The Tunisia-Italy Electrical Interconnection (ELMED) Project

Critical Habitat – Impacts and Mitigation

Report for the European Bank for Reconstruction Development

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Executive Summary

The European Bank for Reconstruction Development (EBRD) are supporting the development of the Tunisia-Italy electrical interconnection (ELMED) project (the “Project”). The Project comprises the construction of a new two-way High Voltage Direct Current (HVDC) submarine electrical interconnection cable between Tunisia (Cap Bon) and Italy (Sicily).

A Critical Habitat Assessment (CHA) has been undertaken in accordance with the PR 6 Guidance Note for the coastal and marine elements of the Project. Prior to the undertaking of the CHA, several studies have been completed to support the evaluation of the Project to date, including an Environmental and Social Impact Assessment (ESIA), marine feasibility studies and underwater surveys. Following completion of the CHA, this document has been produced to provide a review of the potential for impacts on critical habitat and PBF related to assessments already completed and to provide any updates as necessary. The review and update only relates to the submarine cable component and the associated works at the landfall locations on the coast.

A systematic approach has been adopted to determine the potential for Project activities to lead to significant ecological outcomes for critical habitat and priority biodiversity features. The review has considered the impacts that may result after the application of mitigation that is embedded in project design. Residual impacts after the application of such measures were assessed; and additional mitigation has been identified aligned the mitigation hierarchy.

The analysis that has been undertaken shows that most impacts will be of negligible or minor significance in relation to ecosystem integrity. No major impacts on integrity of any feature are anticipated. However, some potential moderate impacts may occur following the application of mitigation that is embedded in project design. The application of mitigation measures ensures that no significant residual effects will occur. No net loss will be achieved for priority biodiversity features, and recommendations have been provided for delivering net gains for critical habitat through limited offset approaches where they are applicable or ACAs.

1 Introduction

The European Bank for Reconstruction Development (EBRD) are supporting the development of the Tunisia-Italy electrical interconnection (ELMED) project (the "Project"). The Project comprises the construction of a new two-way High Voltage Direct Current (HVDC) submarine electrical interconnection cable between Tunisia (Cap Bon) and Italy (Sicily). The Project will be jointly implemented by a partnership between the Italian Electricity Transmission System Operator Rete Elettrica Nazionale S.p.a (TERNA) and the Tunisian energy and electricity company Société Tunisienne de l'Eléctricité et du Gaz (STEG).

The overall objective of the Project is to increase the interconnection capacity, and therefore the security and sustainability of supply of the Euro-Mediterranean system by creating a link between the European and North African energy systems. The interconnection will provide an operating voltage of ±500 kV and a net transfer capacity (NTC) of 600 MW. The Project comprises the emplacement of the cable on land and at sea, as well as consideration of Associated Facilities1. On the Sicilian coast, the cable landfall point is at Marinella; and on the Tunisian coastline, the cable will land to the south of Kélibia. The location of the proposed cable is provided in Figure 1.

EBRD identified the need to undertake a Critical Habitat Assessment (CHA) in accordance with the PR 6 Guidance Note (EBRD, 2022) for the coastal and marine elements of the Project. This was required to determine if the Project can achieve an outcome consistent with Performance Requirement 6 (PR 6) (EBRD, 2019). A CHA has therefore been undertaken (Bluedot Associates, 2023). Prior to the undertaking of the CHA, several studies have been completed to support the evaluation of the Project to date, including an Environmental and Social Impact Assessment (ESIA) (IDEA Consult, 2023a), marine feasibility studies (RINA, 2021; 2023) and underwater surveys. In addition, a Biodiversity Management Plan (BMP) has been developed to include the mitigation measures set out in the ESIA and to provide additional details on management and monitoring proposals (IDEA Consult, 2023b).

Following completion of the CHA, ERBD requires a review of the potential for impacts on critical habitat related to assessments already completed and to provide any updates as necessary. As part of this process, EBRD have also identified the need to review and update mitigation measures that apply to critical habitat and priority biodiversity features (PBF). This document reports upon this review and update. The review and update only relates to

[1]Facilities or activities that are not financed by EBRD as part of the project but which in the view of EBRD are significant in determining the success of the project or in producing agreed project outcomes. These are new facilities or activities: (i) without which the project would not be viable, and (ii) would not be constructed, expanded, carried out or planned to be constructed or carried out if the project did not exist (as defined within EBRDs Environmental and Social Policy (2019)).

the submarine cable component and the associated works at the landfall locations on the coast.

Figure 1: Location of the submarine cable

The landfall location at Marinella, on the coast of Sicily, is shown in Figure 2; and the Kélibia landfall, on the coast of Tunisia, is shown in Figure 3.

Figure 2: Location of the Marinella cable landfall

Figure 3: Location of the Kélibia cable landfall

2 Project Description

A description of the coastal and marine components of the Project is given in the ESIA Report (IDEA Consult, 2023a). From the landfall areas, the cable will be connected to terrestrial infrastructure. However, assessment of such terrestrial infrastructure lies outside of the scope for the review and update being undertaken. The main components that are subject to review in this document are summarised below:

- Power and telecommunication cables will be laid under the sea between the two landing positions. These cables will be in the same footprint, i.e., in the same trench.
- The submarine power cable will extend approximately 200 km across the territorial waters of Tunisia and Italy. The depth of the cable in Italian waters will range to 160 m; and will be 800 m in Tunisian waters. The electrical cable is proposed to have a diameter of 100-140 mm, whilst the telecommunications cable will have a diameter of 25-37 mm.
- A subtidal electrode anode or cathode configuration is also proposed in the nearshore areas. Depending upon, the configuration, the electrode will be connected to the seabed by anchors. In Tunisian waters, the electrode will be located approximately 9 km from the coast; in Italian waters it will be located approximately 4.5 km from the coastline. In addition to the construction of the electrode configuration, deterrents may be placed on the seabed to add protection from trawling. These comprise large concrete structures that are placed on the seabed.
- The undersea electrode will be connected to land by two undersea cables. These cables are expected to have a diameter of 70-100 mm.
- Submarine cables will be laid by a dedicated cable-laying vessel. Prior to laying the cable the route will be cleared using a grapnel. Cable laying activities are proposed to be undertaken over 24 hours over the time required for installation.
- Submarine cable burial is proposed to protect the cable. The cable will be buried by jetting or trenching. In nearshore areas, jetting may be supported by divers. Natural backfilling of disturbed areas will occur. For jetting, the burial depth will be 1-2 m with trench width if 0.3-0.4 m. For trenching, the burial depth will be up to 2 m, the trench width will be 0.2-0.5 m. The footprint of the equipment under both approaches will be 3-4 m. In hard substrate areas, cable emplacement will be achieved by cutting.
- The project description in the ESIA states that where burial is not feasible due to seabed conditions, the cable will be laid on the seabed and covered by rock dumping. However, no details are provided to confirm that such works will be required. It is assumed that this burial will occur along the whole length of the cable, but this should be confirmed by the Project.
- The project description in the ESIA states that various techniques may be adopted when crossing other undersea utilities. This may include materials to separate and cover the cable, including shells in plastic material, concrete mattresses, sacks

filled with sand and aggregate etc. However, no details are provided on the presence of such features that require crossing. It is assumed that this will not be required, but this should be confirmed by the Project.

- In the nearshore area, horizontal directional drilling (HDD) will be undertaken to transit the cable from sea to land. No excavations for the cable connection will therefore be undertaken on the coast. Three drillings will be required for the electrode cable, power cable and telecommunications cable. The ESIA states that the maximum length for such drilling is proposed is 600-800 m. However, this is to be assessed by the Contractor; and the distance for drilling should seek to avoid impacts on nearshore sensitive marine habitats as far as is technically feasible. The depth of the exit hole in the sea is not confirmed and will require assessment by the contractor. Drilling will be from the land towards sea. The drilling will require a working area on land, which will cover approximately 1200 m^2. This will be located on the coastal inland of the coastal dune areas.
- At the landfall site the cable will be connected underground using joint boxes. Separate joint boxes, with different dimensions, will house power, electrode and telecommunications cable. These will be located on the coastal inland of the coastal dune areas.
- The construction period for all the above elements is expected to be around 2.5 months.
- During operation cable maintenance may be required, which may require some activities that are like those undertaken during construction.

3 Overview of the Critical Habitat Assessment

The CHA report (Bluedot Associates, 2023) provides a review of the approaches that were taken to determine the presence of priority biodiversity features (PBF) and critical habitat. It also reviewed the potential for the project to impact upon legally protected areas and other areas with recognised high biodiversity values. This information is not repeated here.

