure 3. Plan view of the aero/hydro outdoor prototype and mooring system

The prototype and the mooring lines are represented by the white lines. The magenta square represents the water sheet operated during the experimental campaign. The anchors position correspond to the circles in magenta, in particular: A1 stands for the anchor “Shore side 1”, A2 stand

for the anchor “Shore side 2”, A3 stands for the anchor “Sea side 3” and A4 stands for the anchor “Sea side 4”.

Table 5. Anchoring system characteristics

Anchor number	Drag anchor type
Shore side 1	1 of 1t Mk5 drag anchor
Shore side 2	1 of 1t Mk5 drag anchor
Sea side 3	1 of 1t Mk5 drag anchor
Sea side 4	1 of 1t Mk5 drag anchor

Areas with the seabed slope smaller than 10 degrees have been selected to place the drag anchors. In particular, the anchors near the shoreline will be placed in water depth of 3 to 4 m, before the slope becomes too steep, and on the deep edge of the extended NOEL area, as reported in Figure 3.

2.3 Visual rendering of the aero/hydro prototype installation

The visual rendering of the BGF aero-hydro outdoor prototype installation is provided Figure 4 as seen from the Reggio Calabria (Italy) seafront. NOEL laboratory is also visible, slightly on the left (South) with respect to the model, on the coast.

Other 3D images of the model structure are reported from Figure 5 to Figure 10.

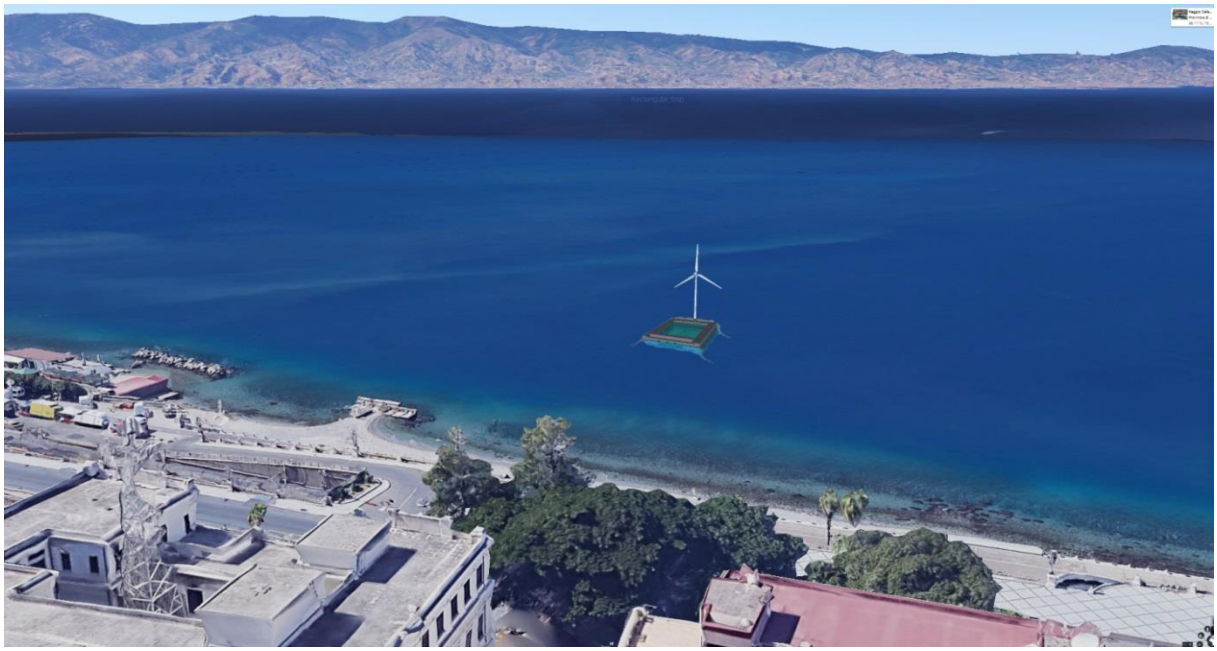


Figure 4. Aero-hydro outdoor prototype visual impression FROM the seafront of Reggio Calabria

