



FORMOSA 2

海能風力發電股份有限公司

Formosa 2 Offshore Wind Farm Project

Summary Environment & Social Impact Assessment

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REVISION RECORD SHEET

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GLOSSARY

AoI	Area of influence
CESMP	Construction environmental and social management plan
COD	Commercial Operation Date
EHS	Environmental, health and safety
EIA	Environmental impact assessment
EPs	Equator principles
ESMS	Environmental and social management plan
ETS	Eastern Taiwanese Straits
GIIP	Good international industry practice
HSE	Health, safety and environmental
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
MNOs	Marine Mammal Observers
OESMP	Operation environmental and social management plan
OSS	Offshore Substation
PSs	Performance Standards
SEP	Stakeholder engagement plan
WBG	World Bank Group
WMP	Waste management plan
WTG	Wind turbine generator

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1.0 INTRODUCTION

1.1 Overview

The Formosa II Offshore Wind Farm (the “Project” or “FOW 2”) is being developed by Swancor and Macquarie Capital (“Formosa 2). It involves the development, construction, commissioning, ownership, operation and maintenance of an offshore wind power generation facility – with a capacity of up to 378MW which will include up to a maximum of 47 units of Wind Turbine Generators (WTGs) and its related infrastructure located off the north-western coast of Taiwan, near Zhunan Town, Miaoli County.

The Project is comprised of two zones (i.e. 5 and 6) from the 36 zones of identified potential concessions, as part of the government’s initiative known as the “Offshore Zonal Development Phase of Taiwan’s Thousand Turbines Project”. Formosa 2 is located near to Formosa I Offshore Wind Farm Project (“Formosa I”) as can be seen in Figure 1.

1.2 Objectives

The primary objective of the summary Environmental Social and Impact assessment is to provide an outline of the information provided in the Project’s approved Environmental Impact Assessment (EIA), dated May 2018 the Stakeholder Engagement Plan and the Livelihood Restoration Plan which further describe the potential environmental and social impacts that shall be addressed during construction and operation.

These documents along with the projects environmental and social management plans (ESMPs) and Biodiversity Management Plan shall be subjected to regular review and updates as the Project progresses.

Together this framework of documents will ensure that the management of biodiversity and social issues relevant to the Project is in accordance with the Applicable Standards of the Project, which includes national legislation and regulations, as well as international standards such as the Equator Principles (EPs), the International Finance Corporation’s (IFC) Performance Standards (PSs), the World Bank Group (WBG) Environmental, Health and Safety Guidelines (EHS) Guidelines and good international industry practice (GIIP) pertaining to biodiversity.

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2.0 PROJECT DESCRIPTION

2.1 Project background

The Formosa 2 Offshore Wind Farm Project (F2) is being developed by Swancor and Macquarie Capital. The project is registered as the applicant of zone #5 & #6 with the Bureau of Energy (BOE) since November 2016 and has successfully passed the Environmental Impact Assessment (EIA) committee review in 2018. The project has also successfully passed the system impact analysis (SIA) with Taipower YingPan substation for a total project capacity of 378 MW.

The water depth on site ranges from 30 to 55 metres LAT, turbines can only be set in the range of 35 to 55 meters. The total area is 68.68 km² and the distance from shore is 3.8 to 9.5 km. Wind Turbine Generators (WTGs) in the range of 6-9.5 MW are considered for F2 with a maximum of 47 WTGs installed in the site.

Currently there is no Offshore Substation (OSS) planned to be installed on site. The WTGs will be connected via 66 kV submarine cables which will then be extended to shore for onshore grid connection.

The Commercial Operation Date (COD) for the project is end of 2021.



Figure 2-1 : Map of FOW2 wind farm and onshore substation

2.2 Onshore habitats

The onshore components of the Project are mainly surrounded by modified habitats (Figure 2-2) which consist mainly of agricultural land, abandoned land, windbreak forest and recreational parks along the coast.

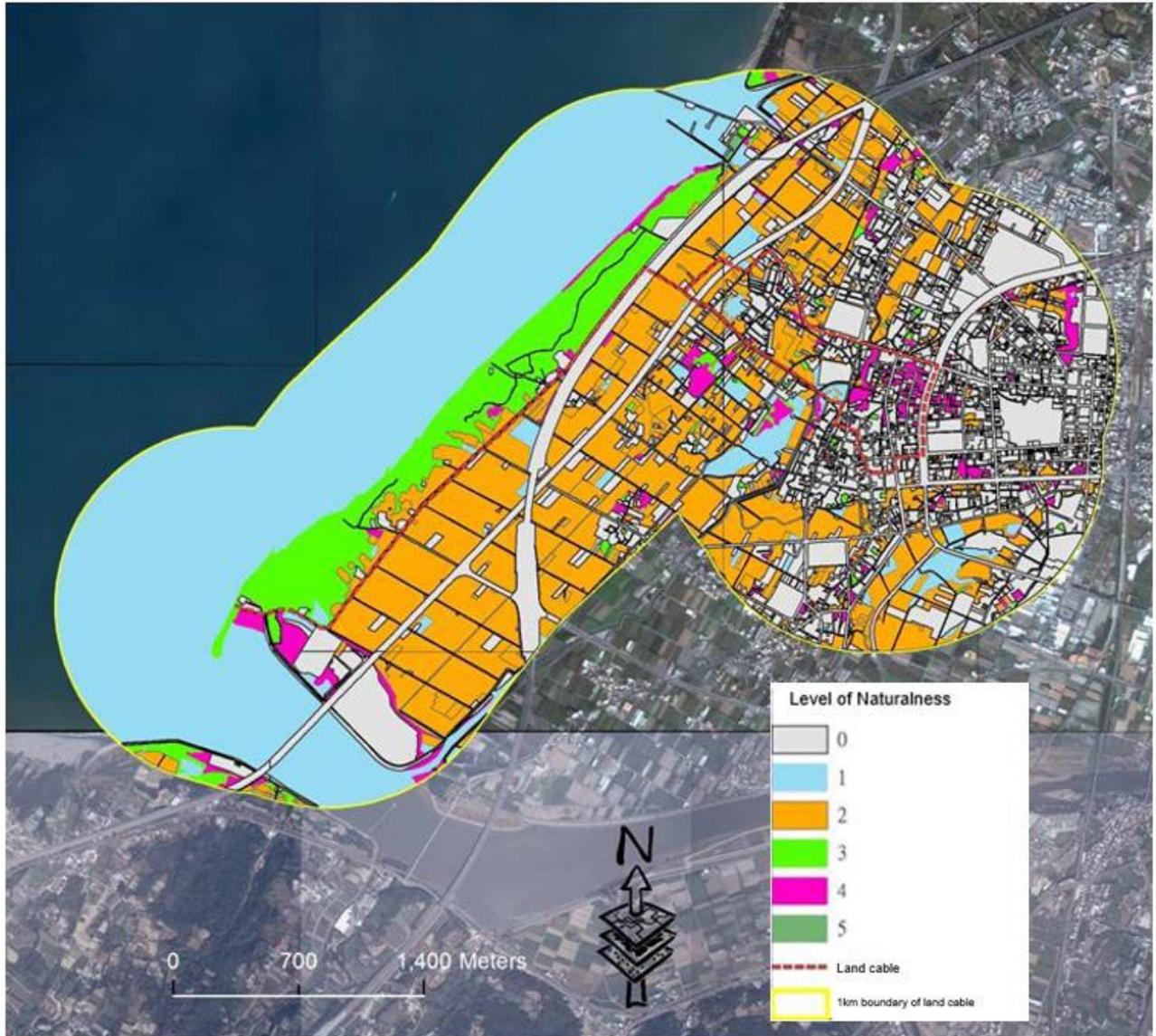


Figure 2-2 : Habitats surrounding Project's onshore components

Note: The larger the number, the higher the naturalness (5- secondary woodland of high naturalness; 4- Mainly coastal sandy areas and grassland; 3: Plantation woodland of moderate naturalness; 2: Agriculture land with frequent disturbance; 1: Bare ground with limited vegetation (including stream, rocky shore, are formed after landslide, sandy beach); 0: No vegetation zone (including city, houses, roads)

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3.0 NATIONAL LEGISLATION AND INTERNATIONAL STANDARDS

3.1 Statutory framework

Formosa 2 shall comply with the requirements of the laws and regulations of Taiwan and the requirements of the approved EIA (Unitech, 2018), as well as the international standards and guidelines provided in Section 3.2 and 3.3.

3.2 Relevant international law

Taiwan has not ratified any international laws and conventions in relation to biodiversity and so the applicable national legislations and permitting requirements as well as third party requirements are described in the following sections.

3.3 National legislation and policy framework

Taiwan's EIA Act (環境影響評估法), which was promulgated on 30 December 1994 and amended on 1 August 2018, governs the EIA process in Taiwan which requires a project proponent to undertake an EIA when it is to have the potential to cause potentially significant environmental and social impact. The administration of the EIA approval and related matters are under the purview of the Environmental Protection Administration (EPA). Detailed EPA procedures and implementation guidelines include:

- Implementation Rules for the EIA Act(環境影響評估法施行細則) (amended on 11 April 2018)
- Environmental Impact Assessment Items and Screening Criteria for Development Activities (開發行為應實施環境影響評估細目及範圍認定標準) (amended on 11 April 2018)
- Guidelines for Conducting Environmental Impact Assessment for Development Activities (開發行為環境影響評估作業準則) (amended 8 December 2017)

Under the screening criteria mentioned above, in terms of development type, offshore windfarms (風力發電離岸系統) are listed as an activity which requires the preparation and submission of an EIA. Formosa 2 shall comply with the requirements of the laws and regulations of Taiwan and the requirements of the approved EIA.

The ecological surveys and assessment within the EIA were conducted in accordance with the below listed specifications as published by the Environmental Protection Administration Executive Yuan, R.O.C (Taiwan) (Taiwan EPA):

- Technical Specifications for Animal Ecology Assessment (動物生態評估技術規範)
- Technical Specifications for Plant Ecology Assessment (植物生態評估技術規範)
- Technical Specifications for Marine Ecology Assessment (海洋生態評估技術規範)

In addition to the overarching EIA act, national legislation in relation to biodiversity applicable to the purpose of this BMP includes the following key laws and regulation:

- Wetland Conservation Act of Taiwan (濕地保育法) (promulgated on 3 July 2013)

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Classifies wetlands of importance into three levels and prescribes wetland management systems accordingly:

- International level (國際級);
 - National level (國家級); and
 - Regional level (地方級).
- Wildlife Conservation Act of Taiwan (野生動物保育法) (amended on 23 January 2013)

Classifies endangered and vulnerable species into three categories and prescribes wildlife management systems accordingly:

- I - Endangered species (瀕臨絕種保育類)
- II - Rare and valuable species (珍貴稀有保育類); and
- III - Other conservation-deserving species (其他應予保育類)

Defines and governs the management of Wildlife Refuge (野生動物保護區) and Major Wildlife Habitat (野生動物重要棲息環境)

- Forestry Act (森林法) (amended on 30 November 2016)

Defines and governs the management of Nature Reserve (自然保護區)

- National Park Act (國家公園法) (amended on 8 December 2010)

Defines and governs the management of National Park (國家公園) and National Nature Park (國家自然公園).