The assessment has confirmed that the ecologically appropriate areas of analysis (EAAAs) that were defined comprise critical habitat across multiple criteria. This includes classification of two specific habitats as being critical habitat (*Posidonia* meadows and coastal lagoons) but also the overall EAAAs based on these area enclosing areas that are of high priority for conservation by national systematic conservation planning. In addition to these multiple individual Annex 1 and Resolution 4 habitats have been defined as PBF. Taking a precautionary approach, 34 species have been identified that may support the classification of critical habitat across multiple criteria. In some instances, a high level certainty for species forming critical habitat can be confirmed. However, in many instances there is some uncertainty, but conclusions have been drawn on the likelihood of triggering critical habitat based on ranges, habitat associations and support for important functions. In addition, 54 species have been identified as PBF. Finally, the project lies within or has some potential connectivity to several legally protected areas and other areas with recognised high biodiversity values.

The CHA therefore confirmed that the Project lies within an area of high biodiversity importance within the Mediterranean Sea and the Project must clearly demonstrates that the requirements of PR 6 have been met.

5 Approach and Methods

5.1 Review of impacts and mitigation

This section explains our approach to review of impacts on critical habitat and PBF that may result from Project activities during construction and operation. The assessment included the following steps:

- Review of the impact assessment and proposed mitigation measures identified in the ESIA Report (IDEA Consult, 2023a) and BMP (IDEA Consult, 2023b).
- Define the significant direct, indirect impacts on critical habitat, to the extent possible with available data.
- Develop of a mitigation strategy to provide a framework for delivery of no net loss (NNL) or net gain (NG) outcomes as required to conform with PR 6 requirements.

The results of the review of impacts are presented in Section 6; and mitigation measures for significant impacts are outlined in Section 7.

5.2 Key PR 6 requirements

PR 6 has a general requirement that where the assessment for a project has identified impacts to biodiversity, risks should be managed in accordance with the mitigation hierarchy and good international practice (GIP). As appropriate, the precautionary approach should be adopted, and adaptive management applied for the implementation of mitigation and management measures. For PBF, there is a requirement for mitigation strategies to ensure NNL, and preferably a net gain. For critical habitat a NG outcome is required.

For critical habitat there it is also necessary for a project to demonstrate that it does not lead to measurable adverse impacts[2] on those biodiversity features for which the critical habitat was designated.

5.3 No net loss and net gains

BBOP (2012a) defines NNL as:

"a target for a development project in which the impacts on biodiversity caused by the project are balanced or outweighed by measures taken to avoid and minimise the project's impacts, to undertake on-site restoration and finally to offset the residual impacts, so that no loss remains."

BBOP (2012a) also states that NGs relate to where actions taken by a project lead to gains that exceed the losses that may result from activities.

[2] Measurable adverse impacts mean the project's direct and indirect impacts will jeopardise the persistence within the study area of any biodiversity value that triggers a critical habitat designation.

5.4 The mitigation hierarchy

The mitigation hierarchy is defined by CSBI (2013) as:

"the sequence of actions to anticipate and avoid impacts on biodiversity and ecosystem services; and where avoidance is not possible, minimize; and where impacts occur, restore; and where significant residual impacts remain, offset."

The mitigation hierarchy is a set of prioritised, sequential components that are applied to reduce the potential negative impacts of project activities on the natural environment (CSBI, 2015). In practice, this means that the priority is to avoid impacts. If this is not possible then minimisation should occur. Where residual impacts remain after minimisation then restoration should occur wherever feasible. If significant residual impacts remain after these measures have been adopted, then as a last resort, offsets should be delivered.

Table 1 provides definitions for the different components of the mitigation hierarchy taken from BBOP (2012b).

Table 1: Definitions for the components of the mitigation hierarchy

Mitigation step	Definition
Avoidance	Measures taken to prevent impacts from occurring in the first place, for instance by changing or adjusting the development project's location and / or the scope, nature and timing of its activities.
Minimisation	Measures taken to reduce the duration, intensity and / or extent of impacts (including direct, indirect, and cumulative impacts, as appropriate) that cannot be completely avoided, as far as is practically feasible.
Restoration	Measures taken to rehabilitate degraded ecosystems or restore cleared ecosystems following exposure to impacts that cannot be completely avoided and / or minimised.
Offsets	Measures taken to compensate for any residual significant, adverse impacts that cannot be avoided, minimised and / or rehabilitated or restored, in order to achieve NNL or a NG of biodiversity. Offsets can take the form of positive management interventions such as restoration of degraded habitat, arrested degradation or averted risk, protecting areas where there is imminent or projected loss of biodiversity.

Avoidance and minimisation are seen as preventative measures; and restoration and offsets are seen as remediative measures (see Figure 4). Figure 4 shows that offsets may include restoration actions. These are different to restoration activities undertaken to address project impacts that have occurred on-site. Restoration offsets relate to actions that are delivered off-site to repair impacts not caused by a project (CSBI, 2015).

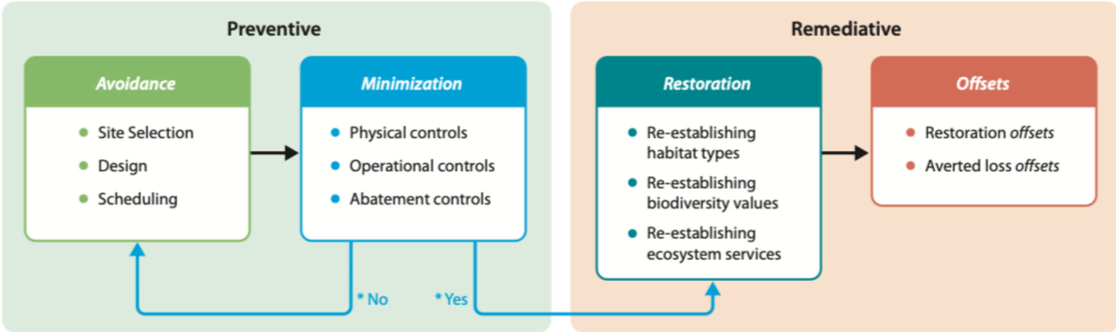

Figure 4: Schematic of how the mitigation hierarchy may be implemented (Source: CSBI, 2015).

In addition to mitigation, projects may also deliver 'additional conservation actions' (ACAs), which are positive interventions for impacts that may be hard to quantify (CSBI, 2015) or where no significant residual impacts remain. ACAs may or may not target features that have been significantly impacted by a project, but unlike offsets they are not designed to provide measurable gains that can be set against those impacts (CSBI, 2015). However, in the context of PR 6, ACAs must demonstrate that gains can be achieved on-the-ground. Unlike offsets, it is sufficient to provide qualitative evidence and expert opinion to validate a NG related to ACAs.

Figure 5 shows how the mitigation hierarchy and ACAs may be applied to achieve NNL or NG relating to a project's impacts. In this example, impacts are reduced by measures to avoid, minimise, and restore; but a significant residual impact remains that requires the implementation of offsets to deliver a NNL and/ or NG in biodiversity. ACAs are delivered where there are no residual impacts (i.e., NNL has been achieved).

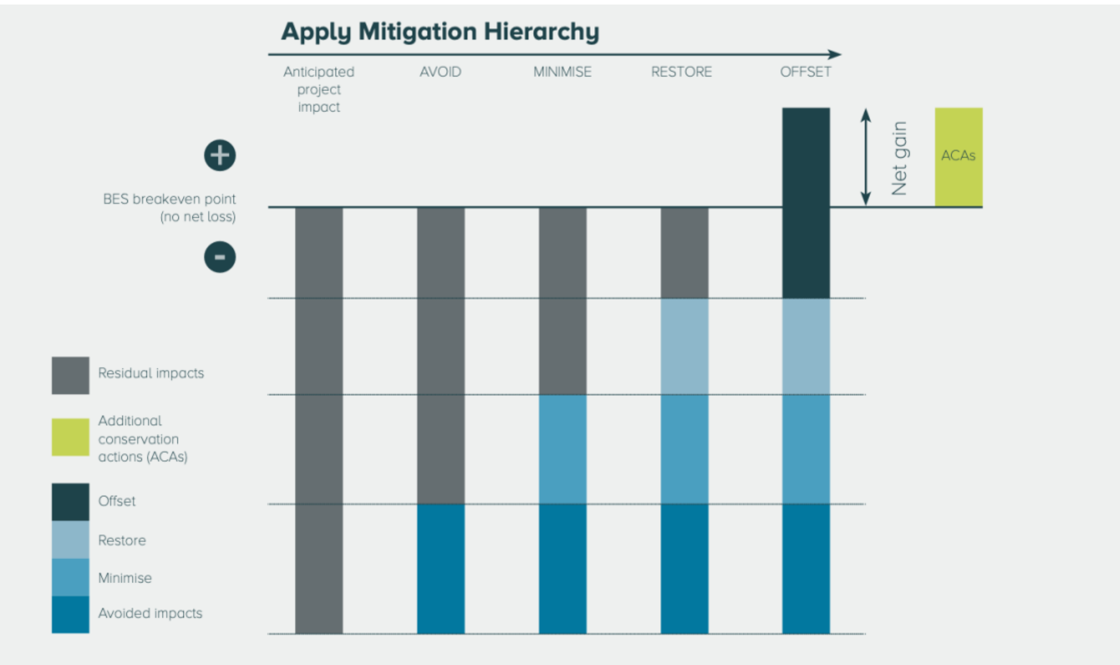

Figure 5: Schematic of the application of how the mitigation hierarchy may be applied to achieve NNL or NG (Source: FFI, 2017).