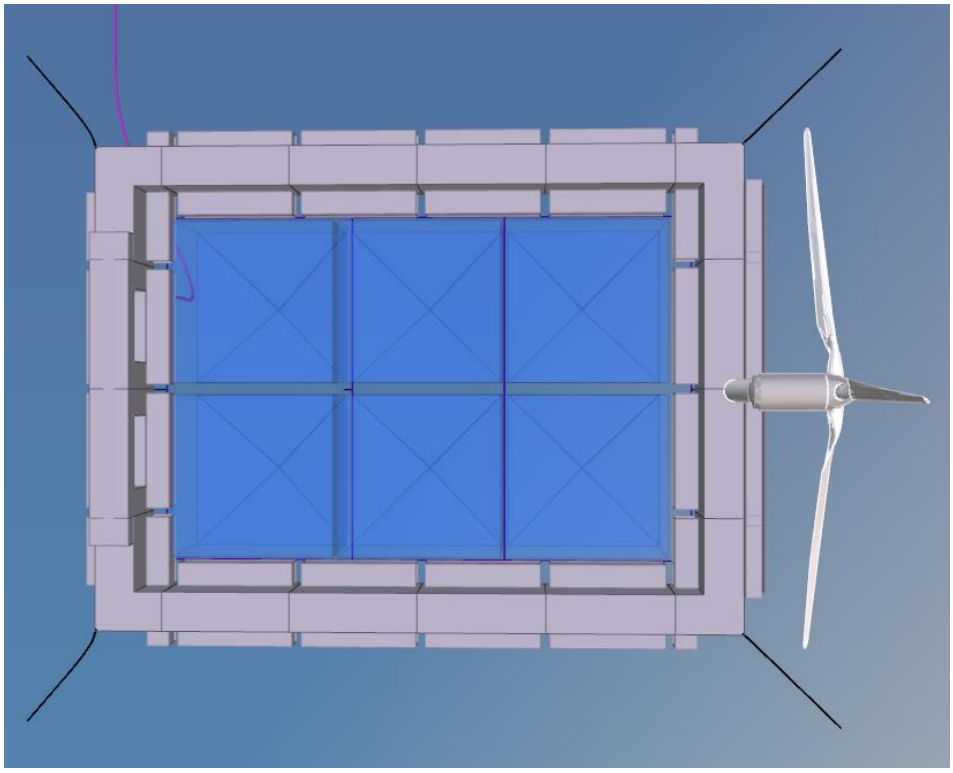


Figure 5. 3D Aero/hydro outdoor scaled prototype model plan view

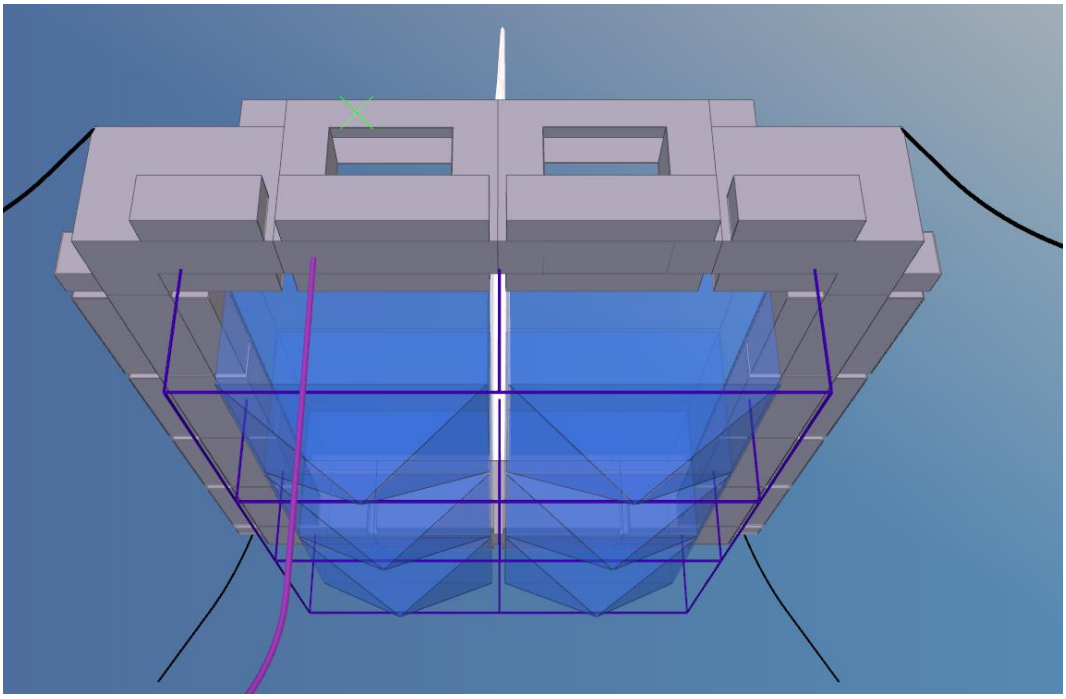


Figure 6.3D aero/hydro outdoor prototype model bottom view

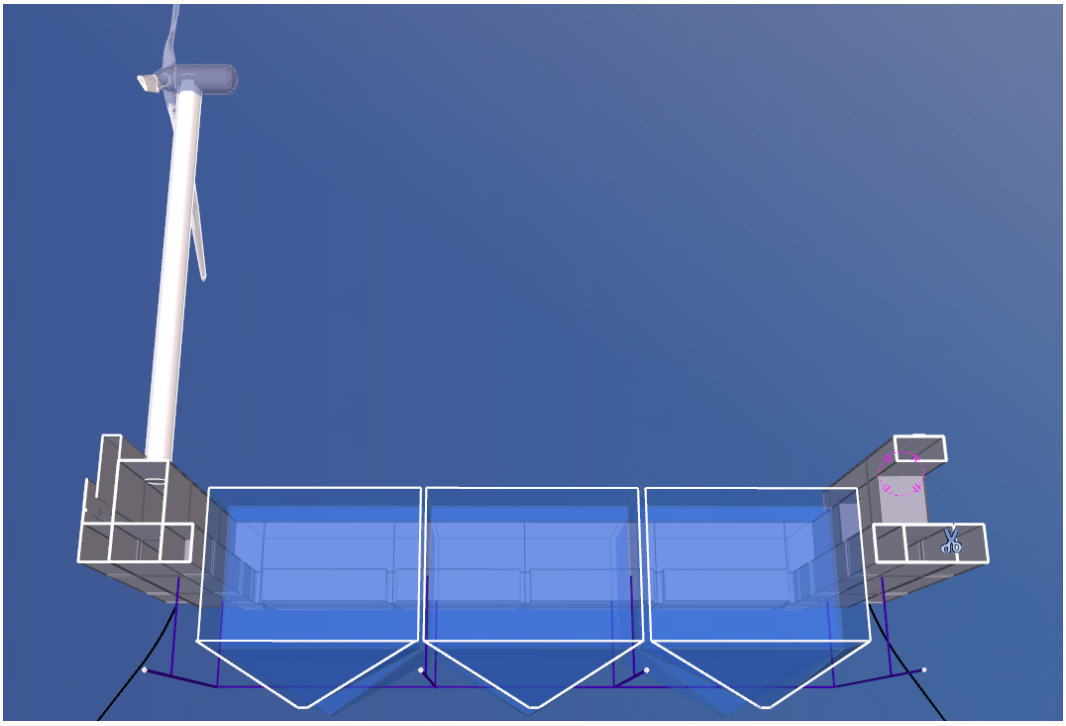


Figure 7.3D aero/hydro outdoor scaled prototype model longitudinal cross section

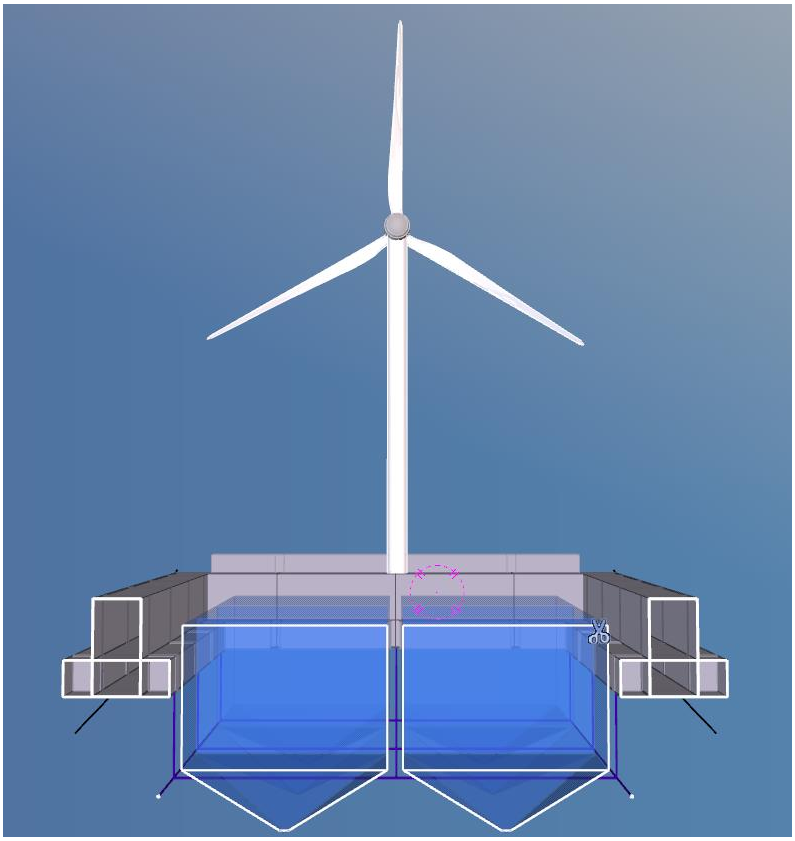


Figure 8. 3D aero/hydro outdoor scaled prototype model transversal cross section

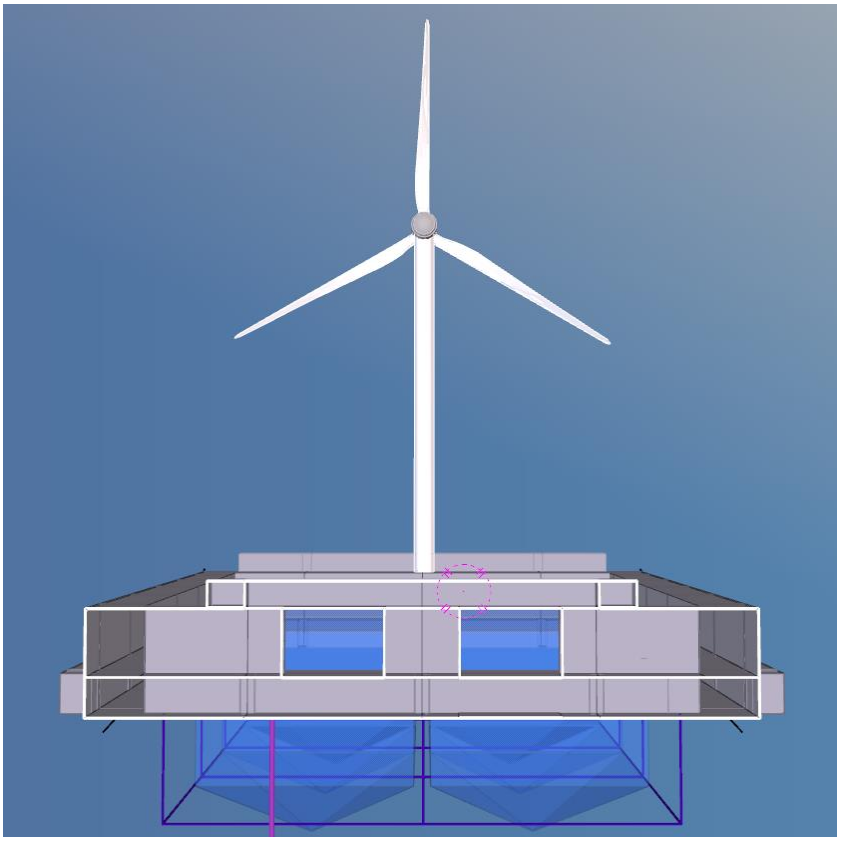


Figure 9. 3D aero/hydro outdoor scaled prototype model aft-side transversal cross section

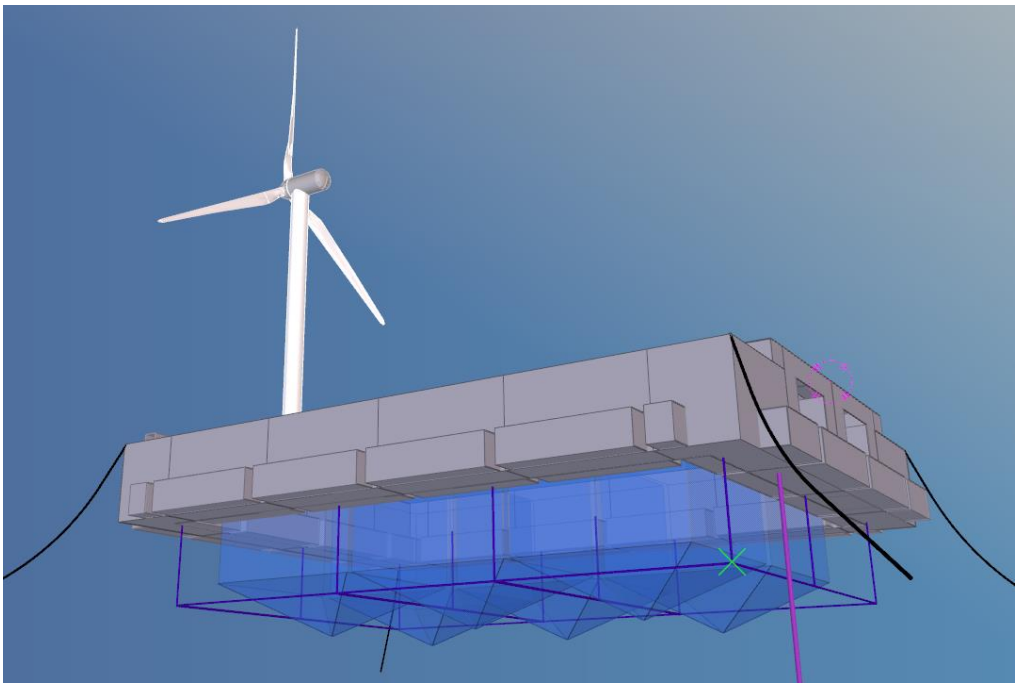


Figure 10. 3D aero/hydro outdoor scaled prototype model view perspective

3 BATHYMETRY

A new bathymetry survey has been performed on July 2019 to determine bed levels within a pre-determined area (Figure 11) in order to correctly design the mooring systems and define the best anchors configuration for the temporary installation of the aero/hydro outdoor prototype at NOEL site. The survey area (Figure 11) starts from the shoreline reaching a depth of -100m swl. A single beam echo sounder was used for the measurements and data were then processed using professional software such as Socet set, Nonio C, Thopos, Meridiana. The acquisition of the data was based on a 5mx5m grid from the shoreline to the depth of -30m swl, then a 10mx10m grid was used to sample data from the depth of-30m swl to the depth of -100m swl.

Figure 11. Survey area, which embodies the experimental campaign area (the white arrow indicates the NOEL laboratory location)

The result of the bathymetry survey is reported in Figure 12. Further, the profile of the bottom was drawn in correspondence of two transects, referred to as “North section” and “South section” and shown in Figure 12.

Figure 12. Bathymetry survey at NOEL site. The red lines orthogonal to the shoreline indicated the two transects chosen to draw the bottom profile reported in Figure 13.

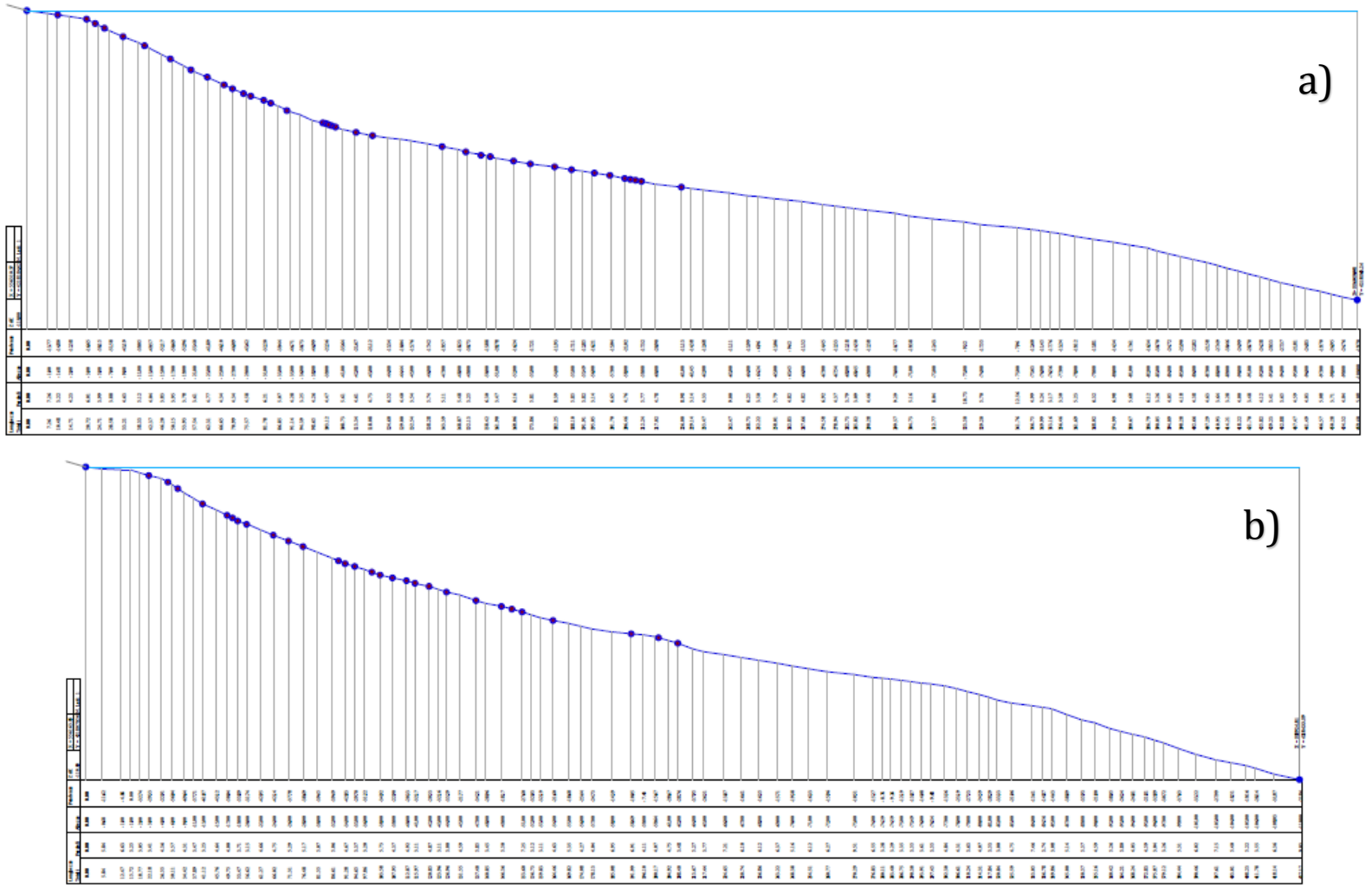


Figure 13. Bottom profile along the two transects indicated in Figure 2. a) North section; b) South section.

4 REFERENCE SITE MAP AND APPLICABLE LANDSCAPE PLANNING

Applicable site mapping is given in Annex 3, Annex 4 and Annex 5.

5 ENVIRONMENTAL BASELINE

The SCI site “Fondali da Punta Pezzo a Capo dell'Armi”, cod. IT9350172, is fully marine site. It has been established to preserve the priority habitat 1120 *, *Posidonia oceanica* beds”, and the non-priority habitats 1170 “Reefs” and 1110 “Sandbanks slightly cover by seawater all the time” (Figure 14).

Figure 14 The SCI area facing Noel site

The site is described as a wide and sparse Posidonia bed, at depth variable between 5 and 50 m. The site is also important for the presence of coralligenous reefs and sandbanks, and also for the presence of protected species, as *Caretta caretta, Tursiops truncatus, Stenella coeruleoalba, Pinna nobilis*, as well as for species related to the peculiar hydrological regime of Messina Strait, as *Cystoseira tamariscifoliae, Desmarestia dresnay, Laminaria ochroleuca, Phillariopsis brevipes, Sacchoriza polyschides* and *Ulva olivascens.*

The site is extended for 1799,4 ha, and includes the municipalities of Villa San Giovanni, Reggio Calabria, Motta S.Giovanni.