3.4 International standards and guidelines

Formosa 2 is committed to complying with the following Applicable Standards:

- EPs III (2013)
- IFC PS6 (2012) and Guidance Note 6 (2018) on Biodiversity conservation and sustainable management of living natural resources
- WBG EHS Guidelines:
 - WBG General EHS Guidelines (2007)
 - WBG EHS Guidelines for Electric Power Transmission and Distribution (2007)
 - WBG EHS Guidelines for Wind Energy (2015)

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3.5 Environmental and Social Management System (ESMS)

The project has also established an overarching Formosa 2 ESMS¹ framework. The above national regulations and guidelines (see section 3.3) were considered throughout the EIA process, while the measures presented in the ESMS additionally considers the achievement of GIIP for construction and operation phases. The prescribed measures of the EIA and ESMS are summarised in this document

3.6 Details of relevant management plans

In addition to being summarised here the management and monitoring requirements set in the following documents are applicable to the construction and operation phase of the Project:

- Formosa 2 EIA (Unitech, 2018)
- Formosa 2 Offshore Wind Farm Project Environmental Management Plan
- Formosa 2 Stakeholder Engagement Plan
- Formosa 2 ESMS
- Formosa 2 Community Health and Safety Plan

¹ The ESMS equivalent document for the Project is Formosa II's offshore wind farm - project environmental management plan (document number: F2-PJM-DEV-F2-PL-EN-00001).

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4.0 BIODIVERSITY BASELINE

The baseline ecological conditions as summarised here were based upon the information contained within the environmental impact assessment (EIA) conducted for the Project.

Various ecological surveys (i.e. terrestrial flora and fauna, marine organisms, cetaceans and birds) were conducted between 2015 to 2017. The document provided the Project's ecological baseline within its area of influence (Aol) and identified a number of mitigation measures to reduce the impact of the Project on habitats and its biodiversity that thrive within. These were then presented within the context of key biodiversity area (KBA), habitats of importance and species of (international) conservation importance.

4.1 Legally protected and internationally recognised areas

The Project is not situated within any area gazetted as national important wetland, forest or marine conservation area, or any wildlife important habitat. However, there are nature conservation areas close to the Project area such as the following:

- Xihu Important Wetland (西湖國家級重要濕地) which is situated approximately 3km south-east of the Project
- Proposed "Major habitat area" (MHA) for the Eastern Taiwanese Straits (ETS) sub-population of Indo-pacific humpback dolphin, which is situated approximately 1.5km east of the Project, along the west coast.

These two areas are discussed within section 4.1.1 and 4.1.2 below.

4.1.1 Xihu Important Wetland

The 142ha Xihu Important Wetland is a natural coastal wetland situated south-east of the Project area, within Houlong town, Miaoli county. The Wetland Conservation Act of Taiwan (濕地保育法) was gazetted on February 2, 2015 accordance with Article 40 of the Act. Therefore, pre-existing wetlands that were nationally deemed important prior to the implementation of the law are now regarded as international and national important wetlands.

Xihu Important Wetland known to be a habitat for egrets and ducks with unpolluted waters. The wetland is known to have biodiversity such as the three-toothed fishes along the coast and Japanese sparrowhawks with the occurrence of leopard cats inland. No endemic, nationally protected, or internationally recognised species of conservation are found within the wetland. However, during spring, the coastal portion of the wetland serves as an important feeding ground for the ETS Indo-pacific humpback dolphins.

The Miaoli county government has also proclaimed a three-acre "Wanwa Veneridae Conservation Area" (灣瓦國姓蟻貝保育區) within the Xihu Important Wetland whereby there is prohibition on harvesting of clams during January to March each year (ie harvesting by public is allowed rest of the year).

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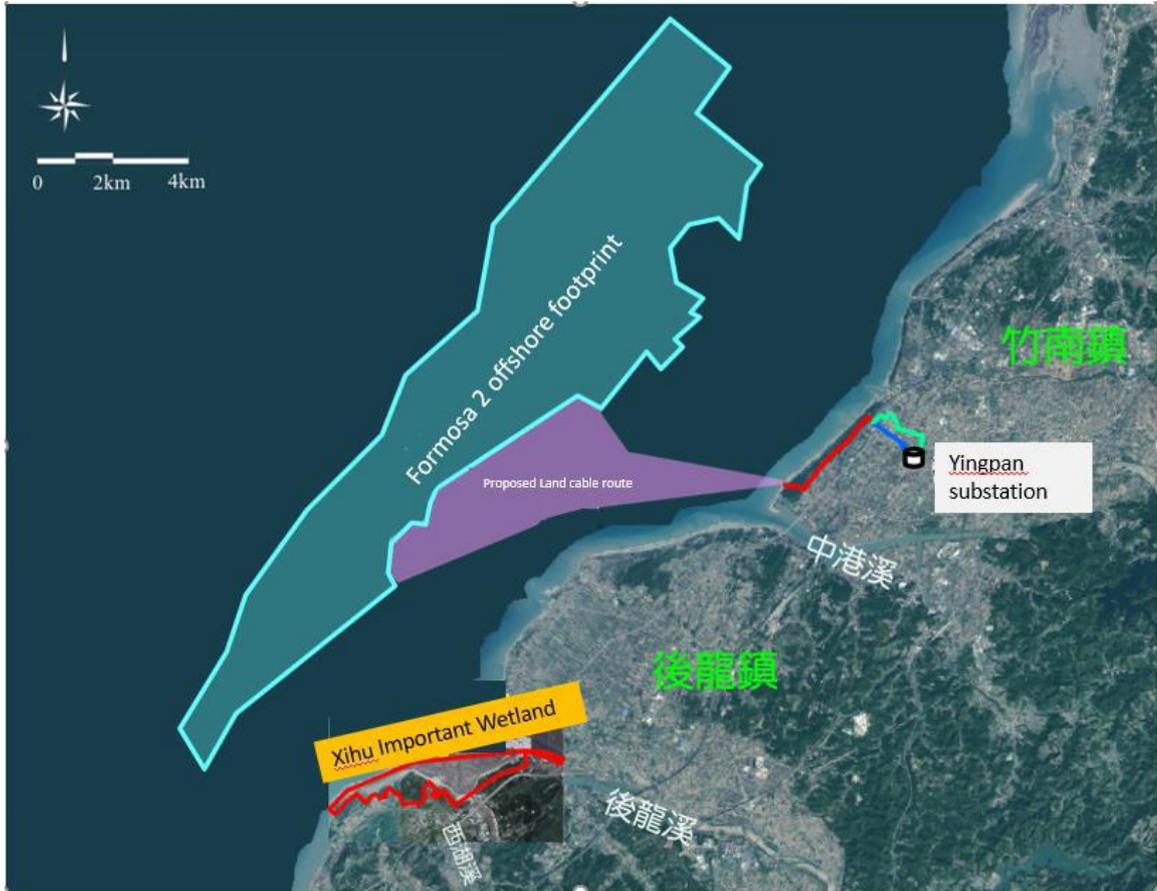


Figure 4-1 : Xihu Wetland of national importance in relation to Project

4.1.2 Proposed Indo-pacific humpback dolphin Major Wildlife Habitat

The proposed major wildlife habitat (MWH) under the Wildlife Conservation Act (article 8) was proposed on 21 April 2014. A consultation period of 30 days was conducted in April to May to consolidate comments from various stakeholders regarding issues such as the boundary of the designated MWH area, marine traffic, capture fisheries restriction and other restriction on industrial developments. As stated above, the habitat is considered an important habitat for the ETS Indo-pacific humpback dolphins but to date, has not been officially designated as a protected area (see section 4.3.2 for details). Surveys conducted

A detailed biodiversity impact assessment was completed for the Project as part of the approved EIA (Unitech, 2018). The document provided the Project's ecological baseline within the Project's (Aol).

Field surveys conducted as part of the EIA includes terrestrial ecology, intertidal ecology and marine ecology. The surveys conducted to date have been summarised in Table 1, with the survey area (or route) as shown in Appendix A.

Table 1: Summary of ecological surveys conducted

Surveys conducted	Summarised results
Terrestrial habitat and flora survey	<ul style="list-style-type: none"> Main habitats identified were of agricultural land, abandoned land and windbreak forests. No habitats of conservation value were identified. Three endemic and two artificially planted rare species of plants were observed.
Terrestrial fauna survey	
<ul style="list-style-type: none"> Mammal survey 	<ul style="list-style-type: none"> Total of 18 species of mammals observed. None of which are of conservation status.
<ul style="list-style-type: none"> Terrestrial bird survey 	<ul style="list-style-type: none"> Total of 61 bird species observed during terrestrial bird survey; 22 migratory species, 15 endemic species/sub-species of birds. Only 5 of out 16 of previously recorded conservation status species were observed during the survey. 11 of the historical recorded species belongs to species that can be found during the coastal bird survey
<ul style="list-style-type: none"> Herpetofauna (Reptiles and amphibians) 	<ul style="list-style-type: none"> A total of four endemic amphibian/reptiles observed: Stejneger's glass lizard (<i>Takydromus stejnegeri</i>), Swinhoe's japalura (<i>Japalura swinhonis</i>), Formosan Chinese skink (<i>Eumeces chinensis formosensis</i>) and Temple tree frog (<i>Kurixalus idiotocous</i>)
<ul style="list-style-type: none"> Bat survey 	<ul style="list-style-type: none"> Total of eight species of bat observed. No bats of national or international conservation status were observed.
<ul style="list-style-type: none"> Invertebrate survey (Butterflies and Odonates) 	<ul style="list-style-type: none"> 13 endemic subspecies of butterflies found within areas of high disturbance.
Costal and marine bird/bat survey	
<ul style="list-style-type: none"> Coastal bird survey Intertidal bird survey Seabird survey 	<ul style="list-style-type: none"> 27 migratory species observed during coastal and intertidal bird survey, two endemic subspecies (<i>Spilornis cheela</i> and <i>Acridotheres cristatellus</i>).
<ul style="list-style-type: none"> Raptor survey² 	<ul style="list-style-type: none"> Raptor survey identified several bird species that have been assessed for a potential risk collision with WTG blades: <ul style="list-style-type: none"> - Chinese sparrowhawk (<i>Accipiter soloensis</i>): o Taiwan protected species (Cat II), Migratory species <ul style="list-style-type: none"> o Estimated migratory numbers of 17,217 in three groups. o Flight altitude averages 259-333m o EIA assessed that the WTG operation have no direct impact on species - Grey-faced Buzzard (<i>Batastur indicus</i>):

² Flight altitude of birds were compared against the height of the WTG blades movement. However, exact length of the WTG blade cannot be determined as the capacity of the WTF has not be decided. However, EIA states that the highest operating range of the WTG blade would be from 182m to 197m above mean sea level (MSL).