5.5 Review of impacts and mitigation

The review of impacts arising from the Project has used a stepwise process shown in Figure 6. The aim is to provide an indication of impacts on priority features to provide the basis for determining residual impacts across the mitigation hierarchy. The conclusions provide a general and precautionary indication of where impacts of potential significance to ecosystem integrity may occur.

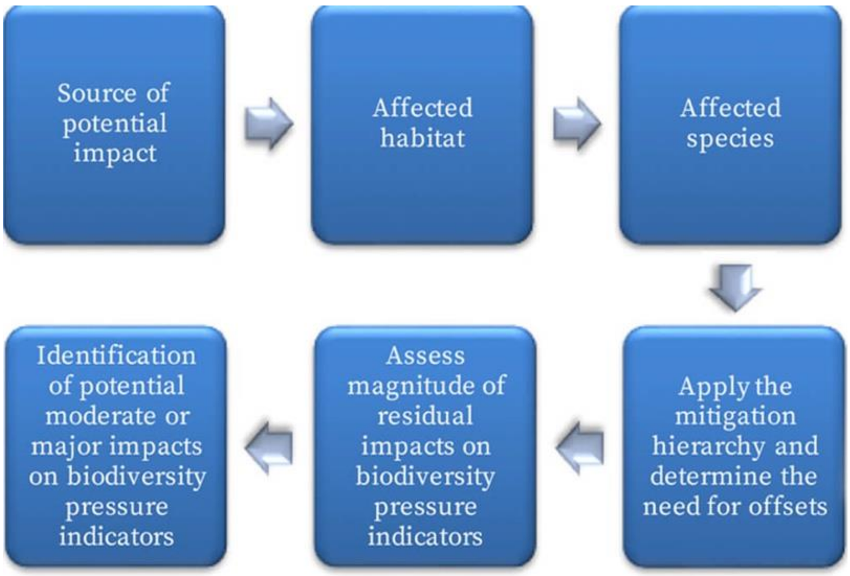

Figure 6: Process for the review of impacts and mitigation.

Impacts have been assessed in relation to a pre-defined set of ecosystem integrity pressure indicators as shown in Figure 7.

Biodiversity pressure indicators	
Habitats	**Species**
Reduction in habitat extent Increase in fragmentation Change in primary productivity Change in ecosystem carrying capacity Reduced ecological connectivity Alteration to diversity	Change in individual species populations Change in distribution and range Alteration to important functions Increased extinction risk

Figure 7: Ecosystem integrity indicators applied to inform the significance of impacts on PBF and critical habitat.

Residual magnitude of impacts for the ecosystem integrity criteria have been defined using the categories shown in Figure 8.

Residual Magnitude Categories
No or negligible impact
Minor impacts that are unlikely to lead to long term measurable effects on ecosystem integrity
Moderate impacts that cannot be avoided and could lead to irreversible change, but do not lead to an irrecoverable loss in ecosystem integrity
Major impacts that would lead to an irrecoverable loss of ecosystem integrity

Figure 8: Categories for determining residual impacts on PBF and critical habitat following the application of mitigation.

Only those impacts that lead to moderate or major residual impacts are considered to lead net loss and measurable effects.

6 Review of impacts on PBF and critical habitat

6.1 Sources of impacts and potentially significant ecological outcomes

The construction and operation of the Project will cause environmental changes that have implications for coastal and marine biodiversity. The source of impacts was defined as a first stage of the assessment using details contained with ESIA study (IDEA Consult, 2023a) and the experience of Bluedot Associates from assessing similar projects elsewhere. A literature review was also undertaken to help to confirm the ecological outcomes that may result from impacts.

For each impact type, consideration has been given to outcomes that may lead to significant effects ecosystem integrity. Such significant ecological outcomes occur would be categorised as moderate or major impacts in line with Figure 8. The likelihood of such significant impacts occurring is assessed in Section 6.2. Sources of impacts and significant ecological outcomes are presented in Table 2.

Table 2: Impacts arising from the Project and identification of potential significant ecological outcomes.

Impact type	Impact source	Significant ecological outcomes
From planned activities		
Increased suspended sediment loads	Disturbance of sediment in the water column during construction arising from seabed disturbance	Reduced light penetration leading to direct, indirect and cumulative impacts on health, productivity and community structure that may lead to habitat degradation. Related outcomes could include: • Direct physiological sub-lethal and lethal effects • Direct reduction in the success of some reproductive processes • Habitat degradation leading to indirect significant effects on the attributes and functions for associated species • Direct disturbance to marine species, including potential long-term displacement and abandonment • Reduced resistance to wider natural and anthropogenic environmental stressors, including cumulative effects.
Sediment deposition	Deposition of suspended sediments on to the seabed following their disturbance during construction from pile	Smothering of marine habitats leading to direct, indirect and cumulative effects on health, productivity and structure that may lead to habitat degradation. Related outcomes include: • Direct physiological sub-lethal and lethal effects

Impact type	Impact source	Significant ecological outcomes
	installation, and vessel and equipment use	• Direct reduction in the success of some reproductive processes • Reduced resistance to wider natural and anthropogenic environmental stressors, including cumulative effects • Direct disturbance to marine species, including potential displacement and abandonment • Habitat degradation leading to indirect significant effects on associated species
Increase in pollution and nutrients in the water column and sediment redistribution	Discharges to the marine environment during construction, including from sediment disturbance, vessel discharges, leaks and spills	• Changes above ecological thresholds that could cause direct and cumulative harm to marine flora and fauna species sensitive to the level of change
Change in bathymetry from erosion around structures	Erosion of seabed sediments resulting from scour during operation	• Localised disturbance to soft sediment marine habitats leading to direct effects on health and structure that may lead to habitat degradation
Underwater sound generation	Underwater sound generated by vessel movements, drilling and cable burial during construction and operation	• Direct permanent physiological effects • Direct behavioural effects that permanently affect the attributes and functions • Cumulative increases on top of existing anthropogenic stressors on sensitive marine species leading to stress that leads to threshold capacity being met • Indirect effects on marine habitat community structures leading to significant effects on the attributes and functions for associated species
Physical loss and disturbance of marine habitats	Temporary or permanent disturbance of habitats and species from construction and operational activities	• Direct injury or mortality of species that lead to long term population effects • Direct reduction in habitat productivity, including indirect impacts in non-impacted areas • Direct and indirect alteration to habitat flora and fauna community structures • Direct habitat fragmentation resulting from different activities in different places and/or alteration to seabed sediment characteristics • Indirect reduced resistance to or increased potential for disease

Impact type	Impact source	Significant ecological outcomes
		• Reduced resistance to wider natural and anthropogenic environmental stressors, including cumulative effects • Potential long term abandonment by mobile species • Habitat degradation leading to indirect significant effects on the attributes and functions for associated species
Artificial lighting impacts during construction	Lighting of construction areas at the landfall sites	• Direct alteration and disruption to the behaviour of sensitive fauna with significant effects on the attributes and functions
Introduction of invasive alien species (IAS) during construction and operation	Vessel movements and ballast water discharge during construction and operation introducing alien species	• Increased competition for natural species leading to indirect impacts on populations and/or displacement
Permanent introduction of new artificial habitat	New hard substrate will create opportunity for colonisation during operation	• Alteration to local community structure and ecosystem functions that affect the persistence of natural communities
Electromagnetic field (EMF) effects and thermal radiation during operation	Submarine power cables could create an external electrical field and thermal radiation	• Possible physiological and developmental effects • Direct alteration and disruption to the behaviour of sensitive fauna with significant effects on the attributes and functions
Thermal radiation during operation	Submarine power cables could create lead to thermal radiation when buried	• No significant ecological outcomes have been reported
From unplanned activities		
Vessel collision	Vessel collision with marine wildlife during construction and operation.	• Direct injury or mortality of marine species
Discharges and spills	Waste discharges and spills from vessels and drilling muds	• Reduced light penetration impairing functions and structure that may lead to direct habitat degradation • Direct smothering of marine habitats leading to direct effects on health and structure that may lead to habitat degradation

Impact type	Impact source	Significant ecological outcomes
		• Oil coating or other direct exposure effects (including ecotoxicology) on flora and fauna species causing impacts on health and/or mortality • Direct reduction in the success of some reproductive processes • Indirect habitat degradation leading to indirect effects on ecosystem functions for some associated fauna species • Reduced resistance to wider natural and anthropogenic environmental stressors, including cumulative effects

6.2 Embedded avoidance of significant ecological outcomes on critical habitat and PBF

Mitigation measures that avoid significant ecological outcomes on critical habitat and PBF have been embedded in the project design. The source of impacts and outcomes associated with the implementation of these mitigation measures are discussed below.