The following areas are particularly noteworthy:

- the northern limit, at the Cannitello locality, where there is a small bed of P. oceanica mixed with rocky outcrops under the bathymetry of 20 m;
- the submerged rocks and the coralligenous biocenosis in the Punta Pezzo area;
- Deep communities, with discontinuous distribution of Laminariace (*Laminaria ochroleuca*) in the depths around 40m between Punta Pezzo and Gallico and the association with *Cystoseira tamariscifoliae, Saccorhiza polyschides and Phyllariopsis brevipes*, in the same area at lower depths;
- the benthic biocoenosis of coarse sands subjected to bottom currents (SGCF sensu Pérès et

Picard) identified at the bathymetry of about 50 m from Punta Pezzo to S. Tirrena Inferiore and a small area parallel to the coast from the Catona Beach to Gallico where patches and turfs of Posidonia oceanica at low bathymetry are, below 20 m;

- spots and turfs of posidonia on the seabed in front of the Ravagnese airport;
- an area with the biocoenosis of fine sand well classified (SFBC sensu Pérès et Picard) up to the bathymetry of 50 m in the bay located between the Fiumara of S. Agata Graziella and S. Leo, which can be included in the habitat 1110;
- the facies with crinoid *Antedon mediterranea*, observed in particular between 30 and 45 m of depth from Villa S. Giovanni and P.ta Pellaro, and several other species of crustaceans and echinoderms, including the endemic species *Astropecten platyacanthus* and *Echinocardium mortenseni*.
- the biocenosis with white hydrocorals subjected to strong bottom currents, characterized by facies with *Errina aspera*, a colonial hydrocoral, with a madreporic appearance on which a mollusk (*Pedicularia sicula*) lives, the giant barnacle, *Pachylasma giganteum* and the decapod *Pilumnus inermis*, an Atlantic species reported in the same area.
- In the area between Villa S.Giovanni and Catona between 20 and 30 m of bathymetry is reported a high density area of chlorophycea *Ulva olivascens*. Below 40 m of depth appears the phaeoficean *Desmarestia dresnayi* which becomes dominant at greater depths and has the maximum coverage around 60-70 m.

In the area outside the old perimeter of the pSIC between Scilla and Villa S. Giovanni and between Villa San Giovanni and Capo Paci, the hard bottom is characterized by particular biocenosis:

- of photophilic algae of the upper infralittoral, with a high layer characterized by the association *Cystoseira tamariscifolia, Saccorhiza polyschides, Phyllariopsis brevipes*, and in the substrate, the phaeoficean *Desmarestia ligulata* and *D. dresnayi;*
- a coralligenous, with the Association of *Cystoseira usneoides, Laminaria ochroleuca* and *Phyllariopsis purpurascens*, which dominates over the typical one from 50 to 80 m of depth.

A dense bed of *C. taxifolia* between 10 and 30 m of depth from Punta Pezzo to Scilla is also reported. Throughout the area there are several specimens of the bivalve mollusc *Pinna nobilis* and the fish population is very rich with numerous specimens of the sarago *Diplodus vulgaris.*

The habitat conservation may be impaired by human pressures, and several are described in the Site management plan. Concerning the installation of the prototype in the Noel site, the below criticalities are considered (bbbb).

Table 6. Pressure and derived impact on protected habitats

Pressures	Threatened habitats	Impacts
Offshore works, submarine cables and pipelines (C))	1110 Sandbanks with weak permanent sea water cover 1120 * Posidonia meadows (Posidonion oceanicae)	– Alteration of the hydro-sedimentological regime of the coasts, – temperature increase locally; – mechanical destruction of leaves and rhizomes of Posidonia; – destruction of biodiversity,

	1170 Cliffs	– coastal erosion; decrease in the tuft density of the seagrass meadows until the lower limit is regressed.

In the following Table 7, the conservation measures prescribed by the site management plan are described. These addresses and actions are generically directed towards the habitat conservation and do not include any action involving the prototype operation at the Noel site.

Table 7. Conservation measure for the IT9350172 site

Conservation measures	
Management objectives	• Conservation of Posidonia meadows (habitat 1120 *) • Conservation of cliffs (habitat 1170) • Conservation of sand banks with weak permanent water cover marine (habitat 1110) • Sustainable management of fishing activity • Protection of the hydrosedimentological balance of the coast • Citizen Awareness and training on the protection of naturalistic emergencies
Addresses and management actions **Reg: measures regulations;** **Amm: administrative measures;** **Con: contractual measures;** **Int: active interventions**	• Prohibit the removal of the beached Posidonia, in order not to interfere with the natural course of the coast and allow the formation of banquettes from the coasts facing the pSIC (Reg); • Involve local communities and trade associations - with particular reference to those in the fishing sector - in the activities related to site management (Int); • Support organic farming throughout the province (Con); • Create an observatory for the protection of the hydro-sedimentological regime of the shoreline (Int); • Prepare material and / or information panels on biology, ecology and the importance of the conservation of posidonieto for pSIC users in the ports and beaches (Int); • Support the development of fishing tourism (Con); • Create common market areas (e.g. in Catona, Calamizzi and Pellaro) for the direct sale of fish, taking advantage of hygienic and sanitary spaces (standard refrigeration and ice plants) (Int) 28; • Implement training / retraining courses for local fisheries operators in order to develop greater environmental awareness (Int); • Support small-scale fishing and in particular the use of spears for swordfish fishing (Con); • set up yellow warning buoys at the limits of the areas of greatest interest for the marine environment of the pSIC (Int + Reg); • Prohibit the anchorage on the Posidonia meadows, as indicated in the "land use map with reference to the types of habitat", possibly regulating the mooring with fixed buoys for anchoring pleasure boats in bays very frequented by tourism nautical (Reg + Int); • Prohibit the removal, destruction and damage of rocks and the collection of specimens of vegetation and fauna, from the 1170 habitat "Reef", as indicated in the "land use map with reference to habitat types" (Reg);

- Prohibit the use of the purse seine in the Posidonia areas, as indicated in the "land use map with reference to the types of habitat", and / or any documents drawn up by the Managing Body (Reg);
- Monitor the density of turf and leaves, marking of the lower limit of Posidonia, biomass, productivity, internode length, lepidochronology, of Posidonia oceanica meadows in addition to the analysis of the epiphytic community on leaves and rhizomes;
- Support the development of a monitoring program for coralligenous biocoenoses, corresponding to the 1170 habitat "Reefs";
- Monitor the presence of different species of Caulerpa spp .;
- Allow professional fishing activities only for units of the small fishing category (units not exceeding 10 GRT) entered in the registers of the competent maritime offices of Villa San Giovanni and Reggio Calabria (Reg);
- Extend the period of temporary interruption from coastal fishing activity local and close with passive tools (fishing stop from the Ordinance of the competent Port Authority following Ministerial Decree) to all types of tools, even not indicated in the Decree (Reg);
- Prohibit trawling, dredging and rake fishing and fishing with non-manual seine, the spider seine (Reg).

6 SEABED CHARACTERISTICS

The coastal deposits consist of gravelly and sandy lithotypes, arranged in more or less irregular layers, and are always found in the dissolved state, which determines a high permeability for porosity. Local permeability reductions, however lacking in particular practical significance, can be found in areas where the concentration of fine-grained materials prevails.

The data from geognostic investigations confirm that a lithological predominance of sandy gravels alternated with sand with pebbles.

The thickening is not very powerful, so resistance to erosion and shear stresses is maintained at rather low levels.

The average overall thickness of the formation is less than 10 meters, but the overlapping to the formation of alluvial deposits and of the gravels of Messina, lithologically very similar, can increase the apparent thickness.

From the general indications given above, it can be deduced that the lithotypes that constitute the geological substratum of the area are represented by elements clastics with a diameter between the maximum size of the pebbles and the minimum size of the slimes, with an extended intermediate band that covers the whole field of gravels and sands, not excluding occasional boulders.

According to geological studies available on the area near NOEL laboratory [R1], [R1] , the seabed is mainly characterized by sand and gravel, generally arranged in irregular layers displaying high levels of permeability due to porosity.

From the shore to the depth of around -5m swl the seabed is light brown and grey and it's composed mainly by sand and stones (see Figure 17). From the depth of around -5m swl to the depth of around -9m swl the seabed is light brown and it it is characterized by sand with medium-fine particles, locally silty and/or gravelly (see Figure 18 and Figure 19). Moving to deeper areas (from -9m swl to -15m swl) the seabed becomes dark grey and it is mainly composed of medium-fine sand, locally gravelly. From the depth of -15m swl the soil is characterized by sand and gravel and it's mostly grey (see Figure 19 and Figure 20).

7 BENTHOS

The benthic communities on the Messina Strait, considered on a vast area scale, are depicted in Figure 15. The map has been retrieved from EMODnet website.

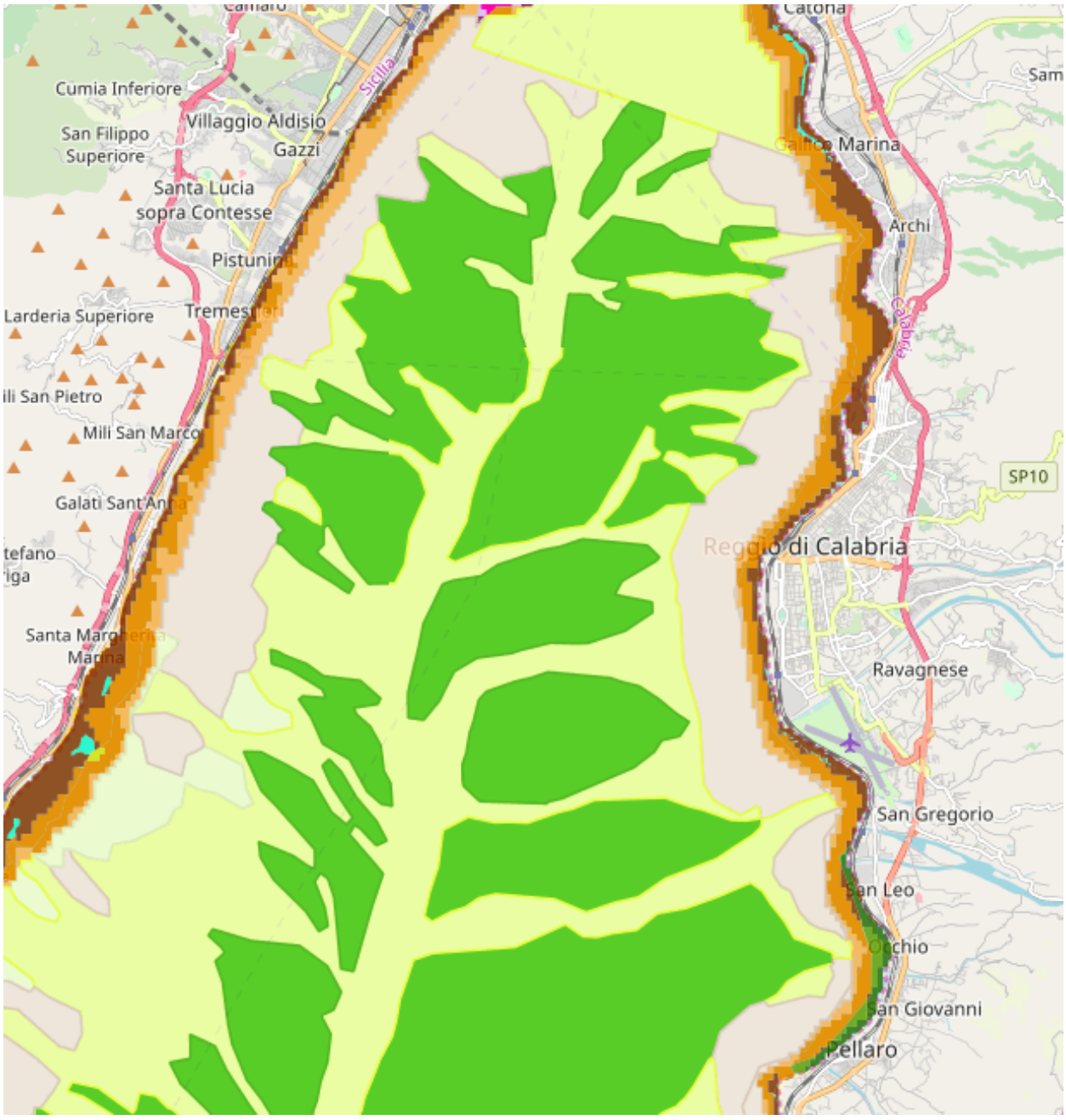


Figure 15. Broad scale habitat map

LEGENDA:

Green: Eunis A6.51 Mediterranean communities of bathyal muds;

Yellow:Eunis A6.4 Deep sea muddy sand

Grey: Eunis A6.2 Depp sea mixed substrata

Light brown: Eunis A5.47Mediterranean communities of shel-edge detritic bottoms

Brown: Eunis A5.46 Mediterranean coastal detritic bottoms

Dark brown: Eunis A5.13 Infralittoral coarse sediments

During the bathymetry survey measurements presented in Section 2, the scuba divers took pictures of the bottom along the two transect presented in Figure 12. The photos taken along the North Section and the South Section are reported in Annex 1 and Annex 2. From the photos and the visual inspection of the seabed of the experimental area no “Posidonia oceanica” was found.