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	<ul style="list-style-type: none"> ○ Taiwan protected species (Cat II), Migratory species ○ Four groups of a total 1,066 numbers estimated. Flight altitude average 259-400m (WTG assessed to have no direct impact on species) - Terns: <ul style="list-style-type: none"> ○ Six species of Terns observed and assessed not to pass through the Project area. However, some species of terns that were not recorded during the survey are known to breed on islands north of Taiwan such as the International Union for Conservation of Nature (IUCN) Endangered Black-bellied Tern (<i>Sterna acuticauda</i>) require further monitoring to assess if the terns do pass through the Project area. - Black-faced Spoonbill (<i>Platalea minor</i>): <ul style="list-style-type: none"> ○ Endangered in the IUCN Red List and locally protected (Cat I) species. ○ Mapping of the Black-faced spoonbill migratory route has been assessed to fly near or through the Project area. ○ Flight altitude of black-faced spoonbill not established. Estimated average flight attitude is 190.25m.
<ul style="list-style-type: none"> • Bat coastal survey 	<ul style="list-style-type: none"> • Total of 8 species of bats recorded with seasonal occurrence of each species during winter and spring. No bats of conservation status indicated.
<ul style="list-style-type: none"> • Night avian survey (radar) 	<ul style="list-style-type: none"> • 58 records of flightpaths observed in August, majority was situated in the southwest section of the Project. Most sighting occurred within 1-5km from the coastline. This has been identified as high risk of bird collision) • 272 records of flight paths with 8 records of flight attitudes observed in September and November surveys. • Flight altitude survey: Lowest attitude recorded was 13m and highest was 157m. There were no records within 200-500m range. Four visual observations of the Grey-faced buzzard were made. • Peak nocturnal activity was between 2300-0100hr and 0500-0700hr.
Intertidal survey	
<ul style="list-style-type: none"> • Intertidal ecological survey 	<ul style="list-style-type: none"> • Generally low biodiversity (0.52 -2.72) observed based on Shannon-Weiner index which is typically between 1.5-3.5 in most ecological studies.
Marine survey	
<ul style="list-style-type: none"> • Phytoplankton survey • Zooplankton survey • Marine ichthyoplankton, fish larvae and post-larvae survey • Marine benthos survey 	<ul style="list-style-type: none"> • Five surveys were conducted from July 2015 to April 2017 with 10 sampling points for each survey. • Total of 173 species of phytoplankton and 29 species of zooplankton recorded with varying degrees of biodiversity recorded in different sampling stations • No species of conservation concern observed. Fish within Project area mainly composed of species found within shallow waters of Western coast of Taiwan.

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Cetacean survey

- Indo-pacific humpback dolphin (Vu)
- Indo-pacific bottlenose dolphin
- Dwarf sperm whale
- Indo-pacific finless porpoise (Vu)
- No ETS Indo-pacific humpback dolphins were observed in the northern area of the Project area, but desktop study showed high occurrence within the eastern side of the Project where the suitable habitat of the ETS Indo-pacific humpback dolphins is situated
- Low observations of Indo-Pacific bottlenose dolphins northeast of Project
- Desktop studies showed occurrence of dwarf sperm whale and Indo-Pacific finless porpoise.

Based on baseline studies conducted for the ESIA, migratory birds and the ETS Indo-pacific humpback dolphins are likely to be species of conservation concern. Baseline bird survey results indicate that a variety of migratory bird species was observed within the offshore windfarm footprint. Migratory birds have been identified to be vulnerable to collision with WTG blades due to high nocturnal activity through southwest of the Project's offshore WTG footprint towards land. The ETS Indo-pacific humpback dolphin has a confined habitat distribution east of the Project close to the coastline. Further details of migratory birds and the ETS Indo-pacific humpback dolphin can be referred to in the following sections 4.3.1 and 4.3.2.

4.2 Species of conservation concern

4.2.1 Birds

Table 2 summarises all bird species of conservation concern recorded within the Project area during the EIA surveys. There were no birds with critically endangered or endangered status as defined by International Union for Conservation of Nature (IUCN). A total of 13 nationally protected birds were recorded (one Category I; nine Category II and two Category III). Migratory bird species and nocturnal birds have been identified to have highest potential for collision risk within the southwest portion of the Project's offshore WTG footprint due to intersecting flightpaths with the Project area as well as low flight altitudes during the night.

Table 2: Birds of conservation status

Species	Common name	IUCN status	Taiwan status	Migratory /native	Endemic
<i>Accipiter soloensis</i>	Chinese sparrowhawk	Least Concern	Protected (Cat II)	Migratory	-
<i>Acridotheres cristatellus</i>	Crested Myna	Vulnerable	Protected (Cat II)	Migratory	Endemic subspecies
<i>Acridotheres javanicus</i>	Javan Myna	Least Concern	-	-	-
<i>Apus nipalensis</i>	House swift	Least Concern	-	Migratory	Endemic subspecies
<i>Butastur indicus</i>	Grey-faced Buzzard	Least Concern	Protected (Cat II)	Migratory	-
<i>Caprimulgus affinis</i>	Savanna nightjar	Least Concern	-	Migratory	Endemic subspecies
<i>Cisticola exilis</i>	Golden-headed Cisticola	Least Concern	-	Migratory	Endemic subspecies
<i>Cyanoderma ruficeps</i>	Rufous-capped Babbler	Least Concern	-	Migratory	Endemic subspecies
<i>Dendrocitta formosae</i>	Grey Treepie	Least Concern	-	Migratory	Endemic subspecies



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<i>Dicrurus macrocercus</i>	Black Drongo	Least Concern	-	Migratory	Endemic subspecies
<i>Elanus caeruleus</i>	Black-winged Kite	Least Concern	Protected (Cat II)	Migratory	-
<i>Falco peregrinus</i>	Peregrine Falcon	Least Concern	Protected (Cat I)	Migratory	-
<i>Falco tinnunculus</i>	Common Kestrel	Least Concern	Protected (Cat II)	Migratory	-

Species	Common name	IUCN status	Taiwan status	Migratory /native	Endemic
<i>Hypothymis azurea</i>	Black-naped Monarch	Least Concern	-	Migratory	Endemic subspecies
<i>Hypsipetes leucocephalus</i>	Black Bulbul	Least Concern	-	Migratory	Endemic subspecies
<i>Lanius cristatus</i>	Brown Shrike	Least Concern	Protected (Cat III)	-	-
<i>Lanius schach</i>	Long-tailed shrike	Least Concern	-	Migratory	-
<i>Numenius arquata</i>	Eurasian Curlew	Near Threatened	Protected (Cat III)	Migratory	-
<i>Pandion haliaetus</i>	Osprey	Least Concern	Protected (Cat II)	Migratory	-
<i>Pomatorhinus musicus</i>	Taiwan Scimitar-babbler	Least Concern	-	Migratory	Endemic
<i>Prinia crinigera</i>	Striated Prinia	Least Concern	-	Migratory	Endemic subspecies
<i>Prinia inornata</i>	Plan Prinia	Least Concern	-	Migratory	Endemic subspecies
<i>Pycnonotus sinensis</i>	Light-vented Bulbul	Least Concern	-	Migratory	Endemic subspecies
<i>Rostratula benghalensis</i>	Greater Painted-snipe	Least Concern	Protected (Cat II)	Migratory	-
<i>Sinosuthora webbiana</i>	Vinous-throated parrotbill	Least Concern	-	Migratory	Endemic subspecies
<i>Spilornis cheela</i>	Crested Serpent-eagle	Least Concern	Protected (Cat II)	Migratory	Endemic subspecies
<i>Sterna albifrons</i>	Little Tern	Least Concern	Protected (Cat II)	-	-
<i>Streptopelia orientalis</i>	Oriental turtle-dove	Least Concern	-	-	Endemic subspecies

Note (1) The IUCN Red List of Threatened Species. Version 2018-2 <http://iucnredlist.org>

(2) According to Taiwan Council of Agriculture (行政院農業委員會)'s list of protected wildlife species (保育類野生動物名錄), category II species (二級保育類) are defined as rare and valuable species while category III species (三級保育類) are defined as other conservation-deserving wildlife. The Endemic species or subspecies.

Raptor surveys using radar was conducted to assess movement of birds through the Project area. As such, the flight paths of Grey-faced buzzard, Chinese sparrowhawk, Terns as well as the Black-faced spoonbill was established, whereby the above species have been assessed to be of higher risk of collision due either one or more of the following:

- Flight altitude and activity at night
- IUCN Conservation status of Vulnerable or higher
- Flight path intercepting Project's offshore WTG footprint

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4.2.2 Indo-pacific humpback dolphins

As per section 4.1.2 , it was identified that a subpopulation of Indo-pacific humpback dolphin (*Sousa chinensis taiwanensis*) exist in the Eastern Taiwan Strait (ETS). The ETS Indo-pacific humpback dolphin is listed as an Endangered species (under category I) in Taiwan and the ETS subpopulation is considered Critically Endangered under the IUCN Red List of Threatened Species (Wang and Araujo-Wang, 2018)³.

The ETS Indo-pacific humpback dolphin inhabits a narrow strip of waters of the western coast of Taiwan, between Miaoli County and Jiangjun fishing port of southern Taiwan. The species distribution comprises shallow coastal waters at depths up to 15m, that is between 2 and 2.5km from the coast (Reeves et. Al, 2016).

The range of which the ETS Indo-pacific humpback dolphins are found is situated outside of the Project’s offshore WTG footprint (see Figure 4). Formosa 2 has committed to site the WTGs at a sea water depth of at least 35m, which is outside of the proposed Major Wildlife Habitat of the Indo-pacific humpback dolphin (see Figure 4). The proposed laying of the transmission cable transects the dolphin’s habitat and its impact is considered temporary and localised, which can be readily addressed with appropriate mitigation measures. This has been elaborated on within section 5.

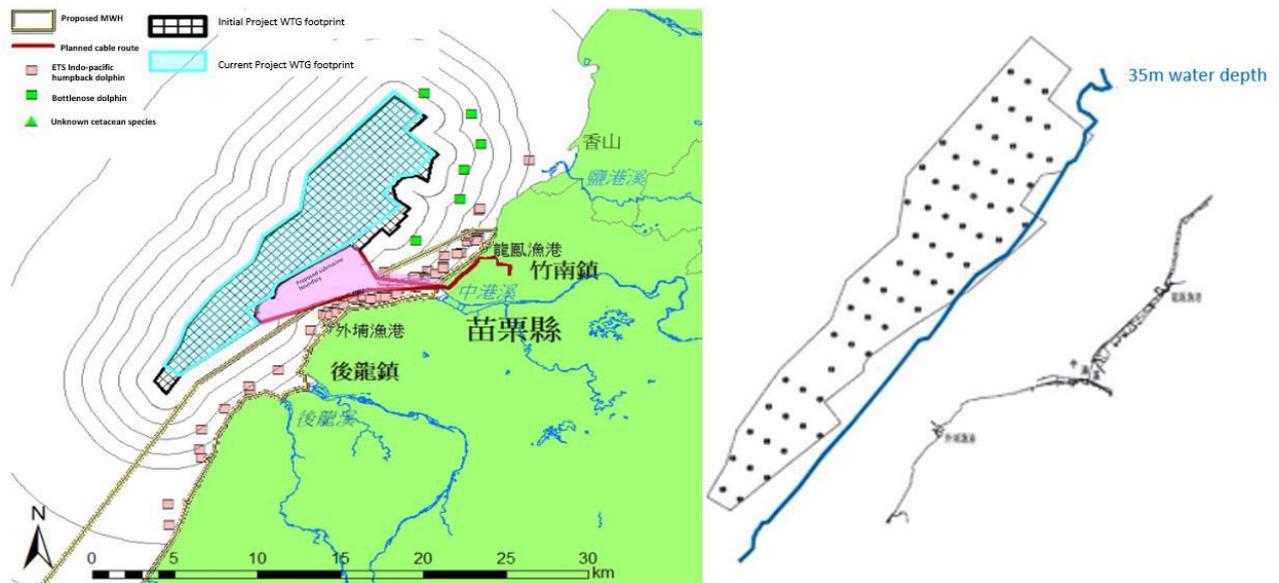


Figure 4-2 : Project Aol, range of Indo-pacific humpback dolphin and WTG siting

³ Wang, J.Y. & Araujo-Wang, C. 2018. *Sousa chinensis ssp. taiwanensis* (amended version of 2017 assessment). *The IUCN Red List of Threatened Species* 2018: e.T133710A122515524. <http://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T133710A122515524.en>. Downloaded on 28 January 2019.