6.2.1 Physical loss and disturbance of marine habitats

Construction activities will lead to some small-scale disturbance to the seabed, including route clearance, cable burial and electrode installation. The footprint of these activities at any point along the cable route are small but will occur the length of the cable route. The avoidance measures that have been embedded in project design to address impacts associated with seabed disturbance for relevant critical habitat and PBF are discussed below.

6.2.1.1 *Posidonia* meadows and the associated fan mussel (*Pinna nobilis*)

Seagrass habitats are present in the nearshore waters of Sicily and Tunisia. The cable route has avoided dense *Posidonia* meadows in the nearshore waters of Sicily. The construction of electrodes and deterrents are also outside of the footprint of seagrass habitat. Therefore, no footprint impacts on reefs that comprise critical habitat are expected associated with these activities.

6.2.1.2 Reef

The review of available baseline information suggest that the construction of electrodes and deterrents will be outside of the footprint of reef habitat. Therefore, no footprint impacts on reefs that comprise critical habitat are expected associated with these activities.

6.2.1.3 Loggerhead turtles (*Caretta caretta*)

Nesting of loggerhead turtles is currently only confirmed on the coast of Sicily where the landing is proposed. However, nesting on the Tunisian coastline cannot be discounted related to uncertainties in baseline information. All nesting is expected to be at a low level. Footprint impacts on sea turtle nesting beaches relate to the key zones that support nesting activity. Turtles will leave the sea and crawl to a suitable nesting position. The 'turtle crawl zone' includes the intertidal beach to the area where nesting takes place. The nesting position is normally above HW. This area is classed as the 'turtle nesting zone'. Nesting can occur in the intertidal zone, but this is a rare occurrence and eggs laid in this zone have a naturally low chance of survival. Coastal works will be outside of the nesting zone and the use of HDD will ensure that there is no disturbance across the crawl and nesting zones. Therefore, footprint impacts are avoided.

6.2.2 EMF effects during operation

6.2.2.1 Benthic elasmobranchs

During operation, submarine power cables emit EMF. Elasmobranchs are especially sensitive to electric currents and can sense weak electric fields emitted by prey, conspecifics and/ or predators. Several benthic elasmobranch species have been identified as critical habitat and PBF.

EMF emitted by submarine power can affect predator-prey interactions and lead to avoidance / attraction to the area around the cable. For prey species, EMF could induce a 'freeze response' (Hutchison et al. 2020a), and in predators has been shown to increase foraging behaviour (Hutchison et al. 2020b), both of which have energetic and potential physiological consequences.

In elasmobranchs, the electromagnetic sense is primarily utilised at close ranges (Taormina et al., 2018). As such, benthic elasmobranch species are most likely to be impacted by submarine power cables, with negligible impact on pelagic species. It is unlikely that any behavioural changes to these benthic species will lead to an irrecoverable loss to these individuals, populations, or system. This is especially the case as burial of the cable will mitigate the potential for effects. Normandeau Associates (2011) reported that the burial of submarine power cables to depths of 2 m has been shown to reduce the EMF value at the seabed interface by 75%.

6.3 Remaining potential significant impacts on critical habitat and PBF

6.3.1 Review of impacts on critical habitat and PBF

Table 3 provides a review of the potential significance of impacts on critical habitat and PBF that remain following the application of embedded avoidance measures. All impacts presented in in Section 6.1 have been considered to demonstrate completeness of the assessment. The shading within Table 3 relates to the categories presented in Figure 8. The understanding of significance has been informed by the conclusions of the ESIA (IDEA Consult, 2023a) and/ or experience of Bluedot Associates from the assessment of similar projects elsewhere. Baseline conditions have been informed by the reviewed undertaken for the CHA (Bluedot Associates, 2023). Precaution is adopted where there is some uncertainty associated with impacts. Given the large number of attributes meeting PBF, the review has been undertaken related to broad species groups.

Where significant ecological outcomes are possible these are discussed in more detail below.

Table 3: Potential significance of pre-mitigation adverse impacts and related ecological outcomes on critical habitat and PBF.

Features	Suspended Sediments	Sediment deposition	Pollution	Scour	Underwater sound	Habitat loss & disturbance	Artificial light	IAS	Artificial habitat	EMF	Heat radiation	Vessel collision	Discharges & spills
Critical habitat													
Posidonia meadows													
Coastal lagoons													
Reefs													
Fan mussel (*Pinna nobilis*)													
Haliotis stomatiaeformis													
Mediterranean slipper lobster (*Scyllarides latus*)													
Maltese skate (*Leucoraja melitensis*)													
White shark (*Carcharodon carcharias*)													
Sawback angleshark (*Squatina aculeata*)													
Smoothback angleshark (*Squatina oculata*)													
Common guitarfish (*Rhinobatos rhinobatos*)													
Blackchin guitarfish (*Glaucostegus cemiculus*)													
Rough skate (*Raja radula*)													
Angleshark (*Squatina squatina*)													
Blackspotted smoothhound (*Mustelus punctulatus*)													
Common smoothhound (*Mustelus mustelus*)													
Shortfin mako (*Isurus oxyrinchus*)													
Sandbar shark (*Carcharhinus plumbeus*)													

Features	Suspended Sediments	Sediment deposition	Pollution	Scour	Underwater sound	Habitat loss & disturbance	Artificial light	IAS	Artificial habitat	EMF	Heat radiation	Vessel collision	Discharges & spills
Swordfish (*Xiphias gladius*)													
Mediterranean shortbill spearfish (*Tetrapturus belone*)													
Bluefin tuna (*Thunnus thynnus*)													
Tortonese's goby (*Pomatoschistus tortonesei*)													
North African Shad (*Alosa algeriensis*)													
Loggerhead turtle (*Caretta caretta*)													
Green turtle (*Chelonia mydas*)													
Hawksbill turtle (*Eretmochelys imbricata*)													
Kemp ridley turtle (*Lepidochelys kempi*)													
Sicilian pond turtle (*Emys trinacris*)													
Common bottlenose dolphin (*Tursiops truncatus*)													
Common dolphin (*Delphinus delphi*)													
Fin whale (*Balaenoptera physalus*)													
Sperm whale (*Physeter macrocephalus*)													
Risso's Dolphin (*Grampus griseus*)													
Long-finned pilot whale (*Globicephala melas*)													
Cuvier's beaked whale (*Ziphius cavirostris*)													
Mediterranean monk seal (*Monachus monachus*)													
Scopoli's Shearwater (*Calonectris diomedea*)													

Features	Suspended Sediments	Sediment deposition	Pollution	Scour	Underwater sound	Habitat loss & disturbance	Artificial light	IAS	Artificial habitat	EMF	Heat radiation	Vessel collision	Discharges & spills
Yelkouan shearwater (*Puffinus yelkouan*)													
Mediterranean storm petrel (*Hydrobates pelagicus melitensis*)													
Marbled Teal (*Marmaronetta angustirostris*)													
PBF													
Annex 1 and Resolution 4 coastal habitats													
Widespread sandbanks which are slightly covered by sea water all the time													
Widespread sublittoral sediment													
Patches of submerged or partially submerged sea caves													
Molluscs													
Cartilaginous fish													
Bony fish													
Jawless fish													
Reptiles													
Coastal and seabirds													
Nearshore coastal birds													
Birds of prey													

6.3.2 Discussion of potentially significant impacts on critical habitat and PBF

6.3.2.1 Physical loss and disturbance of marine habitats

Posidonia meadows and the associated fan mussel (*Pinna nobilis*)

Whilst the ESIA Report and BMP for the Project state that direct impacts on seagrass habitats will be avoided by using HDD this may not always be possible.