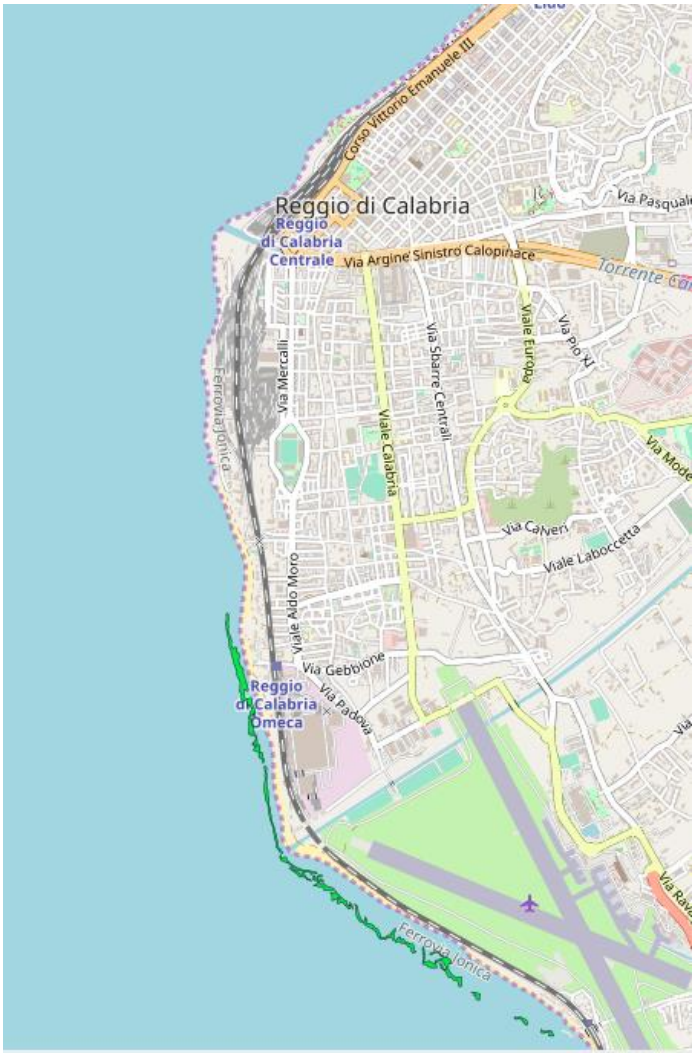


Figure 16. Nearest Posidonia oceanica beds in the installation area

Several Mediterranean fanworm (Sabella spallanzanii) were found starting from the depth of -28m swl (see Figure 21 and Figure 22).

Figure 17. Photograph of the seabed at the depth of -1.5m swl

Figure 18. Photograph of the seabed at the depth of -9.0m swl

Figure 19. Photograph of the seabed at the depth of -12.0m swl

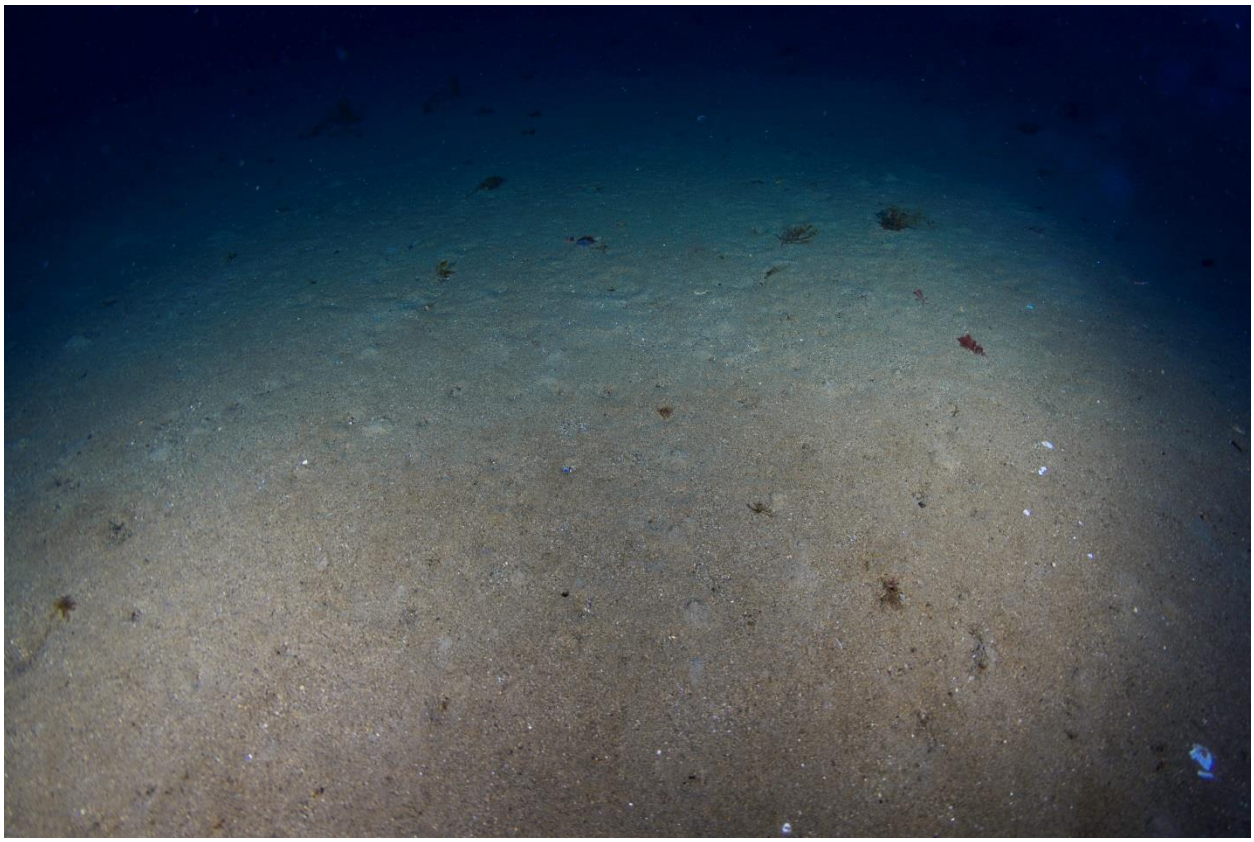


Figure 20. Photograph of the seabed at the depth of -59.0m swl

Figure 21. Photograph of the seabed at the depth of -28.6m swl

Figure 22. Photograph of the seabed at the depth of -48.9m swl

the benthic biocenosis found in the installation area are indicated, at small scale, in Figure 23.

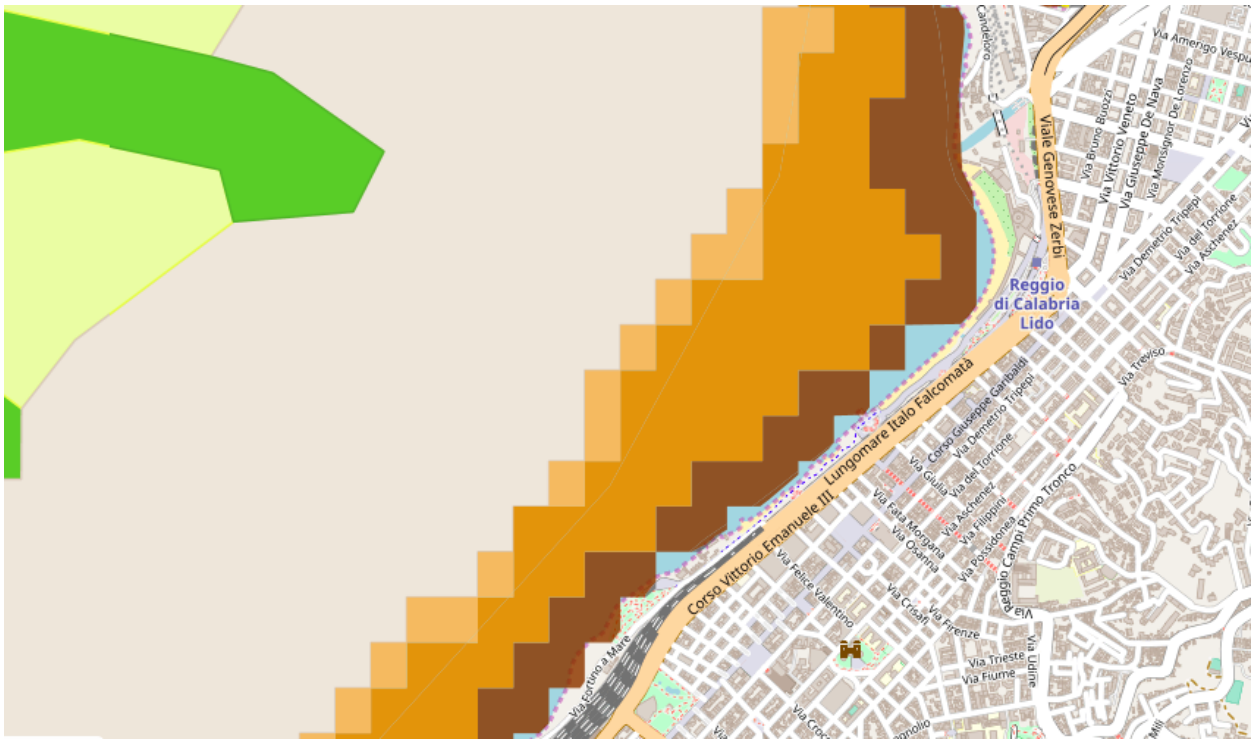


Figure 23. Benthic communities of the Noel area.

Light brown: Eunis A5.47 Mediterranean communities of shel-edge detritic bottoms

Brown: Eunis A5.46 Mediterranean coastal detritic bottoms.

Dark brown: Eunis A5.13 Infralittoral coarse sediments.

The deepest part of the area belongs to Coastal Detritic bottoms (DC *sensu* Pérès et Picard, 1965, Eunis A5.46) and the coastal side to the Infralittoral Coarse sediments (Eunis A 5.13).

From the coast to the deepest part of the surveyed area, the sea bottom is featured by:

1. down to -9 m , an area of mixed coarse sediments (cobble, pebbles, sand), sometimes covered by a layer of brown algae, which growth is impaired by sediment grinding action;
2. down to 65 m, a sandy sediment mixed with gravels, mainly of terrigenous origin with rodolithes, and several specimens of *Sabella spallanzani* standing out the sea bottoms;

Any abundant superficial fauna is visible, and bivalves shell is uncommon.

The area down to -30 m can be described as an habitats with a moderate exposition, with coarse sand, gravelly sand, shingle and gravel in the infralittoral plan. The habitats containing this biotope may be subject to continual or periodic sediment disturbance from wave or current action, which prevents the establishment of a more stable community. A sub-climacic community may develop with opportunistic taxa such as *Chaetozone setosa* and *Scoloplos armiger* often dominating. Such habitats are characterised by a robust fauna of infaunal polychaetes such as *Lanice conchilega*, cumacean crustacea such as *Iphinoe trispinosa* and *Diastylis bradyi*, and venerid bivalves. The

lancelet *Branchiostoma lanceolatum* may also occur in gravel bottoms.

The deepest part of the surveyed area is described as occurring on a substratum whose nature depends largely on the typology of the nearby coast and of nearby infralittoral formations. The specific characteristic pool is composed by *Cryptonemia tunaeformis, Bubaris vermiculata, Genocidaris maculata, Ophioconis forbesi, Lima loscombei, Propeamussium incomparabile, Chlamys flexuosa, Laevicardium oblongum, Cardium deshayesi, Tellina donacina, Eulima polita, Drillus maravignae.* The area may be ascribed to a Coastal Detritic with a "Pralines" facies, sensu Pérès et Picard, established on a coarse sediment with a negligible mud fraction. The surface is sparse with nodules of calcareous Rhodophyceans, as *Lithotamnium racemum* and *L. fruticulosum*, that roll over the substratum under the effects of bottom currents. Due to this last factor, the species *Venus casina* is generally found as associated. The relevant number of *Sabella spallazani* found are anchored on gravel or debris (even of human origin) of greater size, and witnesses a degree of organic enrichment of overlying waters.

8 BIRDS

The SPA "Costa Viola" and Monti Peloritani" include the areas of the maximum importance for migratory birds (Table 8). The Messina Strait can be considered the third most important migratory corridor, after Gibraltar and Bosphorus, for the avifauna moving within the Mediterranean basin.

In particular, the area of Antennamare and the Strait of Messina, together with the Strait of Gibraltar and the Bosphorus, represent the three areas in which Mediterranean flocks are concentrated, especially in spring. In fact, through the Strait of Messina, from 20,000 to 35,000 specimens belonging to numerous species of birds, especially birds of prey pass, and some of which are very rare and / or deserving of maximum protection. The ridge of the Peloritani Mountains also offers the possibility of nesting with species of birdlife relevant to the protection of biodiversity at regional and national level such as Aquila chrysaetos and Falco biarmicus. Also the lakes of Faro and Ganzirri offer refuge and trophic opportunities to the species in migration, in particular to the water birds, and for some of them they also represent significant nesting sites.