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5.0 ENVIRONMENTAL ASPECTS

5.1 Terrestrial habitats

5.1.1 Plants

IMPACTS

Construction phase

An onshore substation with an estimated footprint of 600m² will be constructed to allow power to be transformed from 66kV to 161kV before being transported to the existing Yingpan substation. Land for the onshore substation was privately owned agricultural land but has been bought over by Formosa 1 to construct the onshore substation. Permanent impact is expected through some clearance of vegetation, although there is low plant diversity in this area (and most of the vegetation had already been cleared during Formosa 1 construction phase).

The planned land cable route has an estimated total length of 4.8km and will utilise publicly owned roads and open cut/cover burial construction methods. Land use surrounding the planned land cable route is generally agricultural land, abandoned land and windbreaks with a considerable proportion of naturalised (exotic) species and cultivated species. . Temporary impact in terms of some vegetation clearance and dust deposition on plants is expected during the construction phase. Formosa 2 is committed to prevent the removal of trees during onshore construction. If tree removal cannot be avoided, transplanting or replanting activities will be conducted.

Operation phase

In the longer term, strong winds in the Project area may pose a challenge for afforestation. Vegetation clearance during the construction phase may have potential to cause fragmentation effects in the longer term.

MITIGATION MEASURES

Table 3 below summarises the mitigation measures proposed in the EIA for implementation throughout the Project lifecycle.

Table 3: Summary of mitigation measures for terrestrial plants

Type of measure	Description of measure
Construction phase	
Project siting	<ul style="list-style-type: none"> The substation is located on area where there is low plant diversity. Measures will be undertaken to minimize removal of vegetation when laying the land cable outside of the current substation by adjusting the cable alignment (if possible). If tree removal cannot be avoided, transplanting or replanting activities will be conducted. If the Project requires the use of protected forest area, Formosa 2 will make the necessary permit applications before commencing any construction. Construction for the laying of land cables will avoid the removal of trees where possible. If trees have to be removed, approval will be obtained from relevant local authority (eg Forestry Bureau) and the affected trees will be transplanted or replanted. Construction for the laying of land cables will utilise

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	existing roads where possible to avoid impacts to protected forests/ coastal windbreaks or any forests.
Method of undertaking work	<ul style="list-style-type: none"> Laying of the terrestrial cables within the Zhunan artificial wetlands will utilise a horizontal directional drilling (HDD) method (水平導向鑽掘工法) to avoid impact of open excavations. Water will be sprayed over the ground will be for dust suppression. Other dust suppression measures include covering exposed excavated land and excavated material on transporting vehicles. The use of chemical fertilisers and pesticides will be avoided during replanting works.

Operation phase

Method of undertaking work	<ul style="list-style-type: none"> Disturbed habitats (i.e. surrounding the land cables and other onshore facilities) will be restored to its original condition following the completion of construction works. Native plant species will be used for replanting. The use of chemical fertilisers and pesticides will be avoided during replanting works. Maintenance vehicles will avoid driving through terrestrial habitats.
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5.1.2 Animals

IMPACTS

Construction phase

No international or national protected species were identified for mammals, amphibians, reptiles, butterflies and dragonflies. In terms of terrestrial birds, two category II and one category III species were identified. These bird species tend to occur along the coastline. Since the existing habitat is considered to be disturbed and altered (i.e. comprising of industrial area, secondary forest, fish ponds, farmlands and residential areas), it is expected that the existing animals are adapted to anthropogenic presence. Therefore, vegetation clearance during the construction phase is expected to have a temporary impact on all terrestrial animals. The movement of construction vehicles may also increase the risk of animal road kills as well as cause disturbance to animals in the vicinity

Operation phase

No significant impacts on terrestrial animal ecology is expected during the operational phase of the Project.

MITIGATION MEASURES

Table 4 below summarises the mitigation measures proposed in the EIA for implementation throughout the Project lifecycle.

Table 4: Summary of mitigation measures terrestrial animals

Type of measure	Description of measure
Construction phase	
Project siting	<ul style="list-style-type: none"> Existing roads will be utilised where possible during construction to minimise disruption to existing habitats.

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Method of undertaking work	<ul style="list-style-type: none"> Construction of the cables in the intertidal zone will utilise horizontal directional drilling (HDD) method (水平導向鑽掘工法) to minimise impact to surrounding animals Vehicle speeds within the construction zone will be limited to prevent road kills Low-noise construction machinery will be used
Training	<ul style="list-style-type: none"> Training will be conducted for construction workers to prevent disturbance to bird habitats and prohibit any capture, harassment and abuse of wildlife.
Regulations	<ul style="list-style-type: none"> The Project will comply with Article No. 16 and 17 of the Wildlife Conservation Act (野生動物保育法) which relates to no hunting and abusing of wildlife

Operation phase

Method of undertaking work	<ul style="list-style-type: none"> Maintenance vehicles should avoid cutting through terrestrial habitats.
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5.2 Marine habitats

5.2.1 Fish (including commercial fishery species)

IMPACTS

Construction phase

Noise from piling works may temporarily deter fish from the habitat and interfere with spawning activities. It has been suggested that August may be the breeding season for commercial tonguefish species (*Cynoglossus quadrilineatus*; 雙線舌鰻). Surveys also found the presence of croakers (Sciaenidae; 石首魚) in the Project area, which are known to generate sounds during their breeding seasons. Therefore, underwater noise generated from the installation of WTGs and submarine cables may interfere with their communication and affect their breeding.

Other potential impacts during the construction phase include habitat loss due to construction of WTG foundations and cable laying as well as decrease in water quality due to higher levels of suspended sediments. These impacts are expected to be temporary and or minor. Measures for mitigating water quality impacts (i.e. sediment suspension) are further elaborated in detail under section 5.2.2.

Operation phase

Noise from operation WTGs may also affect fish communities, particularly in terms of masking effect on bioacoustics. Operational noise from a windfarm is expected to occur within 1-400HZ and range from 80-110 dB. Operational noise for the Project is not expected to have a significant impact on noise as typical background noise in the marine environment tends to occur around 1,000HZ. Other effects from electromagnetic field and collision with WTGs are expected to be insignificant.

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It is anticipated that there may be positive impacts in the long term. The Project windfarm may have a deterrence effect on bottom trawling⁴ due to obstruction of the WTG while there will also be fishing exclusion zones defined around each WTG foundation. (i.e. exact distance of buffer zone to be confirmed through negotiations with government and fishing association).

The offshore WTG foundations may also act as artificial substrates to facilitate habitat creation which may provide food sources and shelter for fish communities as well as attract commercial fishery species known to occur in Miaoli's reefs such as grunts (Haemulidae; 石鱸科), snappers (Lutjanidae; 笛鯛科), knifejaws (Oplegnathidae; 石鯛科), groupers (Serranidae; 鮨科(石斑類)) and rabbitfish (Siganidae; 臭肚魚科).

MITIGATION MEASURES

Table 5 below summarises the mitigation measures proposed in the EIA for implementation throughout the Project lifecycle.

Table 5: Summary of mitigation measures for fish communities

Type of measure	Description of measure
Pre-construction phase	
Project siting	<ul style="list-style-type: none"> Should the finalised WTG or submarine cable positions overlap with any protected reef zones (保護礁禁漁區)⁵, Formosa 2 will inform the Fisheries agency or relevant authorities (礁區公告機關) to obtain their opinion and avoid siting the WTG and submarine cables on any reefs
Regulations	<ul style="list-style-type: none"> The Project will comply with the "Regulations of Permission on Delineation of Course for Laying, Maintaining, or Modifying Submarine Cables or Pipelines on the Continental Shelf of the Republic of China"⁶ (在中華民國大陸礁層鋪設維護變更海底電纜或管道之路線劃定許可辦法) to ensure minimal impact to marine habitat
Construction phase	
Method of undertaking work	<ul style="list-style-type: none"> Silt screens(防止膜/防濁布/防濁幕/防污屏) will be deployed around the intertidal area during the laying of submarine cables to minimise the spread of suspended sediments while preventing the access of marine organisms into the construction boundary. At any one time, only the piling for one WTG foundation will be conducted. Laying of the submarine cable will be conducted in sections; each section will be restored to its original condition before commencement on the construction of the next section. Laying of the submarine cables within the intertidal zone will utilise a horizontal directional drilling

⁴ Although it is noted that according to the Fisheries Act, bottom trawling is prohibited within 3 nautical miles from the coast

⁵ <https://www.fa.gov.tw/cht/ResourceFishRight/content.aspx?id=21&chk=718d9cab-a5d8-44ed-a2dd-123b7597e87a>

⁶ <http://www.rootlaw.com.tw/en/LawContent.aspx?LawID=A040040020003300-1061109>

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(HDD) method (水平導向鑽掘工法) to minimise impact on the intertidal zone.

- Wastewater and excavated material will not be discharged to the intertidal zone. Wastewater is to be collected on-site and disposed by a licensed third-party water waste disposal company. Proper storage of wastewater is to be implemented as per the waste management plan.
- If construction works coincides with the breeding season of fishery species, Formosa 2 will adopt a soft start (ramp-up) method for piling works.
- Wastewater and excavated material will not be discharged to the intertidal zone. Wastewater is to be collected on-site and disposed by a licensed third-party water waste disposal company. Proper storage of wastewater is to be implemented as per the waste management plan

Operation phase

Monitoring

- Monitoring of water quality will be conducted

5.2.2 Cetaceans

IMPACTS

Construction phase

Underwater noise during the Project's construction phase has been considered the most significant noise source derived from percussive piling on turbine foundations. Potential impact from pile driving to cetaceans during construction may cause the following changes:

- Temporary/permanent hearing loss caused by pile driving
 - Cetaceans survival ability may be compromised
- Behavioural change/reactions
 - Temporary loss of feeding/breeding habitats resulting in habitat displacement
- Masking effects of pile driving noise
 - In the event of the pile driving noise from the construction of the offshore WTGs exceeds ambient noise in terms of audibility and coincides with the frequency band of the cetaceans, communication between the cetaceans may be affected.

Impulsive-type noise from piling activities is the main source of underwater noise and can generally reach 200 dB re 1 μ Pa (RMS) at 100m from the noise source. In accordance with German standards (StUK4) (2013)⁷, underwater noise should be limited to SEL 160dB at 750m from the noise source to prevent temporary hearing loss or other more

⁷ Bundesamt für Seeschifffahrt und Hydrographie (BSH), 2013. Investigation of the Impacts of Offshore Wind Turbines on the Marine Environment (StUK4). <http://www.oddzialywaniawiatrakow.pl/upload/File/7003eng.pdf>

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adverse damage to cetaceans. With the adherence to StUK4 standards and mitigation measures in place, no temporary hearing loss in cetaceans has been anticipated.

The utilisation of construction vessels may contribute to underwater noise resulting in behavioural change in the cetaceans. However, with mitigation measure in place to limit vessel speeds, no temporary hearing loss in cetaceans has been anticipated.

In addition, the laying of submarine cables can increase turbidity levels in the water column and adversely affect water quality and fish communities, thereby indirectly impacting cetaceans. Measures are in place to mitigate high turbidity levels caused by cable laying, including the following:

- Silt screens will be deployed around the intertidal area during the laying of submarine cables to minimise the spread of suspended sediments while also preventing the access of marine organisms into the construction boundary.
- Laying of the submarine cable will be conducted in sections; each section will be restored to its original condition before commencement on the construction of the next section.
- Laying of the submarine cables within the intertidal zone will utilise a horizontal directional drilling (HDD) method to minimise impact on the intertidal zone. Monitoring of water quality will be conducted throughout the construction phase.