Survey information would suggest that cable installation in the nearshore areas of Sicily may still have an impact in areas comprising sand with scattered coverage of *Cymodocea nodosa*.

The limits on the distance for implementing HDD may mean that the seagrass meadows that are thought to be present in Tunisian nearshore waters cannot be completely avoided. Existing information suggests that such meadows may extend by a few kilometres, which may mean that the HDD exit points cannot extend beyond this habitat. The potential for avoidance of these habitats using HDD requires confirmation by a Contractor using survey information; but taking a precautionary approach, it is considered that there is potential for some impacts to occur. Where cable installation occurs through ploughing or jetting, disturbance may also result from vessel anchoring. Therefore, whilst cable routing and HDD may have avoided impacts in some areas, full avoidance may not have been achieved. The extent of impacts is likely to be relatively small relating to the footprint of disturbance. Therefore, taking a precautionary approach, moderate impacts on Posidonia meadows may occur.

The fan mussel (*Pinna nobilis*) is closely associated with seagrass habitats. It is mostly associated with *Posidonia meadows* but may also be found in *Cymodocea nodosa* meadows and other habitats that may be present in nearshore waters. The extent of impacts is likely to be small based on the footprint of disturbance. Therefore, taking a precautionary approach, moderate impacts on this species may occur.

Reefs

Cable installation has the potential to have adverse impacts on deep-sea coral and sponge communities and nearshore biogenic reefs (*Cladocora caespitosa* and coralline algal formations). Survey and design information confirms that some reef habitat has been avoided, but complete avoidance cannot be confirmed. Some footprint impacts are especially likely for shallow water reefs where such habitat is present broadly. Therefore, taking a precautionary approach, moderate impacts on reef habitat may occur.

Haliotis stomatiaeformis

The endemic species *Haliotis stomatiaeformis* has a general distribution that includes nearshore areas of Sicily. It is thought to extend in nearshore zones to a depth of 10 m where it lives under rocks and stones. The use of HDD may mean that any impacts on this species are avoided based on this habitat range. However, this requires confirmation using survey information related to the distance and depth that can be achieved using HDD.

Based on existing information it is not possible to confirm if the HDD exit point lies beyond 10 m. If this is confirmed by the Contractor, then impacts have likely been avoided. Nevertheless, HDD will significantly reduce the extent of impacts where this species may be present. As full avoidance may not be achieved, taking a precautionary approach, moderate impacts on this species may occur.

Sicilian pond turtle (*Emys trinacris*)

The endemic Sicilian pond turtle is recorded as being present in the Sistema dunale Capo Granitola, Porto Palo e Foce del Belice Special Area of Conservation (SAC). The cable route transects through this SAC. This species is restricted to wetland and pond areas. There is insufficient baseline information available to evaluate if this species will be present where footprint impacts may occur on the coast. The footprint of works is relatively small, and they are unlikely to be undertaken in the habitat where this species is present, but this cannot currently be confirmed. Therefore, on a precautionary basis, moderate impacts could occur if impacts occur within the habitats where this species is present.

Green ormer (*Haliotis tuberculata*)

This species has been identified as a PBF. This species is presented within coralline algae communities where there are weak currents. It is generally found in from the intertidal zone to depths of 20 m. The use of HDD may mean that any impacts on this species are avoided based on this habitat range. However, this requires confirmation using survey information related to the distance and depth that can be achieved using HDD. If this is confirmed by the Contractor, then impacts have likely been avoided. Nevertheless, HDD will significantly reduce the extent of impacts where this species may be present. As full avoidance may not be achieved, taking a precautionary approach, moderate impacts on this species may occur.

Annex 1 and Resolution 4 coastal habitats

Coastal construction works at the landfall sites could lead to footprint impacts on Annex 1 and Resolution 4 habitats. On the Sicilian coast, this includes all habitats listed as features of the SAC. However, no detailed baseline information is currently available on the coasts at both landfall sites to confirm if these habitats are present. Further information is therefore required. On a precautionary basis, moderate impacts could on habitat that is classified as PBF.

6.3.2.2 Increased suspended sediment loads and sediment deposition

Seabed disturbance will lead to the suspension of sediments into the water column. In all instances, the scale of seabed disturbance is small and any increases in suspended sediments is expected to very localised to the area of disturbance. Impacts will be temporary as activities are undertaken. Cable burial activities will be undertaken in a linear manner. As such, impacts are not expected along the entire cable route for the entire period of the cable laying duration and will relate to activities at each point along the cable route. The zone of suspension will be dependent on waves and currents conditions during the works with maximum concentrations occurring within and immediately adjacent to the works. In deeper waters, it is expected that suspended sediments will largely remain towards the lower part of the water column where current velocities are lower limiting dispersal. In such areas it is expected that the extent of sediment deposition will also be spatially limited to a localised settlement area; and that settlement would occur rapidly, especially in deeper waters with weak currents. Cable burial from jetting activities in nearshore waters will provide greater potential for dispersal of sediments due to the more dynamic nature of hydrodynamic processes in this area and the greater level of sediment disturbance from such activities, especially when used for in sandy seabed areas. This may extend the zone of sediment dispersal. Area where jetting will be undertaken is unknown. Outside of a mixing zone close to activities, it is likely that levels will reach baseline levels very quickly. These activities will also only be undertaken over a short period. Outside of a mixing zone close to activities, it is likely that levels will reach baseline levels relatively quickly.

Posidonia meadows and the fan mussel (*Pinna nobilis*)

Elevated suspended sediment concentrations in the water column have the potential to cause impacts by reducing the intensity of light and therefore photosynthetic activity of seagrasses. Smothering caused by sedimentation directly onto plants may also have adverse impacts.

The use of jetting techniques in nearshore will lead to the suspension of sediments, which could also result in sediment deposition and smothering of seagrass and the associated fan mussel. The extent of impacts is dependent upon the extent of smothering that occurs.

Whilst it is possible for significant ecological outcomes to result, the short period of activities in any area and relatively low levels of sediment disturbance it is unlikely that major impacts will occur that leads to irrecoverable loss. In general, impacts would occur over more prolonged periods of exposure and with higher levels of sedimentation. Indeed, it is expected that if any degradation occurs that natural recovery of seagrass habitat or populations of associated species will occur relatively quickly. The situation regarding the extent of impacts is uncertain. However, on a precautionary basis, moderate impacts may occur.

Reefs

There is potential for cable installation to lead to sediment suspension adjacent to reef habitats. In turn, sedimentation could lead to deposition with smothering impacts that may lead to localised effects on reef integrity. The extent of sedimentation and smothering impacts is dependent upon the proximity of sensitive reef habitat and the behaviour of sediments once disturbed. It is unlikely that extensive impacts will occur, but the situation is uncertain. Therefore, on a precautionary basis, moderate impacts may occur.

6.3.2.3 Artificial lighting impacts during construction

Loggerhead turtles

Construction lighting within land-based working areas and the lighting of construction vessels and equipment can result in detrimental impacts on nesting loggerhead turtles. Nesting is currently only confirmed on the coast of Sicily where the landing is proposed. Nesting on the Tunisian coastline cannot be discounted based on existing information. All nesting is expected to be at a low level. The extent of required lighting in coastal construction areas is unknown. The landfall areas where works are proposed have localised development, which is more expansive on the Sicilian coastline. Therefore, light impacts are likely to already be occurring.

Adult sea turtles are known to avoid nesting on beaches that are brightly lit. Females sometimes may not emerge from the sea due to the presence of artificial lighting or may emerge at an alternative site or they may be disturbed during emergence. Females that complete nesting may also have difficulty finding the sea again because of artificial lighting. In addition, adults and hatchlings may be disorientated or misoriented and unable to find the ocean in the presence of direct light or sky glow. Light pollution may cause hatchlings trying to find the sea to move in the wrong direction (mis-orientation) as well as interfering with their ability to orient in a constant direction (disorientation). These impacts can lead to mortality as hatchlings become exhausted, dehydrated, predated or crushed by vehicles etc. Lights can also interfere with the in-water dispersal of hatchlings (DEE, 2020). All such impacts may reduce the reproductive output of nesting beaches. DEE (2020) presented a 20 km threshold area for lighting impacts, which is a precautionary limit based on observed effects of sky glow on sea turtle hatchlings. It is a nominal distance but shows that lighting for construction may have broad scale impacts dependent upon local conditions.