Table 8. List of birds recorded in the "Monti Peloritani" SPA site

Legend: c: concentration; p: permanent; w: wintering; Green : marine species

Scientific Name	Presence	Abundance	
		Min	Max
Alauda arvensis	c		
Alcedo atthis	c		
Alectoris graeca whitakeri	p	5	30
Anas acuta	c		
Anas clypeata	c		
Anas crecca	c		
Anas penelope	c		
Anas querquedula	c		
Anthus campestris	c		
Aquila chrysaetos	p	1	1
Aquila clanga	c	2	2
Aquila heliaca	c		
Aquila pomarina	c	5	5
Ardea purpurea	c		
Ardeola ralloides	c		
Botaurus stellaris	c		
Buteo rufinus	c	6	12
Calonectris diomedea	c		
Caprimulgus europaeus	c		
Charadrius alexandrinus	p	1	5
Chlidonias hybridus	c		
Chlidonias niger	c		
Ciconia ciconia	c	200	400
Ciconia nigra	c	50	90

Circaetus gallicus	c	1	5
Circus aeruginosus	c	1800	2500
Circus cyaneus	c	20	80
Circus macrourus	c	20	80
Circus pygargus	c	600	800
Coracias garrulus	c		
Egretta alba	w	2	2
Egretta alba	c		
Egretta garzetta	w	4	4
Egretta garzetta	c		
Falco biarmicus	p	1	1
Falco columbarius	c	1	4
Falco eleonorae	c	3	30
Falco naumanni	c	15	40
Falco peregrinus	p		
Falco vespertinus	c	100	1000
Ficedula albicollis	c		
Fulica atra	c		
Fulica atra	w		
Gallinago gallinago	c		
Grus grus	c		
Hieraaetus fasciatus	c		
Hieraaetus pennatus	c	10	60
Himantopus himantopus	c		
Hydrobates pelagicus	c		
Ixobrychus minutus	c		
Larus audouinii	c	1	5
Larus genei	c		
Larus melanocephalus	c		
Larus melanocephalus	w		
Milvus migrans	c	900	1200
Milvus milvus	c	2	6
Neophron percnopterus	c	3	12
Nycticorax nycticorax	c		
Pandion haliaetus	c	20	35
Pernis apivorus	c	19000	23000
Philomachus pugnax	c		
Phoenicopterus ruber	c		
Platalea leucorodia	c	200	300
Plegadis falcinellus	c	100	200
Pluvialis squatarola	c		
Rallus aquaticus	c		
Sterna sandvicensis	w	15	30
Sterna sandvicensis	c		
Sylvia undata	p		
Tringa erythropus	c		
Tringa glareola	c		

Tringa nebularia	c		
Tringa totanus	c		

The marine species, highlighted in green in the above table, have a flight height distribution compatible with the swept area by the wind turbine experimental machine, and may be expected to interact with it.

9 HUMAN ACTIVITIES

Fishing, hunting and gathering: small fishing activities are widespread in Villa S. Giovanni and Reggio Calabria, mainly with: gillnets, longlines and line and gillnets, longlines, lines and seines; in addition, the harvesting of marine fauna is reported in the area.

Transport and communications: the coastal area is mainly occupied by the town of Reggio Calabria. The port of Villa S. Giovanni and the port of Reggio Calabria are located on the coast facing the site.

There are numerous submarine cables and pipelines in the area of Villa S. Giovanni, between Catona and Gallico, Rada dei Giunchi, Punta Calamizzi and Torre del Lupo, bound for Sicily.

Pollution and other human activities: the city of Reggio Calabria is responsible for releasing untreated water in the coastal marine environment; in fact the city's purification network is inadequate. In addition, the area is affected by a high traffic of ships carrying goods and passengers between Calabria and Sicily and vice versa, plus a modest nautical traffic due to fishing boats and in summer to pleasure craft. Ship traffic is responsible for high noise and water pollution.

Modifications by man of the hydraulic conditions: the arms of the ports of Villa S. Giovanni and Reggio Calabria may have caused partial variation of marine currents. In addition there are several canalized rivers.

10 LEGAL FRAMEWORK

Due to its limited size and to its temporary operating time schedule, the model installation is not expected to be subject by the Environmental Authority to any environmental assessment process. Impact on the environmental components is in fact expected to be negligible.

Nevertheless, in the case that the Environmental Authority decides to perform an assessment of the environmental footprint of the prototype, this have to be subjected to an assessment under the proper procedure, as stated under the Italian law.

The prototype as whole does not fall under any category reported in Annex II to the Part 2 of the D. Lgs. 152/2006 and amendments. When considering carefully the structure and its operating mode, it results that the main body (the floater) cannot display any environmental effect different from a common boat of similar size, being an inert floating body. The wind turbine, on the contrary, may be classified under comma 7-bis of the Annex II, part 2, as:

"7-bis) Wind power plants for the production of electricity located at sea."

In the specific case, no energy production is forecasted, but the general arrangement of the installation is of the same kind.

The competence for the project assessment is under the Ministry of the Environment that should submit it to a proper EIA assessment.

However, Legislative Decree 152/2006, at Art. 6, paragraph 6, letter b, report that:

" The Screening of being subject to EIA is carried out for: *the projects listed in Annex II to part two of this decree, which serve exclusively or essentially for the development and testing of new methods or products and are not used for more than two years*", that is exactly the case of the BGF prototype project.

The prototype project has therefore to enter a Screening process, under the competence of the Ministry of the Environment.

As a result of the Screening process, pursuant Art. 6, comma 7, letter c) the projects that, at the outcome of the Screening of the EIA liability, are considered producing significant environmental impacts, are submitted by the competent Authority to a proper EIA process.

As stated in art. 7-bis, comma 4, at the state level, the competent Authority is the Ministry of the Environment and the Protection of the Territory and the Sea (MATTM), which operate in collaboration with the Ministry of Heritage and Cultural Activities and Tourism (MiBACT) for the related preliminary activities to the VIA procedure. The provision of Screening to EIA is adopted by the MATTM. The EIA provision is adopted in the forms and with the methods referred to in Article 25, comma 2, and in Article 27, comma 8 of D. Lgs. 152/2006.

The procedure to carry out the Screenig procedure are stated under the art. 19 of the D. Lgs. 152/2006. Steps are:

1. The proponent shall transmit to the competent authority the preliminary environmental study in electronic format, drawn up in compliance with the contents of Annex IV-bis to part two of D. Lgs. 152/2006, as well as a copy of the payment of the contribution referred to in Article 33 of same law.

2. The preliminary environmental study is published in a timely manner on the website of the competent authority, in such a way as to guarantee the protection of the confidentiality of any industrial or commercial information indicated by the proposer, in accordance with the provisions of the law on public access to the environmental information.

3. The competent authority electronically communicates to all the Administrations and to all the territorial bodies potentially interested the publication of the documentation on its own website.

4. No later than 45 days from the communication referred to in paragraph 3, any stakeholder can view the preliminary environmental study and the accompanying documentation on the website, submitting their observations to the competent authority.

5. The competent authority, based on the criteria set out in Annex V to part two of D. Lgs. 152/2006, taking into account the comments received and, where appropriate, the results of any other assessments of the effects on the environment made on the basis of other relevant European, national or regional legislation, verifies whether the project has possible significant environmental impacts.

6. The competent authority may, for one time only, request clarifications and additions to the proposer, within 30 days of the expiry of the deadline referred to in paragraph 4. In this case, the proposer shall transmit the requested clarifications within and no later than following 45 days. At the motivated request of the proposer the competent authority may grant, for one time only, the suspension of the deadlines for the presentation of the additions and clarifications requested for a period not exceeding 90 days. If the proposer does not send the requested documentation within the set deadline, the application is considered rejected and the competent authority is obliged to proceed with the filing.

7. The competent authority adopts the provision of verification of being subject to EIA within the following 45 days from the expiry of the deadline referred to in paragraph 4, or within 30 days from receipt of the documentation referred to in paragraph 6. In exceptional cases, relating to nature, complexity, location or size of the project, the competent authority may extend the deadline for the adoption of the verification provision once and for a period not exceeding 30 days; in this case, the competent authority shall promptly notify the proposer in writing of the reasons justifying the extension and the date by which the provision is expected to be adopted.

8. If the competent authority decides not to subject the project to the EIA procedure, it specifies the main reasons for the failure to request this assessment in relation to the relevant criteria listed in Annex V of D. Lgs. 152/2006, and, where requested by the proposer, taking into account of the eventual observations of the Ministry of cultural heritage and activities for the profiles of competence, specifies the environmental conditions necessary to avoid or prevent those that could otherwise represent significant and negative environmental impacts.

9. If the competent authority determines that the project should be subject to the EIA procedure, specify the main reasons for the EIA request in relation to the relevant criteria listed in Annex V of D. Lgs. 152/2006.

10. (omissis)

11. The provision for the Screening to EIA, including the reasons, is published in full on the website of the competent authority.

12. The deadlines for issuing the provision for Screening to EIA are considered mandatory under and for the purposes of articles 2, paragraphs 9 to 9-quater, and 2-bis, of the law of 7 August 1990, n . 241.

13. All documentation relating to the proceeding, as well as the results of the consultations carried out, the information collected, observations and opinions are promptly published by the competent authority on its website.

As stated in Annex IV-bis, Part 2, the contents of the Environmental Preliminary Study are:

1. Description of the project, including in particular:

a) a description of the physical characteristics of the whole project and, where relevant, of the demolition works;

b) the description of the location of the project, in particular as regards the environmental sensitivity of the geographical areas that could be affected.

2. The description of the components of the environment on which the project could have a significant impact.

3. The description of all the likely significant effects of the project on the environment, to the extent that information on these effects is available, resulting from:

(a) expected residues and emissions and waste production, where relevant;

b) the use of natural resources, in particular soil, land, water and biodiversity.

4. In preparing the information and data referred to in points 1 to 3, the criteria contained in Annex V shall be taken into account, where appropriate.

5. The Environmental Preliminary Study takes into account, where appropriate, the available results of other relevant assessments of the effects on the environment carried out based on European, national and regional regulations and may contain a description of the characteristics of the project and / or the measures envisaged to avoid or prevent those that could otherwise represent significant and negative environmental impacts.

11 AREA PLANNING FRAMEWORK

According to the available data published on the website of the Province of Reggio Calabria the municipality of Reggio Calabria belongs to the coastal-hilly area of the Messina Strait (see Figure 24), which alternates beaches to hills and it's characterized by several deep valley incisions. Since it is a densely urbanized area with numerous infrastructures, the spontaneous vegetation can be found almost only in the steepest areas.

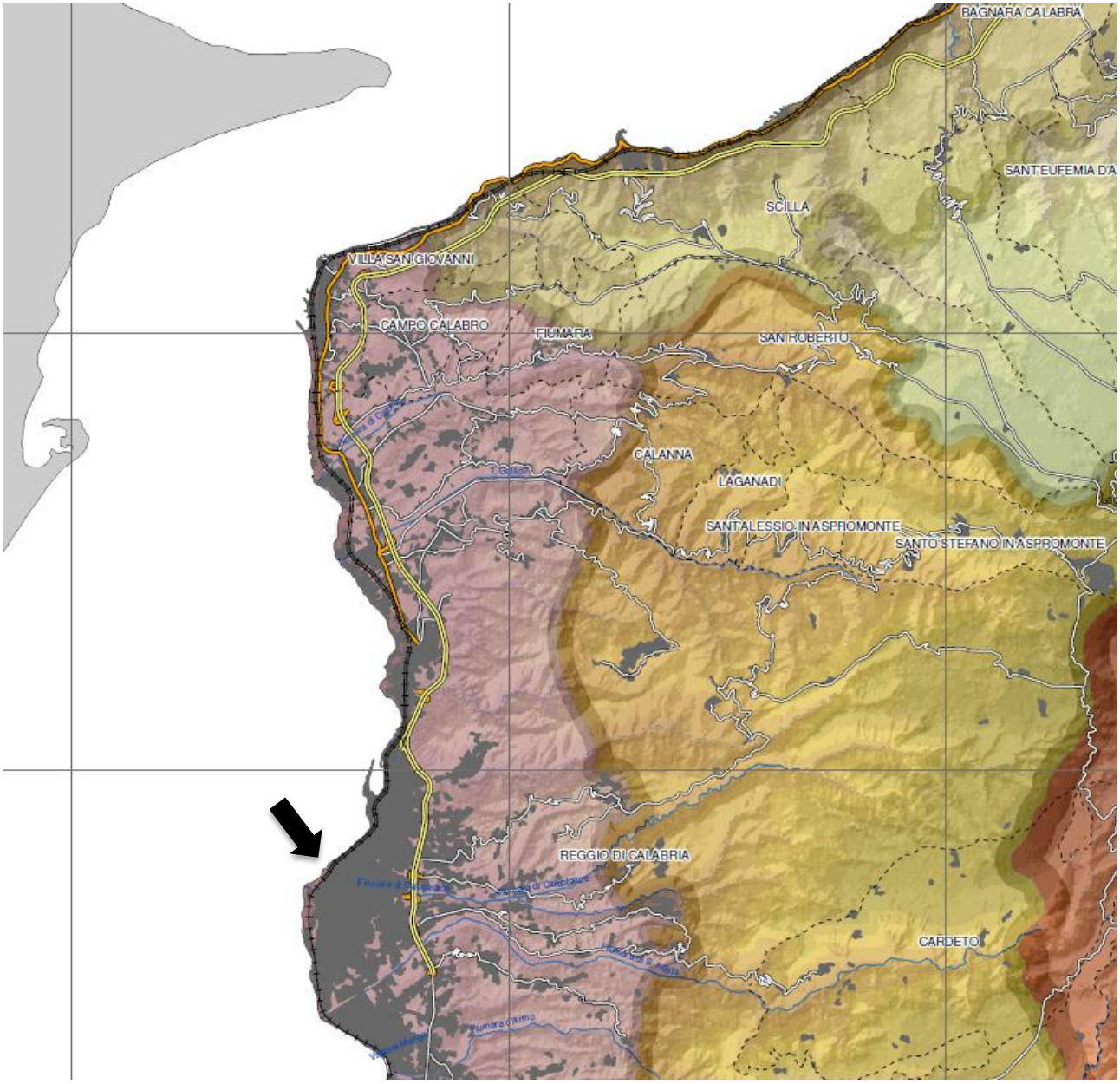


Figure 24. Extract from the landscape areas map (see Annex 3)

The pink area corresponds to the coastal-hilly area (1 – Area costiero-collinare dello Stretto) in Annex 3. The black arrow indicates the NOEL lab position.