Operation phase

During operations, the rotation of wings, gears and generator produces noise that vibrates down the turbine tower and radiates into the surrounding waters. The moving gears within each gearbox of the WTGs have been known as the primary source of noise.

Underwater sound modelling showed that operational noise from the windfarm will reach 40dB at 200m from the Project area. There is little known on the cumulative impact of underwater noise from multiple WTGs on cetaceans. However, it has been reported⁸ that it is impossible to raise combined noise levels above the hearing thresholds of cetaceans as they will never be able to hear more than one turbine and only when it is considerably closer to the turbine than 100m (whereby the minimum distance between two WTGs is likely to be at least 770m, dependent on configuration). Therefore, no temporary and permanent hearing loss in cetaceans has been anticipated.

Maintenance vessels may also contribute to underwater noise. No temporary hearing loss in cetaceans is expected if mitigation measures are in place to limit vessel speeds.

Offshore wind turbines are known to provide marine organisms with a new hard substrate for colonization, thus acting as an artificial reef. The rough surface area of the seabed protection blocks (scour protection) provides attachment areas for the colonisation of organisms such as barnacles, sea sponges and corals that provide hiding spaces for fish

⁸ Tougaard, J. and Mikaelson, M. (2017). Taiwanese white dolphins and offshore wind farms. Report by Aarhus University and NIRAS.

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or a nursery for fish fry. New habitats for fish and other marine organisms are therefore established within the artificial reefs. This is expected to increase the production of cetacean's prey food (fishes) which contributes as a positive impact on cetacean.

MITIGATION MEASURES

Table 6 below summarises the mitigation measures proposed in the EIA for implementation throughout the Project lifecycle.

Table 6: Summary of mitigation measures for cetaceans

Type of measure	Description of measure
Pre-construction phase	
Monitoring	<ul style="list-style-type: none"> Prior to the construction of any WTG, two underwater acoustic monitoring stations (capable of monitoring cetacean acoustics) will be set up within the Project's offshore WTG footprint. Acoustic monitoring will be conducted for one month each season over a year. Visual cetacean surveys conducted on boats will be conducted 30 times per year for a period of two years prior to construction. The surveys will be focused on the ETS Indo-pacific humpback dolphins to gather data and assess population trends
Construction phase	
Project siting	<ul style="list-style-type: none"> The Project's offshore footprint (for WTGs) have been located at least 1km outside the proposed MWH of the ETS Indo-pacific humpback dolphins (華白海豚野生動物重要棲息環境預告公告範圍) to avoid direct impacts. The WTGs will be located 3.8-7km from the coast and at depths of 35-55m, which is historically not known for the occurrence of ETS Indo-pacific humpback dolphins. The design of the underwater cable will employ the shortest distance from the shoreline
Monitoring of cetacean presence during drive piling	<ul style="list-style-type: none"> Establishment of a warning zone of 750m and pre-warning zone of 750-1500m radius from pile driving location. Acoustic and visual cetacean monitoring will be conducted during piling to monitor cetacean activity. A stop work notice will be implemented when cetaceans enter the warning zone. Details to acoustic and visual monitoring for cetacean presence during drive piling are as follows: <ul style="list-style-type: none"> Acoustic monitoring: Four underwater acoustic monitoring devices (see appendix B for monitoring locations) will be set up within 750m of the piling position for continuous monitoring of cetacean (acoustic) activity and to monitor sound exposure level (SEL) at the 750m station to ensure sound levels do not exceed 160 dB [(dB) re. 1µPa2s]. One monitoring station will be set up at the boundary of the proposed MWH of the Indo-pacific humpback dolphins to monitor cetacean activity as well as sound exposure levels. Visual cetacean monitoring with assistance of trained marine mammal



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	<p>observers (MMOs): Four vessels will be deployed to circumnavigate the warning zone of 750m radius from the piling location (see appendix B for monitoring locations). Each vessel will have at least two trained marine mammal observers (or at least three if the monitoring period is expected to exceed six hours).</p> <ul style="list-style-type: none"> ○ No night time piling is expected to be undertaken currently. However, in the event that piling is needed to be conducted at night, thermal imagers will be deployed from two vessels to monitor a 750m radius from the piling location. <ul style="list-style-type: none"> • In the event of cetacean presence within the warning zone, piling works will cease and only recommence after 30 minutes of observing no cetacean activity within the warning zone (警戒區).
<p>Monitoring</p>	<ul style="list-style-type: none"> • Visual cetacean surveys conducted on boats will be conducted 30 times every year during the construction phase (application will be made by Formosa 2 should there be any change required in the survey schedule due to WTG installation works)
<p>Construction methodology</p>	<ul style="list-style-type: none"> • 'Jacket piling (套筒式基礎型式) will be used to minimise underwater noise • Soft start (ramp-up) method over a duration of at least 30 minutes will be used • No acoustic warning systems will be used to deter cetaceans during piling works • Industry best practice underwater noise prevention measures will be used to reduce underwater noise propagation. Such measures may include bubble curtains • Pile driving works will be conducted during day; no piling will commence two hours prior to sunset and sunrise unless required and with safety considerations in place • Vessel speeds will be limited to a maximum of six knots within 1.5km from the proposed MWH of the ETS Indo-pacific humpback dolphins • Marine crews are to be given tool box talk about ETS Indo-pacific humpback dolphins. • In the event of atypical Indo-pacific humpback dolphin behavior, works are suspended where necessary • All notification obligations in the permits are followed • The entire piling process will be recorded from construction vessels. Records will be kept for at least five years • Formosa 2 will coordinate with surrounding wind farms to mitigate cumulative impacts of underwater noise from pile driving. Coordination of pile driving with other surrounding windfarm projects will be conducted to ensure that piling of only one WTG is conducted at any point in time. Coordination of work schedules will be conducted with Zhufeng windfarm (竹風電力離岸風力發電計畫風場) prior to construction • Wastewater and excavated material will not be discharged to the intertidal zone. Wastewater is to be collected on-site and disposed by a licensed third-party water waste disposal company. Proper storage of wastewater is to be implemented as per



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	<p>the waste management plan</p> <ul style="list-style-type: none"> Mitigation measures are in place to prevent high turbidity levels caused by cable laying, including the following: <ul style="list-style-type: none"> Silt screens will be deployed around the intertidal area during the laying of submarine cables to minimise the spread of suspended sediments while also preventing the access of marine organisms into the construction boundary. Laying of the submarine cable will be conducted in sections; each section will be restored to its original condition before commencement on the construction of the next section. Laying of the submarine cables within the intertidal zone will utilise a horizontal directional drilling (HDD) method to minimise impact on the intertidal zone. Monitoring of water quality will be conducted throughout the construction phase.
Regulations	<ul style="list-style-type: none"> The Project EIA has committed to ensure that sound exposure level (SEL) 750m from a WTG foundation will not exceed 160 (dB)re.1µPa²s during piling and the assessment of underwater noise will comply to StUK4 guidelines⁹

Operation phase	
Monitoring	<ul style="list-style-type: none"> Visual surveys will be conducted 30 times every year during the operation phase (not limited to April-September, application will be made by Formosa 2 should there be any change required in the monitoring schedule). Acoustic and visual surveys will be conducted throughout operation to identify changes in species behaviour and occurrence to ensure no adverse effects on the cetaceans were caused by the Project

5.2.3 Birds (including coastal and sea birds

IMPACTS

Construction phase

No significant impacts on birds is expected during the construction phase of the Project.

Operation phase

⁹ Bundesamt für Seeschifffahrt und Hydrographie (BSH), 2013. Investigation of the Impacts of Offshore Wind Turbines on the Marine Environment (StUK4). <http://www.oddzialywaniawiatrakow.pl/upload/File/7003eng.pdf>

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90% of the observed bird flight altitudes were below the lowest point of the rotating wind turbine (ie <25m).

Bird collision modelling have suggested that geese (Anserinae; 雁鴨類) and herons (Ardeidae; 鷺科鳥) have been identified as the most vulnerable species to blade collisions, due to overlaps of average flight altitudes and the height of rotating wind turbines. Based on the worst case scenario (ie 6.0MW WTG, 98% avoidance rate of birds), the number of birds predicted to collide with rotating wind turbines have been estimated at 95 birds/year. The months of September and October have been predicted to have the highest bird collisions rates as compared to the rest of the year.

MITIGATION MEASURES

Table 7 below summarises the mitigation measures proposed in the EIA for implementation throughout the Project lifecycle.

Table 7: Summary of mitigation measures for birds at sea

Type of measure	Description of measure
Pre-construction phase	
Monitoring	<ul style="list-style-type: none"> Bird surveys were conducted in 2017 autumn and 2018 spring. After the completion of bird surveys in 2017 autumn and 2018 spring, Formosa 2 will submit an environmental assessment report to the EIA committee
Construction phase	
Construction methodology	<ul style="list-style-type: none"> Cable laying within the intertidal area will avoid bird migratory peak season of November to March. Laying of the submarine cables within the intertidal zone will utilise a HDD) method to minimise impact on the intertidal zone. Wastewater and excavated material will not be discharged to the intertidal zone. Wastewater is to be collected on-site and disposed by a licensed third-party water waste disposal company. Proper storage of wastewater is to be implemented as per the waste management plan.
Operation phase	
Project siting	<ul style="list-style-type: none"> The WTGS will have a minimum north-south distance of 1,230m and east-west distance of 770m between each WTG. A northwest-southeast “flight corridor” of at least 2km within the Project’s offshore WTG footprint have been set aside for migratory birds to reduce collision risk of birds with the operating WTGs. The Project’s offshore WTG footprint has been located at minimum distance of 3km from the coastline to reduce collision risk of shorebirds to operating WTGs blades. The southern boundary of the Project’s footprint will be reduced to minimise any potential impacts birds flying into and out of Xihu Important Wetland.
Regulations	<ul style="list-style-type: none"> Narrow-banded spotlights will be installed on the WTGs in accordance to the national regulations regarding warning signages and lightings on aviation obstructions (航空障礙物標誌與障礙燈設置標準) to reduce likelihood of bird collision at night

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Monitoring

- Surveillance device, thermal imaging device and acoustic microphone will be mounted on four WTGs to monitor bird activities.
- One WTG will be equipped with a radar device with 24 hour continuous monitoring of bird activities.