The impact of light is dependent upon the type of light being emitted (DEE, 2020). Some light types do not appear to significantly affect nesting densities (Low Pressure Sodium (LPS) and filtered High Pressure Sodium (HPS), which excludes wavelengths below 540 nm), so not all lighting will cause significant effects. However, brightness can be a factor with lights that may induce smaller effects due to wavelengths. The extent of lighting, and the context with respect to existing lighting, needs further assessment. However, on a precautionary basis, moderate impacts may occur.

6.4 Additional mitigation for potentially significant impacts

As outlined in Section 6.2, moderate impacts may occur following the application of avoidance mitigation that is embedded within project design. This section provides additional mitigation measures that may be applied at each step of the hierarchy to address these impacts. Where there is a requirement to use survey information, this must be available prior to the application of mitigation measures and commencement of construction. This may include a detailed review of existing information and additional survey where gaps are present to inform the implementation of avoidance.

Table 4: Implementation of additional mitigation related to potentially significant impacts.

Impact Type	Impact Source	Mitigation Measures
***Posidonia* meadows and the fan mussel (*Pinna nobilis*)**		
Physical loss and disturbance of marine habitats	Temporary and permanent disturbance and loss of habitats and species from construction and operational activities	**Avoid** The distance of HDD should extend offshore as far as is technically feasible to aid the avoidance of impacts on seagrass habitats and the fan mussel. This should be informed by survey information. If it is not possible to extend HDD across all seagrass habitat or to avoid areas where the fan mussel is located, survey information should be used to try to avoid footprint impacts associated with cable burial and anchoring wherever possible. Monitoring should be completed post works in areas to confirm that avoidance has been achieved.
		Minimise If full avoidance of seagrass habitat is not possible, any disturbance of such areas minimised as far as possible. As part of such an approach, the best available techniques and equipment should be used to minimise the width of both the trench and the neighbouring area potentially impacted by the footprint of the machinery used for the burying. Anchoring areas outside of seagrass habitat should also be identified to minimise impacts as far as possible. It is possible to time works to be undertaken when seagrasses may be least sensitive to changes. The ESIA and BMP recommend that construction may be avoided in periods where there is re-growth (autumn) and/ or where fruiting and germination occurs (spring to mid-summer). This measure will help minimise any impacts associated with the works. The application of

Impact Type	Impact Source	Mitigation Measures
		such approaches will need to be informed by survey and monitoring to ensure the correct windows for work are identified.
		Restore If any residual effects on remain after the adoption of the preceding measures, restoration could be undertaken to ensure that the integrity of seagrass habitat and abundance of the fan mussel is not affected in the long term. The BMP recommends that works are undertaken when the potential for colonisation of *Caulerpa sp.* is lowest, i.e., during winter. This approach would help to minimise the potential for disturbed areas to be colonised by this species. Monitoring should be undertaken to confirm the success of the restoration approach. A BAP should be produced to provide details on the restoration and monitoring approach.
Redistribution and deposition of disturbed sediments	Deposition of suspended sediments on to the seabed following their disturbance during construction from pile installation, and vessel and equipment use	**Avoid** The distance of HDD should extend offshore as far as is technically feasible to avoid the need for cable burial through ploughing or jetting in areas where seagrass habitats are present.
		Minimise The best available techniques and equipment should be used to minimise the area of disturbance to limit the potential for sediment disturbance. Monitoring should be undertaken post-survey to monitor the health of habitats and species in the affected areas. As already stated, it is possible to time works to be undertaken when seagrasses may be least sensitive to changes to help minimise any impacts associated with the works.

Impact Type	Impact Source	Mitigation Measures
		Restore If significant smothering effects lead to significant residual effects, restoration should be undertaken. Monitoring should be undertaken to confirm the success of the restoration approach. A BAP should be produced to provide details on the restoration and monitoring approach.
Reef		
Physical loss and disturbance of marine habitats	Temporary and permanent disturbance and loss of habitats and species from construction and operational activities	**Avoid** Use survey information to avoid the disturbance of all deep-sea coral and sponge communities as a priority. This measure should be robustly implemented to ensure there are no impacts on these features. Also, using survey information, avoid biogenic reefs comprised of *Cladocora caespitosa* and coralline algal formations wherever possible along the cable route. This is especially important for communities that have low restoration feasibility (e.g., maerl beds). Monitoring should be completed post works in areas where critical habitat forming reefs are present to confirm that avoidance has been achieved.
		Minimise If full avoidance of *Cladocora caespitosa* reef and coralline algal formations is not possible, any disturbance of such areas minimised as far as possible through appropriate localised routing. As part of such an approach, the best available techniques and equipment should be used to minimise the width of both the trench and the neighbouring area potentially impacted by the footprint of the machinery used for the burying. The extent of additional cable protection on reef areas that comprise critical habitat should be limited wherever possible.

Impact Type	Impact Source	Mitigation Measures
		Restore If any residual effects on *Cladocora caespitosa* reef and coralline algal formations remain after the adoption of the preceding measures, restoration could be undertaken to ensure that the integrity of reef systems is not affected in the long term. However, the feasibility of restoration should be assessed along with the timeframes for recovery. In general, such habitats can take a long time to recover and may have relatively low restoration feasibility. If restoration is feasible, baseline surveys should be undertaken prior to works to quantify the area affected; and monitoring should be undertaken to define the success of restoration measures. A BAP should be produced to provide details on the restoration approach.
		Offset Full restoration is unlikely to be feasible where disturbance to biogenic reefs occur. Therefore, like-for-like restoration offsets will be required. Such offsets should seek to deliver NGs. The approach to offsets should be detailed in a BAP and offset strategy.
Redistribution and deposition of disturbed sediments	Deposition of suspended sediments on to the seabed following their disturbance during construction from pile installation, and vessel and equipment use	**Avoid** Use survey information to avoid cable installation works in soft sediments in proximity to deep-sea coral and sponge communities. The works should ensure no smothering of these habitats. An appropriate exclusion area should be defined through detailed assessment of settling areas. Also, using survey information, biogenic reefs comprised of *Cladocora caespitosa* and coralline algal formations should be avoided wherever possible along the cable route. This is especially important for communities that have low levels of recovery (e.g., maerl beds).

Impact Type	Impact Source	Mitigation Measures
		Minimise The best available techniques and equipment should be used to minimise the area of disturbance to limit the potential for sediment disturbance. Monitoring should be undertaken post-survey to ensure that reefs comprised of critical habitat have not been smothered.
		Restore If significant smothering effects lead to significant residual effects on *Cladocora caespitosa* reef and coralline algal formations, the feasibility of restoration should be assessed, along with the timeframes for recovery. If restoration is feasible, baseline surveys should be undertaken prior to works to quantify the areas affected and monitoring should be undertaken to define the success of restoration measures. A BAP should be produced to provide details on the restoration approach.
		Offset If restoration is not feasible, like-for-like restoration offsets will be required. Such offsets should seek to deliver NGs. The approach to offsets should be detailed in a BAP and offset strategy.
Haliotis stomatiaeformis		
Physical loss and disturbance of marine habitats	Temporary and permanent disturbance and loss of habitats and species from construction and operational activities	**Avoid** The distance of HDD should extend offshore as far as is technically feasible to aid the avoidance of impacts on areas where this species may be present. If it is not possible to extend HDD to avoid areas where this species is located, survey information should be used to try to avoid footprint impacts associated with cable burial and anchoring wherever possible. Monitoring should be completed post works in areas to confirm that avoidance has been achieved.

Impact Type	Impact Source	Mitigation Measures
		Minimise The best available techniques and equipment should be used to minimise the width of both the trench and the neighbouring area potentially impacted by the footprint of the machinery used for the burying. Anchoring areas outside of areas where this species is present should also be identified.
		Restore If any residual effects on remain after the adoption of the preceding measures, restoration could be undertaken to support the recolonisation of areas affected. A BAP should be produced to provide details on the restoration and monitoring approach.
Green ormer (*Haliotis tuberculata*)		
Physical loss and disturbance of marine habitats	Temporary and permanent disturbance and loss of habitats and species from construction and operational activities	**Avoid** The distance of HDD should extend offshore as far as is technically feasible to aid the avoidance of impacts on areas where this species may be present. If it is not possible to extend HDD to avoid areas where this species is located, survey information should be used to try to avoid footprint impacts associated with cable burial and anchoring wherever possible. Monitoring should be completed post works in areas to confirm that avoidance has been achieved.
		Minimise If full avoidance is not possible, any disturbance of such areas minimised as far as possible through appropriate localised routing. As part of such an approach, the best available techniques and equipment should be used to minimise the width of both the trench and the neighbouring area potentially impacted by the footprint of the machinery used for the burying.