The NOEL laboratory and, thus the area in which the experimental campaign will be carried out, is close to some area of archaeological interest and to some area subject to protection (see Figure 25). However, neither with respect to the NOEL laboratory area nor to the water sheet operated during the experimental campaigns there are restrictions that apply.

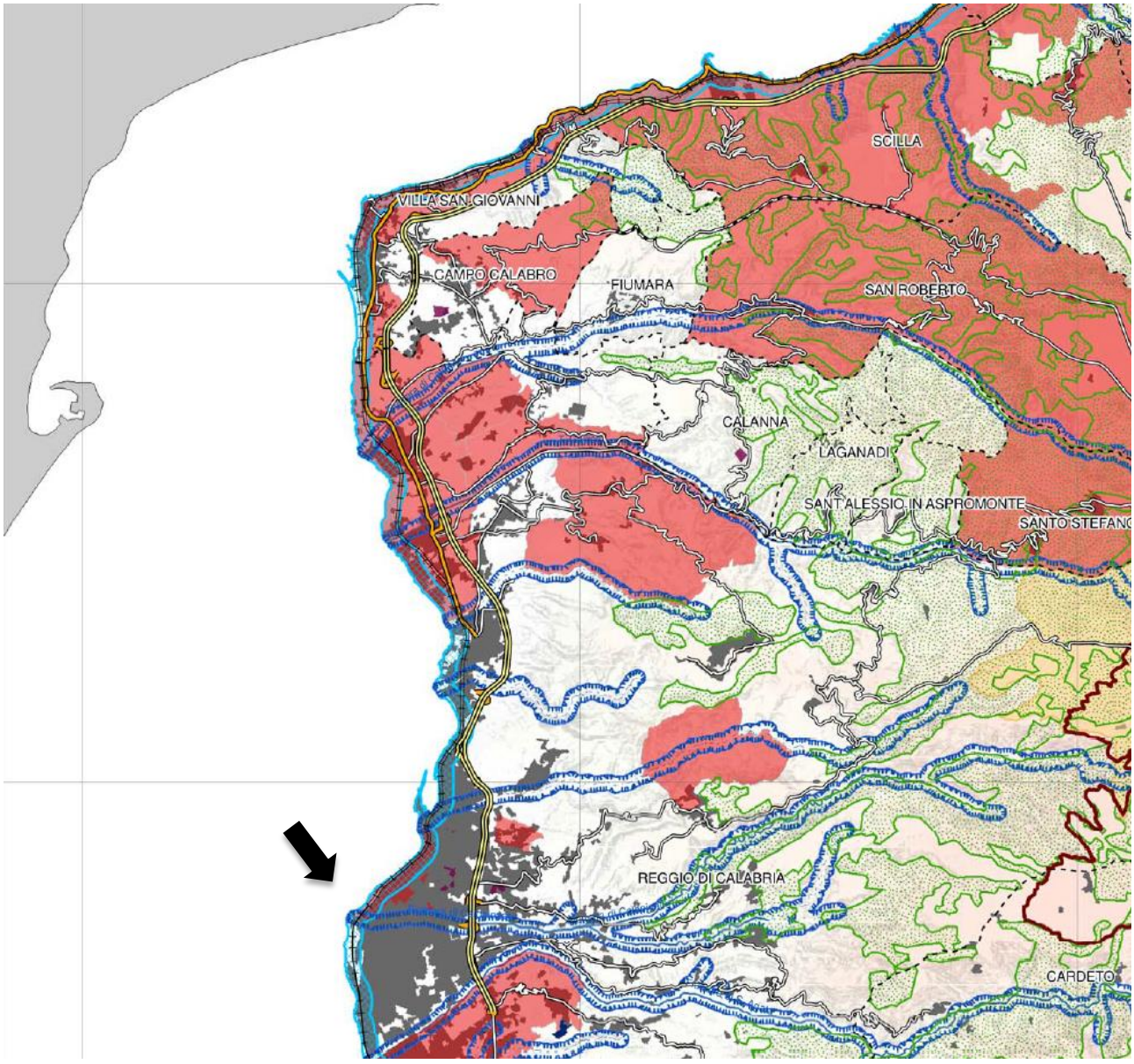


Figure 25. Extract from the landscape/scenic interest map (see Annex 4).

Dark red areas indicate the presence of items of archaeological interest Light red areas indicate areas subject to protection. The black arrow indicates the NOEL lab position.

Along the coast from Villa San Giovanni to Motta San Giovanni there is a Site of Community Importance (SCI), referred to as “Fondali da Punta Pezzo a Capo dell’Armi” (see Figure 26). The area is 0,3 km far from the coast and it has been taken into account when designing the experimental campaign and defining the water sheet that will be operated. As shown in (figure to be added and then cross-referred), the overall footprint of the platform does not cross the SCI area.

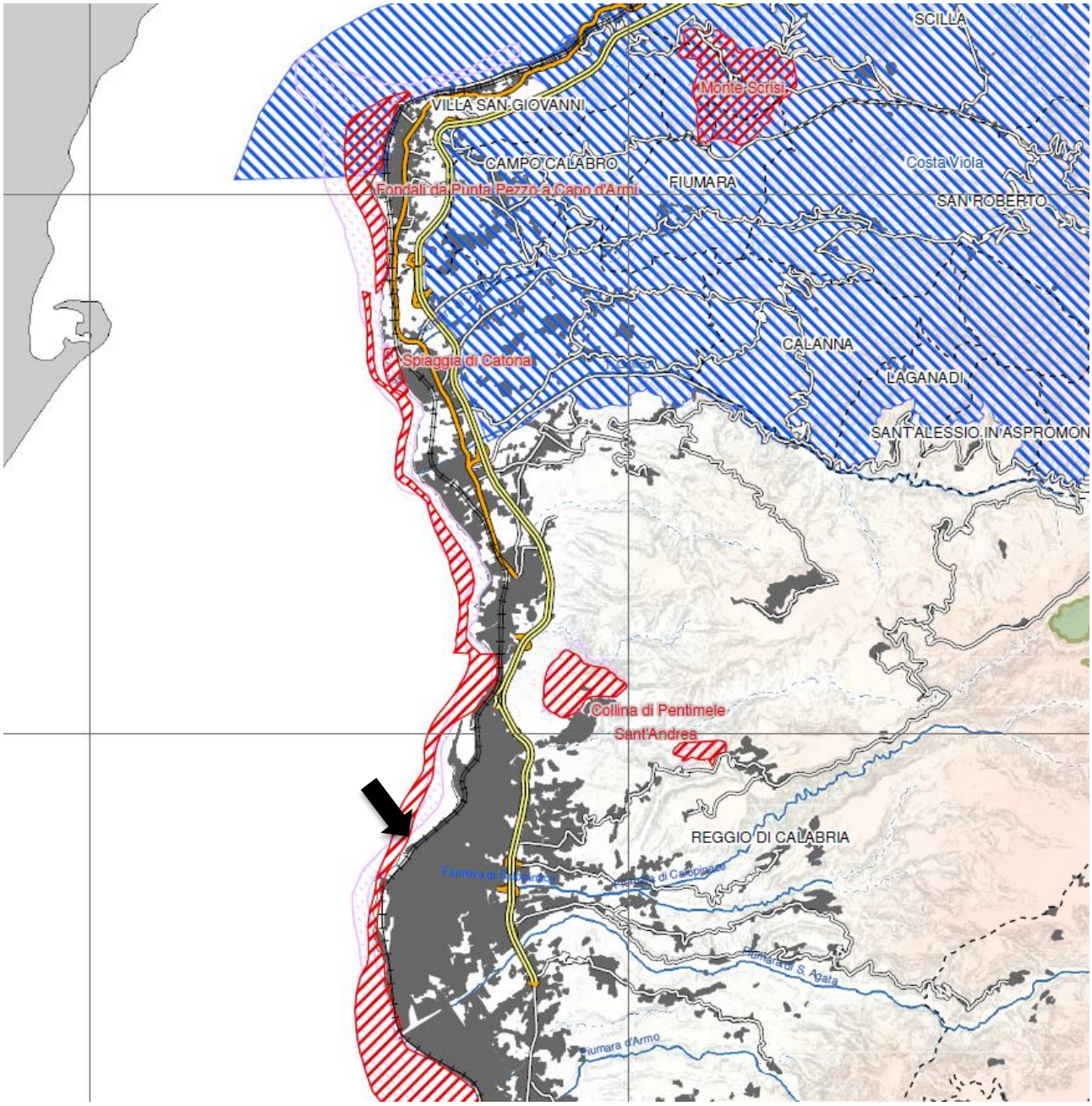


Figure 26. Extract from the protected natural areas map (see Annex 5)

The red striped areas indicate the SCI. The light violet dotted areas indicate the proposal of new definition of the SCI area. The black arrow indicates the NOEL lab position.

12 EXPECTED IMPACTS

The main impacts resulting from the installation, operation and decommissioning of the BGF prototype installed in Reggio Calabria within the NOEL concession will result in charge of the environmental components “Marine Ecosystems”.

Visual inspections and photographic recordings made on the occasion of NOEL's request to extend the concession for the installation of the platform, have revealed that the seabed is composed of sediments of mixed nature, clastic and organogenic soil, in which the fraction of fine sediment is scarce, also due to the strong currents present inside the Strait, which dilute the fine fractions of the sediment. It is therefore not considered that there may be clouding of the water, which would be readily dispersed by the currents.

It is hypothesized that the mechanical removal of the anchors may leave tracks in the sediments, causing incisions of several m^2 of surface that would remain visible until the sediments are re-arranged and re-located due to incident currents and waves.

The impacts expected are as follows:

1. **Marine sediments: smoothering and consequent disturbance of the seabed due to the chain movement on the seabed; sediment disturbance during mooring lifting operations.**

Expected impact:

<u>movement and disturbance of marine sediments on an area equal to the physical footprint of the mooring line lying on the sea bed, thus calculated:</u>

- anchor area;

The smallest anchor reported in Vryhof manual is the MK5 of 1.5 ton; this anchor has a fluke area of approx. 3.6 m^2.

In this area it is expected that the sediments will be reworked to a depth equal to the working depth of the anchor, on a surface equal to the projection of the anchor area on the surface of the seabed.

- area swept by the chain, equal to length x width x angle of movement.

For lines 3 and 4, (at the sea side), the area covered by the bottom chain lying on the seabed is equal to: length x width = 70 x 0,32 = **22,4 m^2**:

Considering as fixed the anchor head, and the chain sweeping laterally on the bottom due to platform movement, at an angle of 4° (see D 5.2 [RD 4]), this lead to a maximum swept surface, per single line, equal to **171** m^2 (approx) following the formula:

Triangle Area = 0.5a*b*sinγ., with a and b triangle sides, and γ included angle;

therefore **342 m^2** for line 3 and 4

Due to the relevant weight of the bottom chain (200 kg /m), it is assumed that this can penetrate the seabed to varying degrees, depending on the compactness of the seabed and the movements impressed in case of bad weather.

Therefore, 3 hypotheses are reported, which must be verified during monitoring:

1. complete chain sinking under sediment;
2. sinking limited to the proximal portion at the anchor, arbitrarily set at 10 m;
3. no sinking.