5.3 Summary of key impacts and mitigations

A brief summary of the Project's construction and operation impacts is provided Table 8 below, a more detailed description of these impacts has been provided in section 5. All mitigation measures will be carried out by contractors overseen by Formosa 2 HSE manager

Table 8: Project key impacts and mitigations

Biodiversity aspect	Key impacts	Mitigations
Onshore project area		
Construction		
Plants and habitat	Temporary impacts to habitat destruction and plant species	<ul style="list-style-type: none"> • Utilisation of HDD method when laying of land cables within the Zhunan artificial wetlands
		<ul style="list-style-type: none"> • Route of cable laying will utilise existing roads where possible to minimise direct impacts to existing habitats and avoid removing any trees where possible. • Native plant species will be replanted where removed during construction. • Water will be used to suppress dust generated on exposed excavated land and excavated materials on transporting vehicles
Terrestrial animals	Risk of wildlife collision with construction vehicles	<ul style="list-style-type: none"> • Vehicle speeds within the construction zone will be limited to prevent road kills • Training will be conducted for Project staff and contractors on habitats and enforcement of no poaching of wildlife.
	Temporary disturbance and alteration of wildlife habitat	<ul style="list-style-type: none"> • Utilisation of HDD method when laying of land cables within the Zhunan artificial wetlands • Low-noise construction machinery will be used to reduce disturbances to wildlife
Operations	No impacts to terrestrial biodiversity anticipated	-
Offshore project area		
Construction		
Marine organisms (fish, corals, benthic organisms)	Noise from pile driving may temporarily deter fish from the habitat and interfere with spawning activities	<ul style="list-style-type: none"> • The piling of one WTG will be conducted at any one time. • If construction works coincides with the breeding season of fishery species, Formosa 2 will adopt a soft start (ramp-up) method for piling works • 'Jacket' piling (套筒式基礎型式) will be used to minimise underwater noise.
	Habitat loss and decrease in water quality	<ul style="list-style-type: none"> • Avoidance of offshore WTGs and submarine cables on any reefs. • Silt screens will be deployed around the intertidal area during the laying of submarine cables to

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Cetaceans (ETS Indo-pacific humpback dolphins)

Offshore piling has the potential to affect cetaceans by excessive underwater noise generated by drive piling. The adverse impacts on the cetaceans are:

- Temporary/permanent hearing loss caused by pile driving
- Behavioural change/reactions
- Masking effects of pile driving noise

minimise the spread of suspended sediments while preventing the access of marine organisms into the construction boundary.

- Sequential laying of submarine cables will be conducted in sections.
- Utilisation of HDD method when laying of submarine cables to minimise impact to intertidal habitat.
- Coordination of offshore construction activities will be coordinated with surrounding windfarms to ensure pile driving of one WTG will be conducted at any one time.
- Wastewater and excavated material will not be discharged to the intertidal zone. Wastewater is to be collected on-site and disposed by a licensed third-party water waste disposal company.
- Acoustic and visual monitoring will be conducted pre-construction and throughout the construction phase
- The Project's offshore WTG footprint have been located at least 1km outside the proposed MWH of the ETS Indo-pacific humpback dolphins to avoid direct impacts.
- The design of the submarine cable will employ the shortest distance from the shoreline to minimise disturbance to the BTS Indo-pacific humpback dolphin habitat.
- A warning zone of 750m and pre-warning zone of 750-1500m radius from pile driving location will be established.
- Continuous acoustic and visual cetacean monitoring will be conducted during piling to monitor cetacean activity as well as monitor sound exposure levels to ensure sound levels do not exceed 160 dB [(dB) re. 1µPa2s]. A stop work notice will be implemented when cetaceans enter the warning zone (ie 750m radius from piling location). Pile driving works will only recommence 30 minutes after ensuring no cetacean activity within the warning zone
- Pile driving works will be conducted during day; no piling will commence two hours prior to sunset and sunrise unless required and with safety considerations in place.
- Where piling needs to be conducted at night, thermal imagers will be deployed from two vessels to monitor a 750m radius from the piling location
- "Jacket" piling will be used to minimise underwater noise.
- Soft start (ramp-up) method over a duration of at least 30 minutes will used.
- Deployment of bubble curtains will be used to minimise underwater noise during pile driving works
- Formosa 2 will coordinate with surrounding wind farms to mitigate cumulative impacts of underwater noise from pile driving to ensure only one WTG to be installed at any one time
- In addition to mitigation measures to be implemented within the Project area, measures have also been proposed around the proposed MWH of the ETS Indo-pacific humpback dolphins to monitor Project impact (ie transmission of underwater noise) at the sensitive receptor (ie Indo-pacific humpback dolphin). These include the



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		<p>following:</p> <ul style="list-style-type: none"> ○ One monitoring station will be set up at the boundary of the proposed MWH of the Indo-pacific humpback dolphins during piling works to monitor cetacean activity as well as sound exposure levels ○ Vessel speeds will be limited to a maximum of 6 knots within 1.5km from the proposed MWH of the ETS Indo-pacific humpback dolphins
Birds (coastal and sea)	No impacts anticipated	<ul style="list-style-type: none"> • Cable laying within intertidal area will avoid peak bird migratory season • Utilisation of HDD method when laying of submarine cables to minimise impact to intertidal habitat. • Proper waste disposal of wastewater and excavated material will be undertaken as per the waste management plan • Biodiversity monitoring will be conducted to monitor behaviour changes (refer to section 6 for details)

Operations

Marine organisms (fish, corals, benthic organisms)	No significant negative impact. However, a positive impact has been anticipated due to the creation of artificial reefs and reduction of commercial fishing activities	<ul style="list-style-type: none"> • Biodiversity monitoring (refer to section 6 for details)
Cetaceans (ETS Indo-pacific humpback dolphins)	No significant negative impact anticipated. However, positive impact has been anticipated due to creation of artificial reef which may increase cetacean food source	<ul style="list-style-type: none"> • Biodiversity monitoring (refer to section 6 for details)
Birds (coastal and sea)	Collision with WTG blades	<ul style="list-style-type: none"> • WTGs placement will be designed to ensure sufficient distance between to allow for birds flying through Project's offshore WTG footprint • "A flight corridor" of at least 2km within the Project's offshore WTG footprint will be set aside for birds flying into Xihu Important Wetland. • Narrow-banded spotlights will be installed on all WTGs in accordance to national regulations and this serves as a visual indication of an obstruction for birds flying at night. • Surveillance devices (ie thermal imaging, acoustic microphone, radar) will be installed on WTGs to monitor bird activities. (refer to section 6 for details)

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6.0 MONITORING AND REPORTING

As per WBG EHS guidelines for wind energy, where multiple wind farm facilities are located in the same geographical area and near areas of high biodiversity value, a coordinated approach between the wind farms for surveys and monitoring has been recommended (IFC WBG, 2015).

6.1 Construction phase monitoring

Construction phase monitoring will consist of a minimum of two years prior to construction commencing, followed by the construction period.

Monitoring plans and parameters can be referred to in Table 9 Project impacts on biodiversity will be assess through on-going monitoring results to ensure the mitigation strategy is appropriate to the magnitude of impacts. The methodology has been deemed scientifically robust and will use the Before-After-Control-Impact (BACI) approach.

Table 9: Construction phase monitoring

Monitoring Parameter	Monitoring locations	Frequency	Responsibility	Documentation/ Reporting
Terrestrial flora and fauna, including invasive species (as per EIA requirements)	Terrestrial electrical distribution system (substation, land cables and their surroundings)	Quarterly (ie once for every season) during construction	<ul style="list-style-type: none"> Formosa 2 (overarching responsibility) EIA consultant or their sub-contractor(s) (implementation) 	Quarterly monitoring report
Intertidal ecology (as per EIA requirements)				Quarterly monitoring report
Marine ecology (as per EIA requirements):	At least 10 monitoring stations around Project's offshore WTG footprint	Quarterly (i.e. once for every season) during construction	<ul style="list-style-type: none"> Formosa 2 (overarching responsibility) EIA consultant or their sub-contractor(s) (implementation) 	Quarterly monitoring report
<ul style="list-style-type: none"> Phytoplankton Zooplankton Fish larvae and eggs Macrobenthos Fish 	Underwater photography (location as per prescribed in the EIA)	Monthly for two years before construction and after each completion of pile driving during construction		
Cetaceans	<p>Visual monitoring:</p> <ul style="list-style-type: none"> At the Project vicinity (as prescribed in the EIA) <p>Acoustic monitoring:</p> <ul style="list-style-type: none"> Deploying four underwater microphones at 750m radius around pile driving location Deployment of 5 underwater microphones (at locations prescribed in the EIA) 	<p>30 visual survey trips a year</p> <p>With each installation of a WTG</p> <p>Quarterly during no pile driving months</p>	<ul style="list-style-type: none"> Formosa 2 (overarching responsibility) EIA consultant or their sub-contractor(s) (implementation) 	<p>Quarterly monitoring report</p> <p>Monthly monitoring report</p>

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Monitoring Parameter	Monitoring locations	Frequency	Responsibility	Documentation/ Reporting
Birds Ecology <ul style="list-style-type: none"> • Terrestrial birds • Coastal birds • Intertidal birds • Seabirds 	<ul style="list-style-type: none"> • Xihu Important Wetland • Along Houlong coastal area • Vicinity of Project's offshore WTG footprint 	Monthly throughout construction with the exception of additional monthly seabird surveys will be conducted monthly two years before construction	<ul style="list-style-type: none"> • Formosa 2 (overarching responsibility) • EIA consultant or their sub-contractor(s) (implementation) 	Quarterly monitoring report
	<ul style="list-style-type: none"> • Radar survey to monitor night bird activity at Project's offshore WTG footprint area (placement of radar system along Zhunan Houlong coastal area) 	Monthly (two years before construction and throughout construction)		

6.2 Operation phase monitoring

Operation phase monitoring will be undertaken following the same survey methods used for the construction phase monitoring to allow for direct comparison of the data and to identify any changes in species distribution and abundance. The operation phase monitoring will be undertaken and implemented for the entire lifespan of the Project (ie envisaged for over a minimum period of twenty years).

Operation phase monitoring is to be conducted during operations as elaborated in the environmental monitoring plan within the local EIA. Monitoring Target species and frequency of each type of monitoring is reflected in Table 10. The overall coordination and reporting will be undertaken by an external ecological consultant and trained MMO for marine mammals

Table 10: Operation phase monitoring

Monitoring Parameter	Monitoring locations	Frequency	Responsibility	Documentation/ Reporting
Intertidal ecology	Xihu Important Wetland	Quarterly during operations	<ul style="list-style-type: none"> • Formosa 2 (overarching responsibility) • EIA consultant or their sub-contractor(s) (implementation) 	Quarterly monitoring report
Marine ecology: <ul style="list-style-type: none"> • Phytoplankton • Zooplankton • Fish larvae and eggs • Macrobenthos • Fish 	At least 10 monitoring stations around Project's offshore WTG footprint <hr/> Underwater photography (location as per prescribed in the EIA)	Quarterly	<ul style="list-style-type: none"> • Formosa 2 (overarching responsibility) • EIA consultant or their sub-contractor(s) (implementation) 	Quarterly monitoring report
Cetaceans	Visual monitoring: At the Project vicinity (as prescribed in the EIA)	30 visual survey trips a year	<ul style="list-style-type: none"> • Formosa 2 (overarching responsibility) • EIA consultant 	Quarterly monitoring report

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Monitoring Parameter	Monitoring locations	Frequency	Responsibility	Documentation/ Reporting
	Acoustic monitoring: Deployment of 5 underwater microphones	Quarterly	or their sub-contractor(s) (implementation)	Quarterly monitoring report
Birds Ecology	<ul style="list-style-type: none"> • Xihu Important Wetland • Along Houlong coastal area • Vicinity of offshore Project's offshore WTG 	Monthly	Formosa 2 (overarching responsibility) EIA consultant or their sub-contractor(s) (implementation)	Quarterly monitoring report
<ul style="list-style-type: none"> • Terrestrial birds • Coastal birds • Intertidal birds • Seabirds 	<ul style="list-style-type: none"> • Radar survey to monitor bird migratory flightpaths 	Monthly (May to August)		Quarterly monitoring report
	<ul style="list-style-type: none"> • Bird surveillance system (thermal imaging, acoustic microphone, radar) installed on WTGs to monitor bird activities 	Continuous monitoring		Quarterly monitoring report

6.3 Reporting and evaluation

The reporting requirements during construction of the Project are detailed in the Formosa II ESMS.