Impact Type	Impact Source	Mitigation Measures
		Anchoring areas outside of areas where this species is present should also be identified.
		Restore If any residual effects on remain after the adoption of the preceding measures, restoration could be undertaken to support the recolonisation of areas affected. A BAP should be produced to provide details on the restoration and monitoring approach.
Loggerhead turtles		
Artificial lighting impacts during construction	Lighting of construction areas at the landfall sites	**Avoid** Avoid coastal construction works during the nesting season for loggerhead turtles (May to August) or to avoid the use of any lighting at the landfall construction areas.
		Minimise If full avoidance is not possible, the likely additional implications of light in the context of other development should be assessed through the undertaking of a baseline study. Beaches should also be surveyed before works commence to see if nesting has occurred in an area that may be impacted by light arising from the Project. If impacts may occur minimisation measures should be applied, such as those reported upon within the Florida Marine Institute's guidelines (Witherington and Martin, 2003) and the Light Pollution Guidelines by the DEE (2020). Annex F of the Light Pollution Guidelines by the DEE provides a Mitigation Toolbox for sea turtles. This guidance was adopted by the Convention of Migratory Species signatory states in February 2020. Some of the key minimisation measures that can be included for activities under control of the Project are listed below:

Impact Type	Impact Source	Mitigation Measures
		• Review lighting requirements in consideration of potential impacts and modify accordingly to reduce overall lighting needs, intensity and glow. • Ensure that the best available technology is in place to minimise lighting impacts, such as high- or low-pressure sodium or filtered LED luminaires with no short wavelength blue or violet and ultraviolet wavelengths. Unfiltered white LED, fluorescent, halogen, mercury vapour and metal halide lights shall be avoided. • Turn off unnecessary lighting and limit the times at which lights are used as far as possible. • Where lights cannot be turned off (even temporarily), light only the intended object or area - keep lights close to the ground, directed and shielded. Use only the minimum number and intensity of lights needed to provide safe and secure illumination for the area at the time required to meet the lighting objectives. • Ensure that areas of the beach are kept dark related to lighting used by the Project. • Control use of transient light sources from the Project, such as vehicle headlights, torches/flashlights, lighting on vessels and navigation lighting through use of best available technology and managing their directional use. • Prohibit recreational activities by Project staff involving lights or fires within sight of the nesting beach at all times. • Monitor to translocate misoriented hatchlings to the sea and redirect or transport disoriented adults back to the sea if lighting from the Project may be causing a problem for sea turtles. Identify the transient any 'problem lights' and address as appropriate with through applying the mitigation discussed above to reduce the impacts of such lights. • All temporary lighting on land shall be removed at the end of the construction period.

Impact Type	Impact Source	Mitigation Measures
Sicilian pond turtle		
Physical loss and disturbance of marine habitats	Temporary and permanent disturbance and loss of habitats and species from construction and operational activities	**Avoid** Use survey information to avoid the disturbance of habitats where this species may be present.
Annex 1 and Resolution 4 coastal habitats		
Physical loss and disturbance of marine habitats	Temporary and permanent disturbance and loss of habitats and species from construction and operational activities	**Avoid** Use survey information to gain a better understanding of the presence of listed habitats. Avoid disturbance of listed habitats wherever possible.
		Minimise If full avoidance is not possible key critical habitat features should be located and any disturbance of such areas minimised as far as possible through appropriate localised routing.
		Restore Restore areas affected by temporary disturbance. Approaches to be established through the development of a BAP.

6.5 Impacts on legally protected and internationally recognised areas of biodiversity value

The physical footprint of the project lies within two SACs and is immediately adjacent to a national reserve on the southern coast of Sicily at the Marinella cable landfall as shown in Table 5. Assessments have been completed for these sites, which have been used to inform the content of Table 5 (Terna Rete Italia, 2023)

Table 5: Legally protected areas within and adjacent to the Marinella cable landfall

Site name	Summary of key features
Fondali di Capo San Marco – Sciacca SAC	This marine site is designated for the presence of *Posidonia* beds, reefs and sandbanks which are slightly covered by sea water all the time. Activities will be undertaken within this SAC boundary. Impacts on Posidonia beds, which are a key feature in this SAC, have been avoided as discussed in Section 6.2.1.1 above. Another feature of interest is sand banks slightly covered by sea water all the time. Terna Rete Italia (2023) carried out an assessment of the potential presence of this habitat, including variations. They concluded that beyond a depth of 20 m, habitats that may be present are not very representative of this priority habitat. On this basis, impacts should be avoided. Another priority habitat in this SAC is reefs. Terna Rete Italia (2023) reported that where this habitat exists the use of HDD will avoid impacts. However, in line with Section 6.4, it is recommended that is confirmed prior to the application of mitigation measures and commencement of construction using survey information – either existing or additionally acquired. Two species are identified being bottlenose dolphins and loggerhead turtles. The adoption of mitigation should ensure that there are no impacts that will compromise the integrity of these species.
Sistema dunale Capo Granitola, Porto Palo e Foce del Belice SAC	The site includes a range of Annex 1 coastal habitats. However, the use of HDD will ensure that no works are carried out within the boundaries of the SAC. The minimum distance between distance between the boundary of works and the site is 45 m. The site also supports range of coastal bird species, as well as loggerhead turtles and the Sicilian pond turtle. Overall, 17 species are identified within this SAC. Connectivity of mobile

Site name	Summary of key features
	species outside of the SAC with areas of construction cannot be discounted. However, the nature of impacts and adoption of mitigation should ensure that there are no impacts that will compromise the conservation status of these sites.
Riserva naturale Foce del Fiume Belice e dune limitrofe	The minimum distance of any project works is approximately 90 m of this national reserve. The project is therefore not located in this site. Connectivity of mobile species outside of the reserve with areas of construction cannot be discounted. However, the nature of impacts and adoption of mitigation should ensure that there are no impacts that will compromise the conservation status of these sites.

Although a Ramsar site is present in the coastal EAAA in Tunisia, the project lies approximately 5 km northeast this area. Of note, the site is located 20 km northeast of the two lagoon areas to the south of the Ramsar site that have been identified as IBAs (Korba and Maâmoura et Tazarka) for their migratory bird interest. The Ramsar site is comprised of coastal lagoons along the coast that are isolated by dunes and beaches. Most of the key features in the site comprise sabkha that periodically fill with rainwater; and the extent of standing water likely varies across the site. Although outside of the Ramsar site, an area of sabkha lies approximately 200 m from the cable landfall, which could provide some connectivity with broader coastal lagoon areas. However, this area will not be impacted by the works. Therefore, it is unlikely that the Project will have any impact on the Ramsar site will occur.

6.6 No net loss and net gains

For some impacts NNL will be achieved without any mitigation that is additional to what is embedded in the project design. For most features, no significant residual impacts will occur following the application of avoidance, minimisation and restoration. However, cable laying may lead to impacts on biogenic reefs comprised of *Cladocora caespitosa* and coralline algal formations. The feasibility of restoration for these features may be low, and therefore, some limited offsets may be required. Whilst further assessment and monitoring is required to quantify losses to inform the development of offsets, the Project should produce a BAP to set out a precautionary approach for their delivery. If offsets are to be implemented, then approaches should be reported in an offset strategy and a Biodiversity Offset Management Plan (BOMP) following the recommendations provided below.

With respect to PBF NNL will be achieved due to the nature of impacts or through application of the mitigation hierarchy. NG is required for critical habitat. Where an offset approach may be needed, this should ensure a NG outcome. For other critical habitat, NG can be achieved using ACAs.

6.6.1 Guidance for offsets

6.6.1.1 Good practice offset principles

Offset approaches should be informed by good practice principles. Key principles for offsets have been expressed in various ways (IUCN, 2014; BBOP 2012b; New Zealand Government, 2014; World Bank Group, 2016). BBOP (2012b) provided 10 good practice principles that are often applied for biodiversity offsets, and these can be used by the Project as a primary guide.

6.6.1.2 Applying the principle of adaptive management

Offset approaches should reflect the principle of adaptive management when implementing the proposed biodiversity offsets. This means that approaches should be responsive to changing conditions and the results of monitoring that is implemented to support the offsets. This includes, as appropriate, any update to the BOMP over time.

6.6.1.3 Steps for offset scoping and implementation

Figure 9 provides as generalised summary of the steps for delivering biodiversity offsets. The evaluation of offset design and subsequent implementation should ensure that the good practice principles are robustly applied.