For the two extreme cases, the displaced sediment volume is calculated, equal to:

Case 1: 171 x 0,32 = 54,7 m^3 of sediment, thus 109,4 m^3 for line 3and 4;

Case 3: 0 x 0,32 = 0, no sediment displacement, only superficial smoothering

In the intermediate case (case 2), it may be hypothesized that the proximal part of the chain would be totally embedded into sediment, down to the anchor working depth, thus reworking/displacing a sediments volume grossly similar to the chain volume; the distal part would partially remain on sediment surface, displacing sediments by its lateral movements. At the present stage, it is not possible to calculate the surface and the volume interested, and this finding would be postponed to the monitoring phase.

For line 1 and 2, the bottom chain length is equal to 45 and 50 m respectively. The maximum angle of lateral shift is calculated (see D 5.2, [RD 4]) in 19°.

The swept areas, calculated as above, are of **329,6** m^2 and **406,9** m^2, for chains of 45 and 50 m respectively.

As above, the 3 possible cases of chain embeddment in sediment can be solved only by the monitoring activity.

The likely disturbed area is then equal to 171 + 171+ 329,6+406,9 = **1078,5** m^2.

The interested area is characterized by mobile sediments, under the influence of strong current and waves, and the impact can be considered as transitory and totally reversible.

2. Marine communities: disturbance, destruction of organisms due to the chain movement.

Expected impact:

<u>movement and disturbance of marine sediments on an area equal to the physical footprint of the mooring line lying on the sea bed.</u>

Both the superficial area than the deeper part are subjected to high hydrodynamic forces, and organisms are adapted to sediment reworking due to bottom current or waves. During disturbance, organisms can migrate deeper into the sediment, or move to near undisturbed areas, being of burrowing and vagile habitus. One species of conservationist value, as *Branchiostoma lanceolatus*, is highly mobile and not expected to be disturbed by mooring deployment. The structuring species for

the deeper part, as *Lithotamnium racemum* and *L. fruticulosum*, can be burrowed or displaced in not-physiological position and therefore be impaired in their photosynthetic activity. These species, although common, can be monitored to assess the percentage of displacement and the recovery in time. However, the impact is expected to be negligible, being exerted over a small area and on species naturally adapted to sediment disturbance.

3. Marine birds:

Expected Impact:

risk of collision with marine birds during poor visibility conditions.

The marine bird species present into the Strait area are able to fly at a height compatible with the rotor of the wind turbine. However, the platform cannot be considered as an attraction point being empty and without any release of attracting matters. The rotor swept area is very small (37 m^2) and this minimizes the probability of collision due to casual encountering during coastal area exploitation by marine species.

The collision is commonly found during poor visibility condition or during night, when approaching birds cannot operate avoidance maneuvers. The wind turbine will then operate only during daylight and in mild weather conditions.

4. Visual impacts

The following Table 9 shows the maximum theoretical visibility distances in kilometers of the BGF platform in relation to different potential altitudes of an observer, both at sea and on the coast.

Table 9. Maximum visibility range of the BGF prototype blade tip

Blade tip height (m)	Observer height (m)	Visibility range (km)
10.4	2	17.5
10.4	5	20.6
10.4	10	24.1

On the basis of the calculation of the theoretical visibility, the BGF platform would be visible in a range of 24.1 km within an elevation of about 10 m above sea level, given that no obstacles (buildings, trees, hills) prevent the view. Visibility of the platform and blade tip is theoretically possible from the most part of the eastern coast of Sicily (Figure 27).

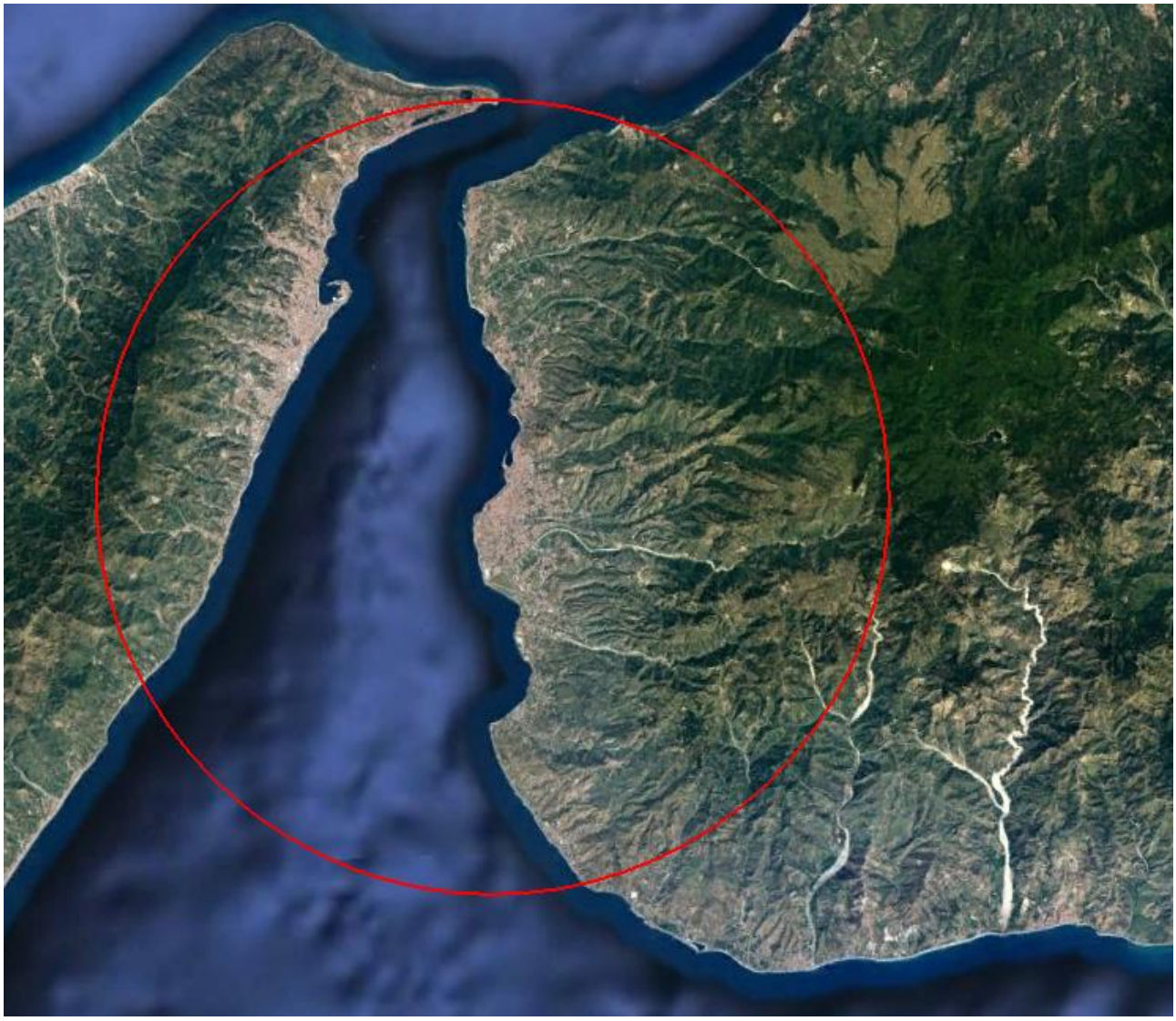


Figure 27. Theoretic visibility range of the BGF prototype by an observer at 2 m

However it should be kept in mind that, in cases where the wind turbine is located at the end of the field of vision, only the upper portion of the structures is actually visible which, as in the case of blade tip, it consists of elements of very reduced volume compared to the base. Additionally, the low contrast between blade color and horizon help to mask the visibility of the rotor.

The degree to which a particular anthropic element can be clearly perceived within an environmental context is called "visibility". The visibility of an element is strictly dependent on the intrinsic physical characteristics of the element (height, width) and on the observer's field of vision.

A visual element can be categorized as:

- Visually dominant: the element has a dominant role within the visual field;
- Potentially distinguishable: the element is distinguishable and the level of disturbance strongly depends from the degree of contrast with the surrounding landscape;
- Insignificant: the element, although visible, does not significantly interfere with the view of the landscape.

According to the generally adopted criterion, the visibility of an element within a given context is limited to cases in which the element occupies at least 5% of the complete visual field of the observer's eye (Figure 28).

Figure 28. Actual visibility of the BGF prototype

However, the real visibility of the BGF prototype will be much less than the theoretical visibility, for a number of reasons:

1. For observers from the sea or from Sicily coast, the blade are smaller than the rear buildings, and cannot be distinguished due to their low contrast;
2. The view shed of the open sea, without obstacles as building or trees, is possible only from the waterfront of Reggio Calabria;
3. Due to its small size, the platform can be perceived only from a close distance, or against a contrasting horizon, as the open sea or the Sicily coast.

Therefore, the BGF prototype can be clearly perceived only from the Reggio Calabria waterfront, along a path of 2.5 km.

Due to the short expected time of experimental activity, the visual impact, being reversible and of short duration, can be regarded as negligible.

13 MITIGATIONS

The overall impact given by the BGF prototype in the Noel site is in general very low and totally reversible. Nevertheless, in order to avoid any environmental effect, some mitigation measures are suggested.

1. **Disturbance of marine sediments**

   The disturbance and the reworking of superficial sediments is due to the chain and anchor footprint. The track could be minimized by shortening, as far as it is technically possible, the length of the mooring chains and its weight. This will reduce the footprint, which in any case will be restored to the natural conditions by the bottom currents and the incident storm waves.

2. **Disturbance of benthic organisms**

   Chain movements could provoke the displacement or destruction of non-mobile organisms or benthic algae. This negative effect can be minimized by reducing, as far as is technically possible, the weight of the bottom chain to minimize its footprint. After mooring removal, bottom community is expected to be quickly restored to the natural condition by recolonization from near areas by mobile organisms, naturally adapted to sediment disturbance.

3. **Risk of collision with marine birds**

   Risk of collision with marine birds flying within 10 m above sea water is low, since the BGF prototype is not representing an attraction point and the surface swept by rotating blades is small. Nevertheless, the use of potentially attracting light else than the signalling lights must be avoided. To prevent the proximity of resting birds with the rotating blades, the prototype has to be covered by an anti-bird net; the experimental session must be limited to conditions of good visibility; an operator must be present or in the nearby during the experimental sessions and be able to shut off the rotor in case of bird flock approaching.

4. **Visual impact**

   The impact can be mitigated by the adoption of platform and wind turbine color (mast/nacelle and blade) of low contrasting colors and tonalities.

14 CONCLUSIONS

The present report has been produced as the result of the Task 4.3 (WP4) of the Blue Growth Farm contract [AD1], [AD2].

This report describes the impacts expected from the BGF prototype installation, operation and decommissioning over the coastal area requested in concession by the NOEL laboratory to carry out the planned experimental purposes.

This report will serve in the next phase as basis for the application to obtain an environmental license, whenever requested by the competent environmental authority, to gather the permission to install and operate the prototype.

The BGF prototype installation, operation and decommission is intended to be run over a short period of time. The expected impacts are considered as negligible, being of short duration, limited in space and time, and reversible.

Impacts are mainly in charge of marine ecosystem. A number of mitigation measures to minimize environmental effects are recommended.

15 REFERENCES

[R1] Mandaglio, 2014, - Relazione geologica, Realizzazione di un sistema di approdo per il collegamento marittimo Reggio Calabria/Messina presso le aree nord del Piazzale porto in Reggio Calabria, commissioned by Caronte & Tourist Spa.

[R2] Università degli Studi Mediterranea, 2014, - Progettazione di un laboratorio di ricerca per le energie rinnovabili, commissioned by Comune di Reggio Calabria.

[R3] EMODnet – www.emodnet-seabedhabitat.eu

[R4] Giaccone, G., Giaccone, T., Catra, M., 2009 – Biocenosi del detritico costiero. Habitat IV.2.2. Biologia Marina Mediterranea, Vol 16 (suppl.1), pp.200-203

[R5] Pérès, J.M., Picard, J. 1964. Nouveau Manuel de bionomie benthonique de la Mer Mediterranee. Recueil des Travaux de la Station Marine d'Endoume, 31 (47): 1-137.