In summary, the Contractors will have internal reporting responsibilities, which will include reporting findings from the daily site inspections; using the inspection checklist to report weekly site inspections; and prepare monthly HSE reports to the Formosa 2.

Formosa 2 is expected to be fully responsible for the following reporting HSE requirements to the lenders (quarterly during construction and semi-annual during operation): non-compliance incidents, environmental monitoring and social complaints, corrective actions, results of environmental monitoring and overall environmental and social performance. If evidence suggests a decline in the ecological conditions relating to the construction and operational activities of the Project, then appropriate intervention and follow up remedial measures will be defined and implemented accordingly.

Monitoring results are also required to be submitted to the Zhunan Township Office and on the Project's official website on a quarterly basis. The environmental protection monitoring committee (as required by Article 17 of the EIA Act) will share information with the public on the activities and progress of the Project.

Following completion of each of the biodiversity monitoring surveys, the results will be evaluated by the external experienced ecological consultant in conjunction with Formosa 2. Any Critically Endangered, Endangered, protected and/or endemic species not previously identified in the EIA will be assessed under IFC PS6 criteria and the outcome and any additional mitigation measures will be incorporated into the projects management plans. The mitigation measures included in the BMP will also be reviewed against the



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results of monitoring surveys and relevant changes to the mitigations will be made where deemed necessary.

As per the WBG EHS Guidelines for Wind Energy, multiple wind farm facilities that are located in the same geographical area and near areas of high biodiversity value, are encouraged to implement a coordinated approach to surveys and monitoring. Due to close proximity of the Project to Formosa 1 Offshore Wind Farm and Zhufeng wind farm, biodiversity monitoring reports surrounding windfarms can be used to supplement the results from the Project to better inform cumulative impacts on biodiversity.

7.0 STAKEHOLDER ENGAGEMENT AND SOCIAL IMPACTS

7.1 Overview

The project has developed a Stakeholder Engagement Plan (“SEP”) which sets out how the project has identified stakeholders relevant to the project and how information disclosure, consultation and grievances with the main external stakeholders and the general public shall be managed during the planning and the execution of the Formosa 2 Offshore Wind Farm (“the Project”).

The SEP provides details on how the Project has met the consultation requirements of the national EIA process and to reflect on how the Project will comply with the Applicable Standards in the future. This SEP has been developed as part of the Project environmental and social management system (ESMS).

It provides details of how the project will ensure a consultation and participation strategy which:

- Identifies stakeholder groups that could be affected or may have an interest in this Project
- Ensures that such stakeholders are appropriately engaged through a process of information disclosure and meaningful consultation on environmental, social and other issues that could potentially affect them
- Maintain a constructive relationship with stakeholders on an on-going basis through meaningful engagement during project implementation
- Establishes a grievance mechanism to allow communities and other stakeholders to register complaints, queries or comments that are addressed in a timely manner by the Project

It should be noted that this SEP is a live document and will be updated from time to time to include further detail at relevant intervals.

7.2 Social Impacts

Following the stakeholder identification phase the specific issues relating to their areas of interest or the potential for impact were discussed and the stakeholders most likely to be impacted were identified.

Further details on these stakeholders are provided in the below:

7.2.1 Affected communities

The main affected communities identified to be impacted by the Project are within Miaoli County (苗栗縣), where the nearest coastline is located, covering the following townships:

- Zhunan Township (竹南鎮), where the land cables and onshore transformer substation are proposed
- Houlong Township (後龍鎮), which is immediately south of Zhunan

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The project will continue to engage with the township and village representatives and local residents in order to provide information about the project, identify potential concerns and introduce any additional mitigation measures required to address that.

7.2.2 Nanlong Fishermen Association

The offshore Project area is partially within the exclusive fishing grounds for the Nanlong Fishermen Association (南龍區漁會) (NFA) (which is made up of fishermen from both Zhunan and Houlong townships). In addition to the regulatory requirement to ensure that agreements are in place with the fishermen association in advance of the works, the Project team recognises that these fishermen will be the main affected group throughout the Project construction and operational life. It is important to the project to establish and maintain a positive relationship with the fisherman and the fisheries association and to work with them to address impacts associated with the development as far as possible.

The project already has an established relationship with the fishermen and the NFA through the work that has been undertaken for Formosa 1 Offshore Wind Farm and have been engaging regularly with them for the development of the current Project. This work will continue as the project moves into construction and operation.

A Livelihood Restoration Plan has been developed setting out the details of the potential economic impact to the fishery and to fishermen and the projects plans for how this will be addressed. The EIA requires annual reviews of the economics of the fishery which will assist in ensuring that any residual impact not addressed by the compensation provided to fishermen can be identified. Ongoing communication will also supplement this and where this isn't sufficient fisherman have the opportunity to raise a concern via the grievance mechanism.

The project is supported in their engagement activities by a fisheries consultant (台灣漁業及海洋技術社) who assisted to determine the appropriate fishery compensation¹⁰ for the Project. Engagement between Formosa 2 and the Formosa 1 Project Company, ensure any cumulative economic impact are dealt with appropriately.

7.2.3 Environment Protection Supervision Committee

An Environment Protection Supervision Committee (環境保護監督委員會) is to be set up to monitor the implementation of the prescribed measures/conditions within the EIA and EIA review findings. The conditions stipulate that the committee shall:

- Be made up of no less than 15 members
- Have at least one third of the committee be made up of technical experts or related academia

¹⁰ The fisheries association agreement is required to secure the fisheries agency approval in order to obtain the construction permit



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- Have at least one third of the committee be made up of members from local groups (e.g. NGOs, residents; or fishermen)
- Publicly disclose an appropriate meeting time and place prior to the committee meetings, so as to invite the general public to attend and/or participate

In the event where monitoring results exceed the regulatory standards, further investigations will be performed to establish the cause of the exceedance. If the cause of the exceedance is deemed to be due to the construction of the Project, the committee shall immediately request Formosa 2 to make improvements to existing measures and plans. Improvements results will be verified by the committee in the next monitoring period. Furthermore, during the annual monitoring meeting, the Formosa 2 shall report annual monitoring results and the handling of abnormal events to the committee.



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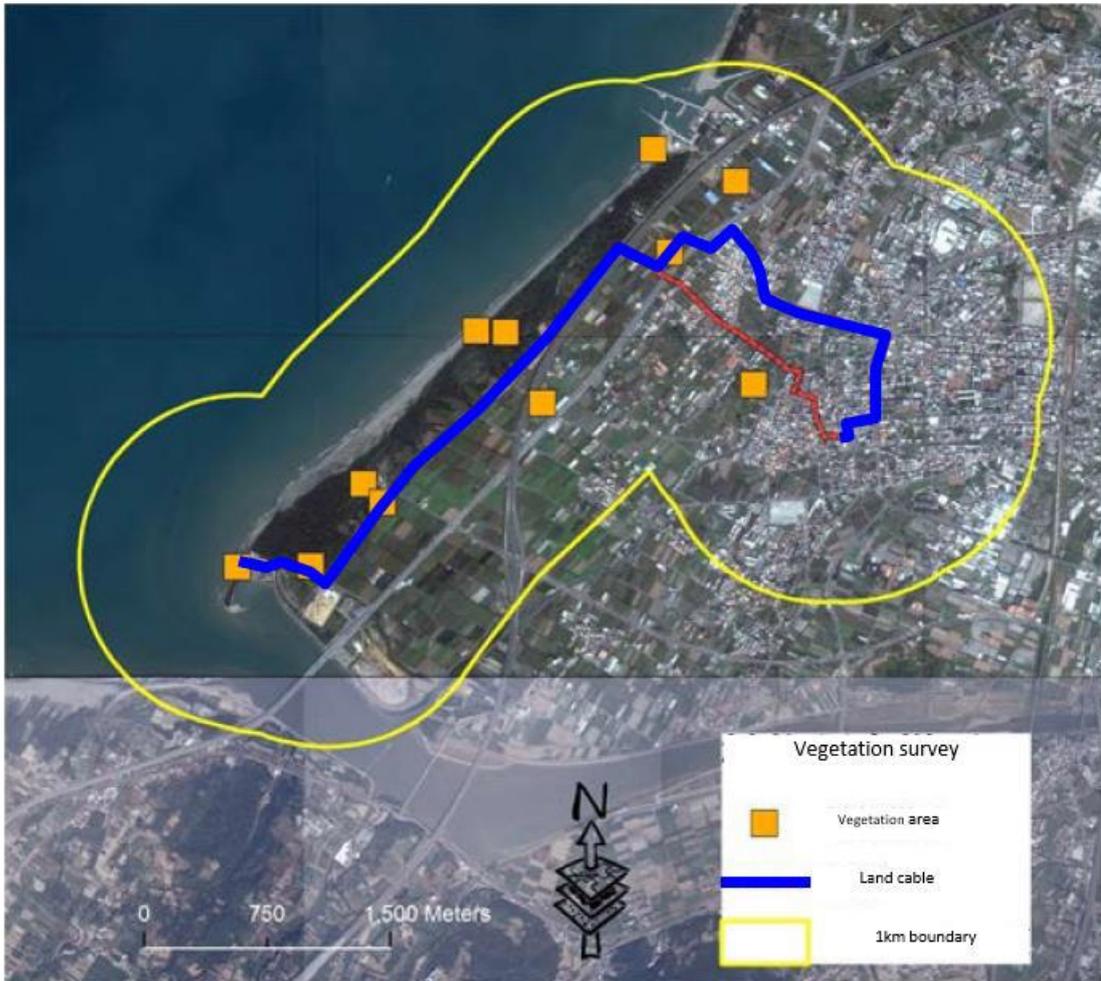
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APPENDICES

- A Survey routes for baseline surveys conducted
- B Cetacean and sound level monitoring stations and warning zones