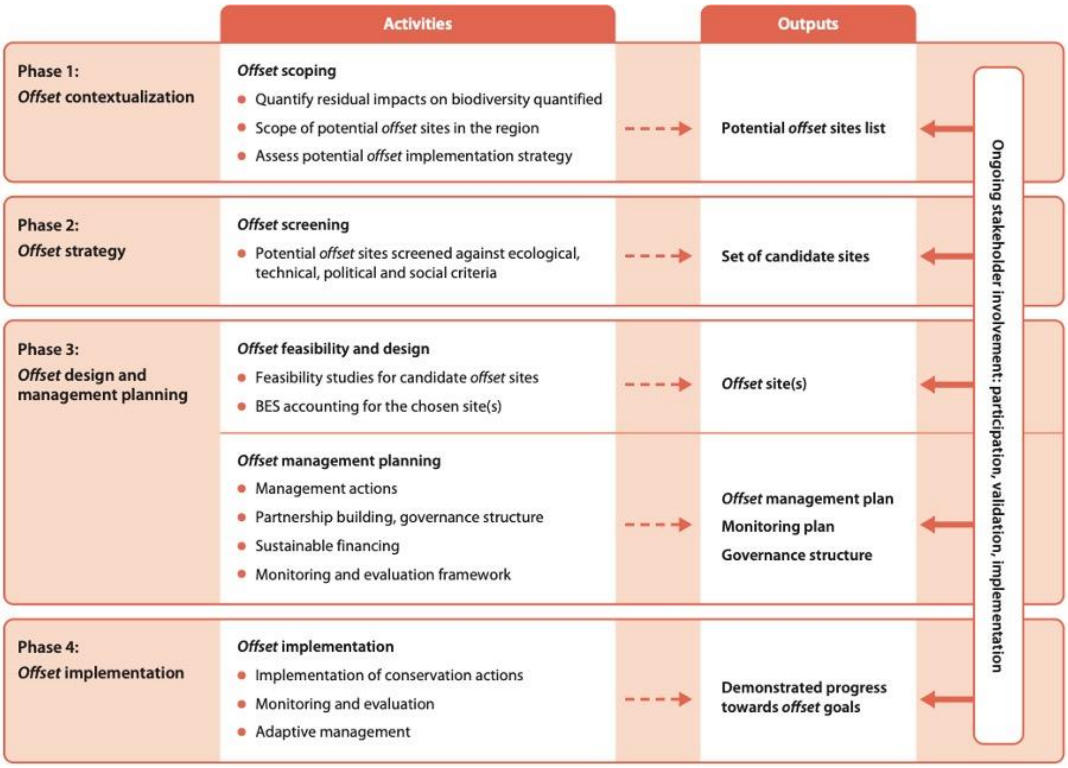

Figure 9: Summary of the general steps and outputs in biodiversity offset design (Source: CSBI, 2015)

6.6.1.4 Evaluate residual losses and gains

There is a requirement for additional assessments to be completed to quantify losses after the implementation avoidance, minimisation, and restoration measures. This information is not detailed in the ESIA and is beyond the scope of this report. Methods and metrics will also need to be identified to help balance the losses and gains to inform the offset design.

6.6.1.5 Offset scoping and design

A scoping process will be required to identify areas where offsets may be delivered. The identification of offset sites should be supported by robust scientific evaluation and seek to achieve maximum gains locally and within the seascape. This approach may define various options for offset delivery, which may be prioritised taking account of opportunities and constraints. The screening should consider theoretical, technical, and socio-political feasibility. The scoping process should consider including ownership and the need for legal arrangements to be established, and the cost to set up and manage the offsets and what approaches can be taken to ensure that the offset can be sustained in perpetuity (or as long as it is required to run). Priority offsets can be evaluated and consulted upon to identify the optimum offset approach.

If no offset options are feasible or residual impacts remain unacceptable then an iterative process should be undertaken to review the application of earlier mitigation steps.

The output of the scoping phase should be the development of an offset strategy that includes the rationale for offset selection and sets out a general approach for offset implementation. It is recommended that the development of an offset strategy follow a systematic step-wide approach that considers: i) the **state** of the environment, ii) **pressures** on biodiversity values, and iii) what **responses** should be undertaken to deliver net gains. Bluedot Associates have developed a guidance framework to support such an approach for marine biodiversity, which may be used as a reference guide (see information available at this link).

The BOMP should also be produced once the strategy has been formed to include information on its technical design, social engagement and participation, governance and management approaches and financial design.

6.6.1.6 Offset implementation

Once a BOMP has been developed, this should be implemented. Appropriate monitoring and evaluation will be required across the timeframe for the offset that embeds the principle of adaptive management (including the selection of thresholds for when corrective actions are needed).

6.6.1.7 Options for the design of offsets

Offsets should be delivered outside the Area of Influence of project activities within the EAAA. There are two main types of biodiversity offsets as follows:

- **Restoration offsets**: These comprise actions that are designed to remediate past damage to biodiversity due to factors unrelated to the development project in question by making positive conservation management interventions. Measures may involve the removal of pressures that lead to degradation, active restoration, and passive restoration.
- **Protection or averted loss offsets:** These comprise interventions which prevent future risks of harm to biodiversity from occurring due to factors unrelated to the development project in question. The offset action aims to avert the loss that is otherwise projected to occur. For averted loss offsets to provide additional biodiversity gain, it must be demonstrated that ongoing or impending threats are imminent and will have significant adverse impacts on biodiversity.

For the Project, it is recommended that a like-for-like restoration offset approach is implemented. Based on the review of impacts and mitigation, this means that offsets should be focused upon restoring degraded biogenic reefs comprised of *Cladocora caespitosa* and coralline algal formations, as appropriate.

Potential offset options within the EAAA include:

- Actively introducing new stocks into a degraded area.
- Manipulating or enhancing the physical, chemical, or biological characteristics of a degraded site to improve natural habitat functions.
- Manipulating or enhancing the physical, chemical, or biological characteristics of a site to develop a habitat that did not previously exist.
- Removal or reduction of pressures on ecosystem structure, composition, and functions to lead to direct restoration outcomes.

The offset approach should demonstrate clear and measurable outcomes using appropriate indicators. It is anticipated that the removal of pressures would lead to most successful outcomes given the low feasibility for proactive restoration of some reef elements. However, the capacity for the Project to exert influence over such pressures needs to be assessed to understand if such an approach is feasible.

6.6.1.8 Stakeholder engagement and collaboration

To ease the implementation of offsets, it is recommended that collaborative approaches are taken forward, and that robust local stakeholder engagement is delivered. Stakeholder consultation and collaborative approaches should seek to:

- Gain expert input into the design of offset approaches.
- Consult on offset approaches with local communities and seek for local community involvement in implementation.
- Outline key findings to inform the establishment of effective offset implementation strategies.
- Identify opportunities that can be supported to limit the need for additional programmes to be developed.

- Identify frameworks for new programmes that can build upon work already completed in the EAAA.
- Understand the potential to use financing mechanisms to support offset implementation and help deliver long term sustainable financing models.

Offset strategies could seek to align and build upon existing programmes that are being delivered in the EAAA. This may involve the provision of support for existing programmes where they are being implemented or to scale approaches into new areas. It should be noted that the funding of existing programmes alone is not considered to be an adequate approach and that any offset strategy should seek to demonstrate measurable additionality over and above what has been achieved by existing programmes.

6.6.2 Additional Conservation Actions

As discussed in Section 3, several features comprise critical habitat in the EAAA. ACAs will be required to deliver NGs for all critical habitat that has been identified. These should be delivered to achieve on-the-ground NG outcomes but do not need to be quantified in the same way as offsets. It is recommended that approaches to ACAs be reported in a BAP.

Again, it is recommended that a systematic state-pressure-response approach is adopted to define the best approach for framing the identification of options to deliver net gains. This should include the identification of ecosystem-based options that provide direct benefits to habitats within the EAAA with associated benefits for critical habitat species. In some instances, species-specific actions can be implemented. The CHA (Bluedot Associates, 2023) has provided information on priority conservation areas that have been defined in the EAAA, including SACs, Special Protection Areas (SPAs), Ramsar site, Important Shark and Ray Areas (ISRAs), Biologically Significant Marine Areas (EBSAs) and the Important Marine Mammal Areas (IMMAs). These priority conservation areas enclose all critical habitat features, and therefore, may provide a spatial focus for delivering ACAs.

7 Conclusions

The review has concluded that most impacts will be of negligible or minor significance in relation to ecosystem integrity. No major impacts on the integrity of critical habitat and PBF are anticipated. However, some potential moderate impacts may occur following the application of mitigation that is embedded in project design. The application of additional mitigation measures ensures that no significant residual effects will occur. Therefore, NNL will be achieved for PBF, and recommendations have been provided for delivering NGs through limited offset approaches where applicable or ACAs.

8 References

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