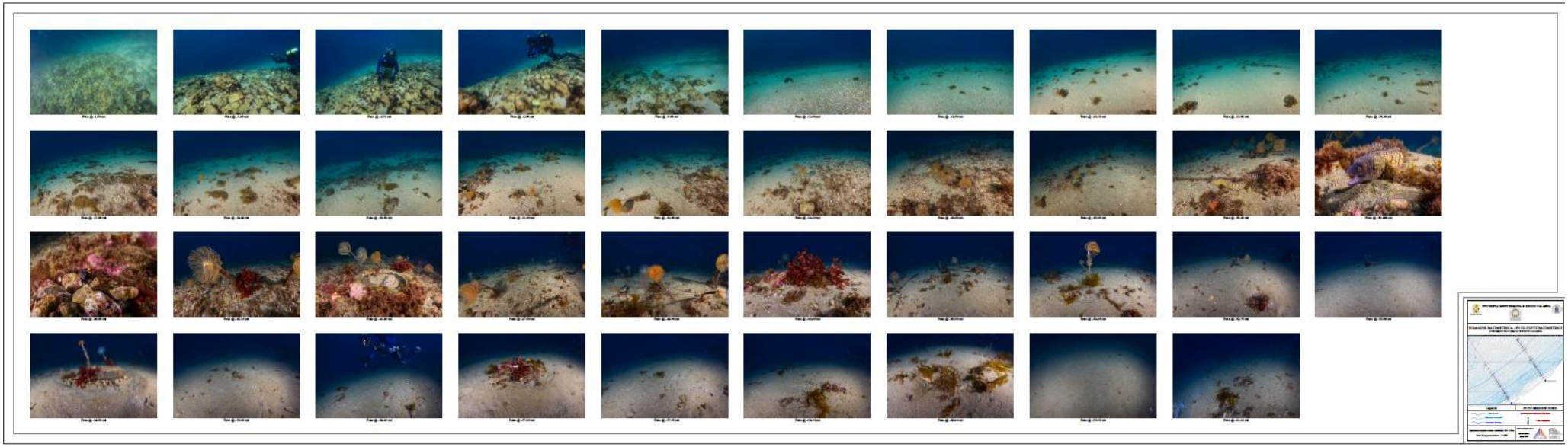
[R6] Bajjouk, B. Guillaumont, N. Michez, B. Thouin, C. Croguennec, J. Populus, J. Louvel-Glaser, V. Gaudillat, C. Chevalier, J. Tourolle, D. Hamon et al. 2015. Classification EUNIS, Système d'information européen sur la nature : Traduction française des habitats benthiques des Régions Atlantique et Méditerranée. Vol. 2. Habitats subtidaux & complexes d'habitats. Réf. IFREMER/DYNECO/AG/15-02/TB2, 237p.

[R7] Natura 2000 – Standard data form IT9350172 – Fondali da Punta Pezzo a Capo dell' Armi.

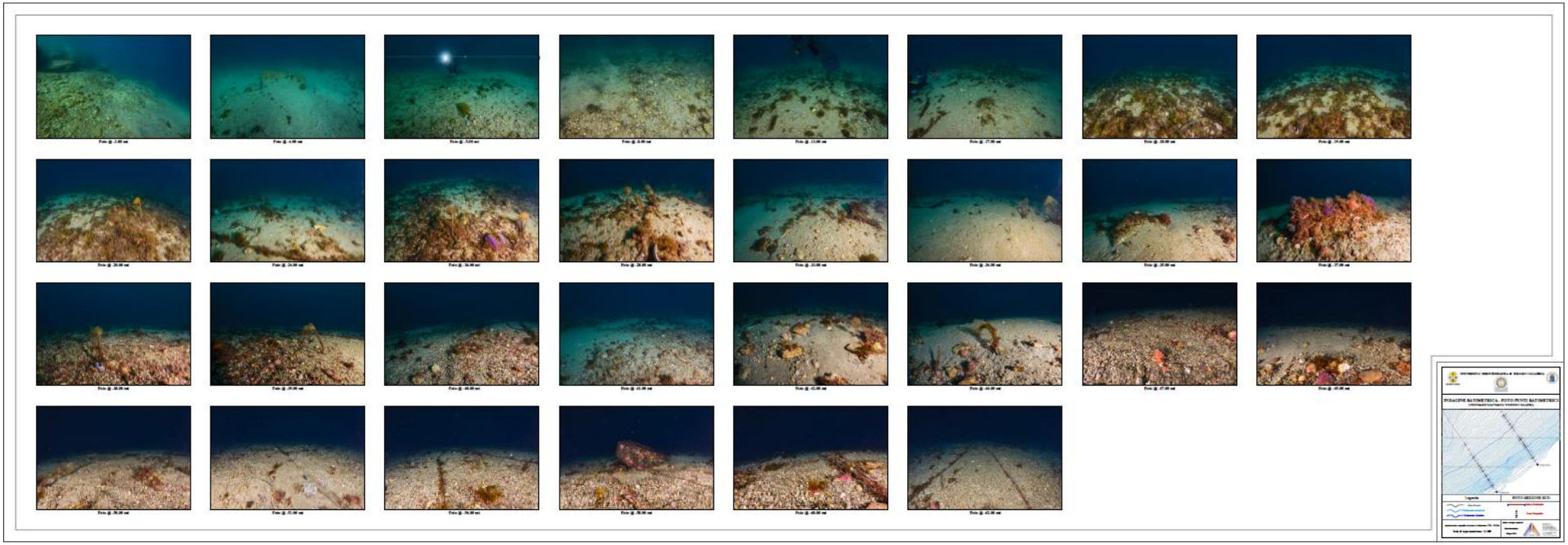
[R8] Natura 2000 – Standard data form IT ITA030042 - Monti Peloritani, Dorsale Curcuraci, Antennamare e area marina dello stretto di Messina

[R9] Provincia di Reggio Calabria, 2007 – Documento definitivo di Piano. Schede delle proposte di gestione per Sito.

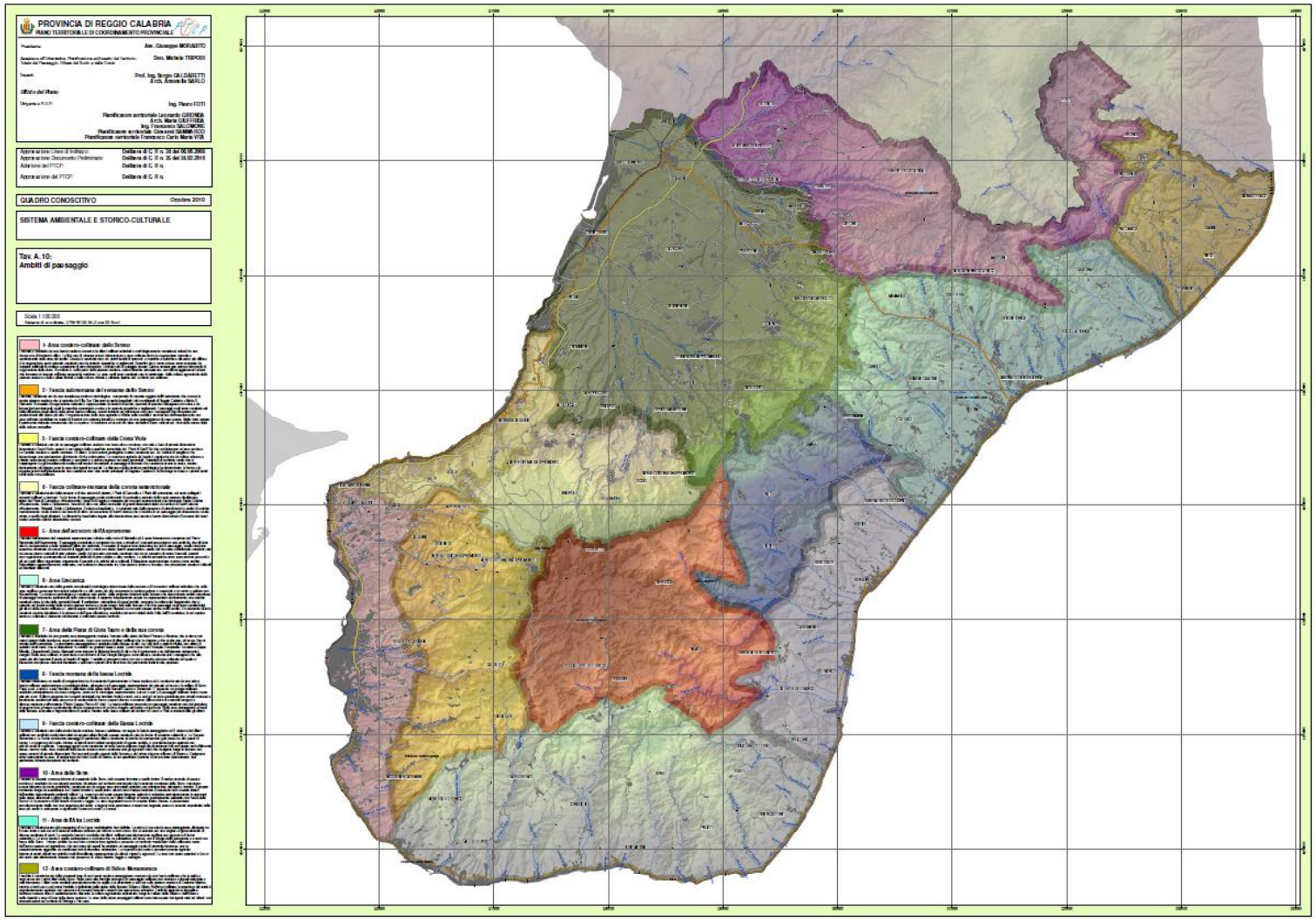
Annex 1. Complete package of photographs taken along the North Section



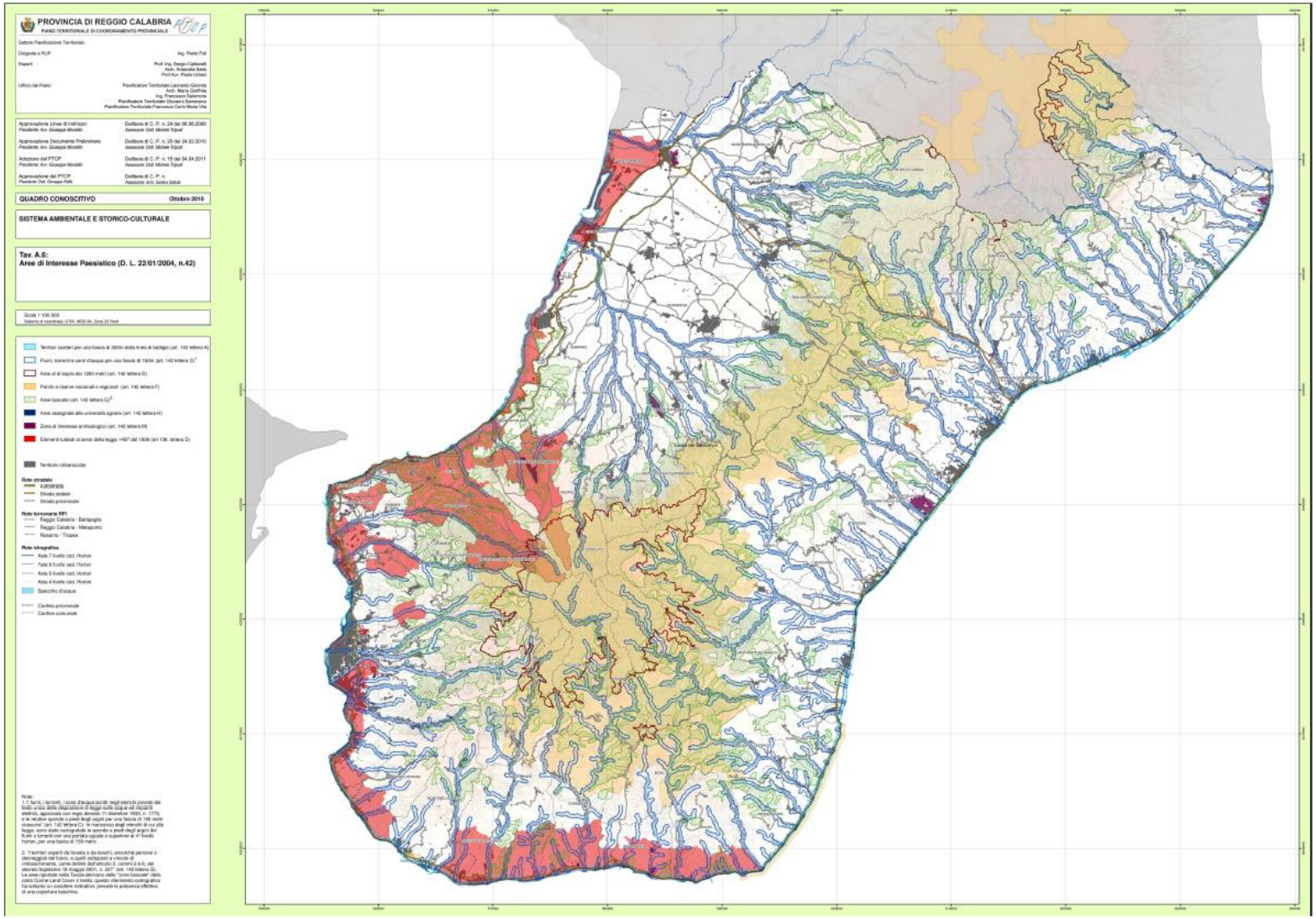
Annex 2. Complete package of photographs taken along the South Section



Annex 3. Map of area of landscape interest



Annex 4. Map of area of environmental and historic & cultural heritage interest



Annex 5. Map of protected areas