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A SURVEY ROUTES FOR BASELINE SURVEYS CONDUCTED



Vegetation transect survey

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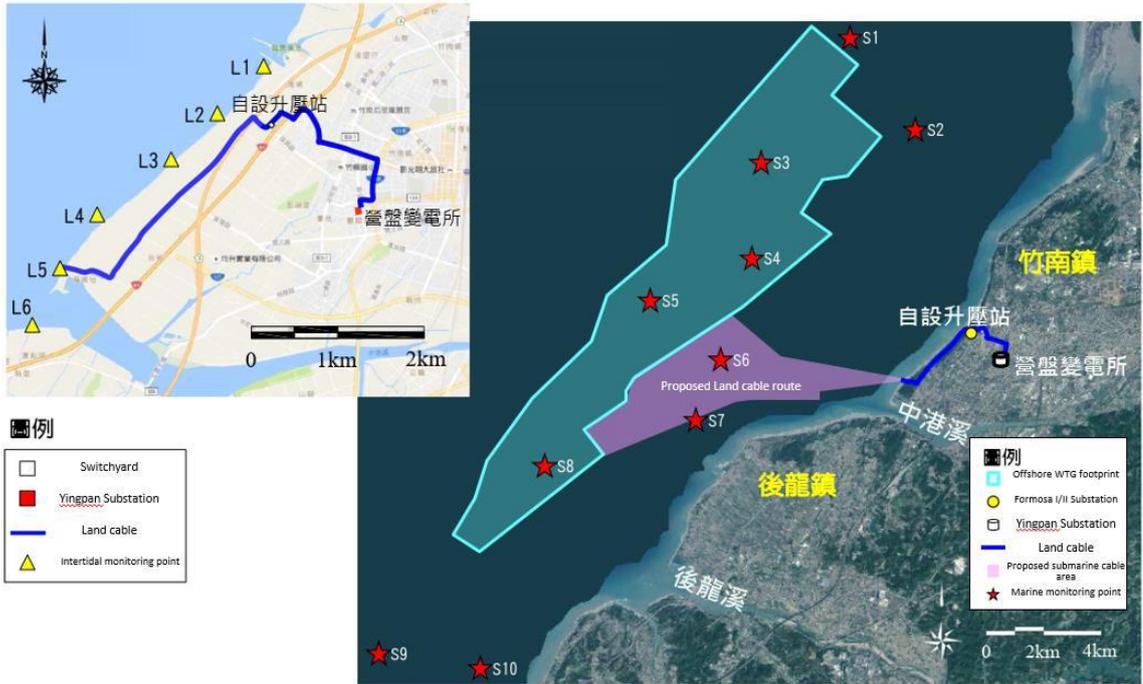
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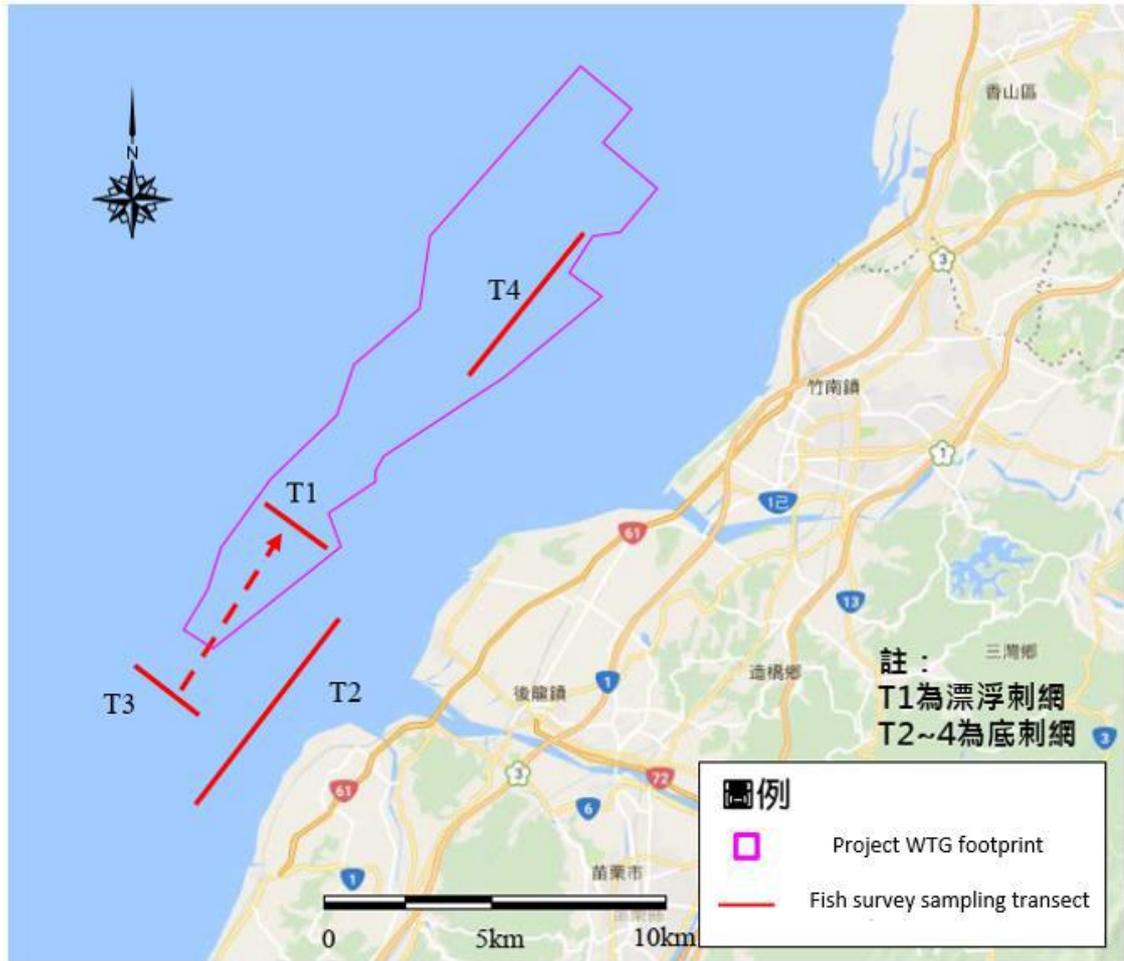
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Marine survey

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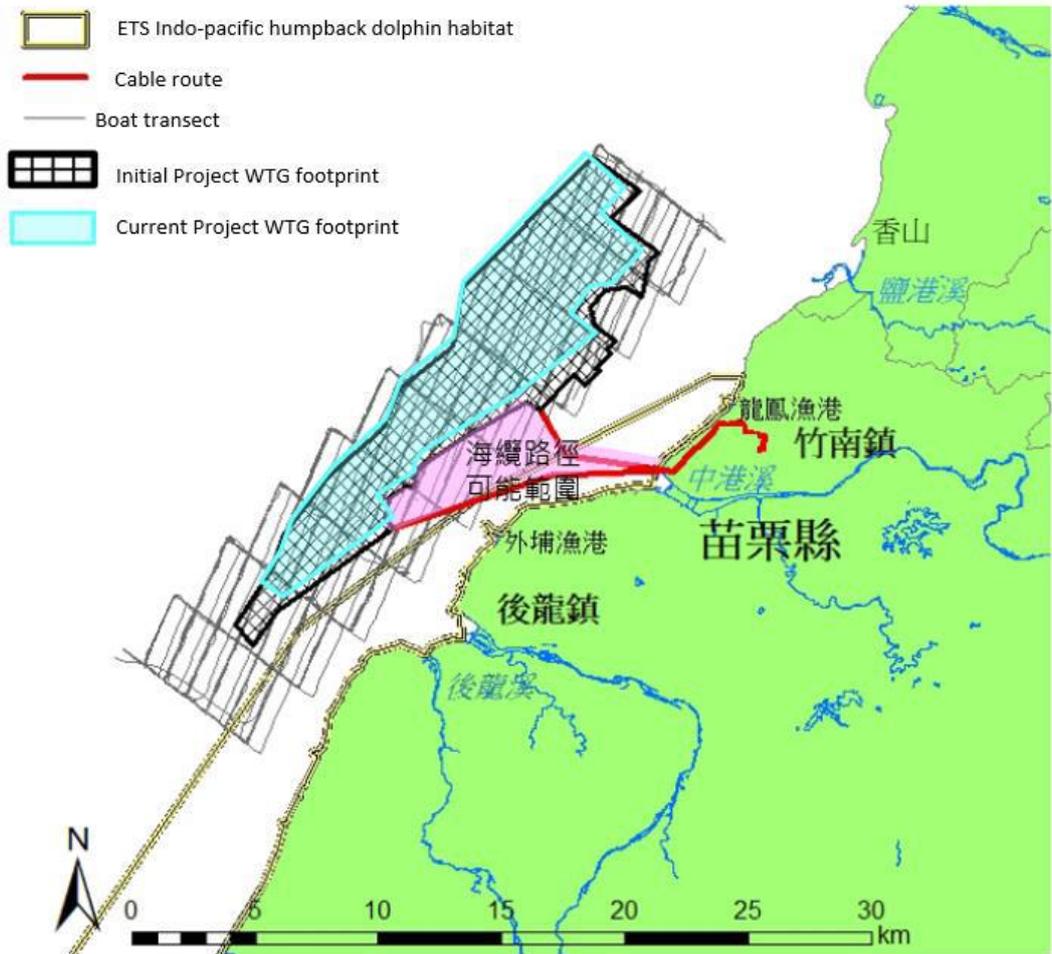
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Fish survey sampling points

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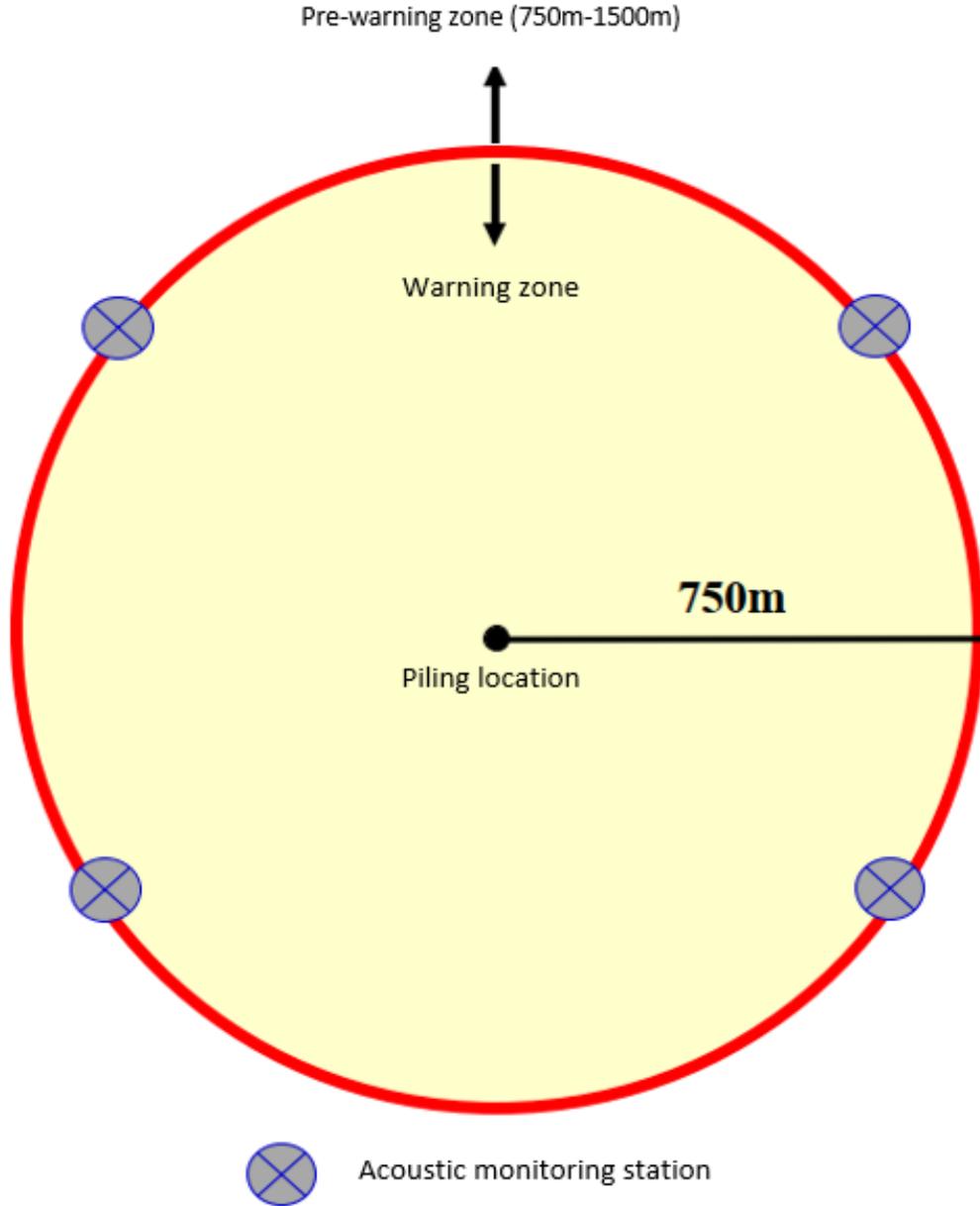


Cetacean boat survey

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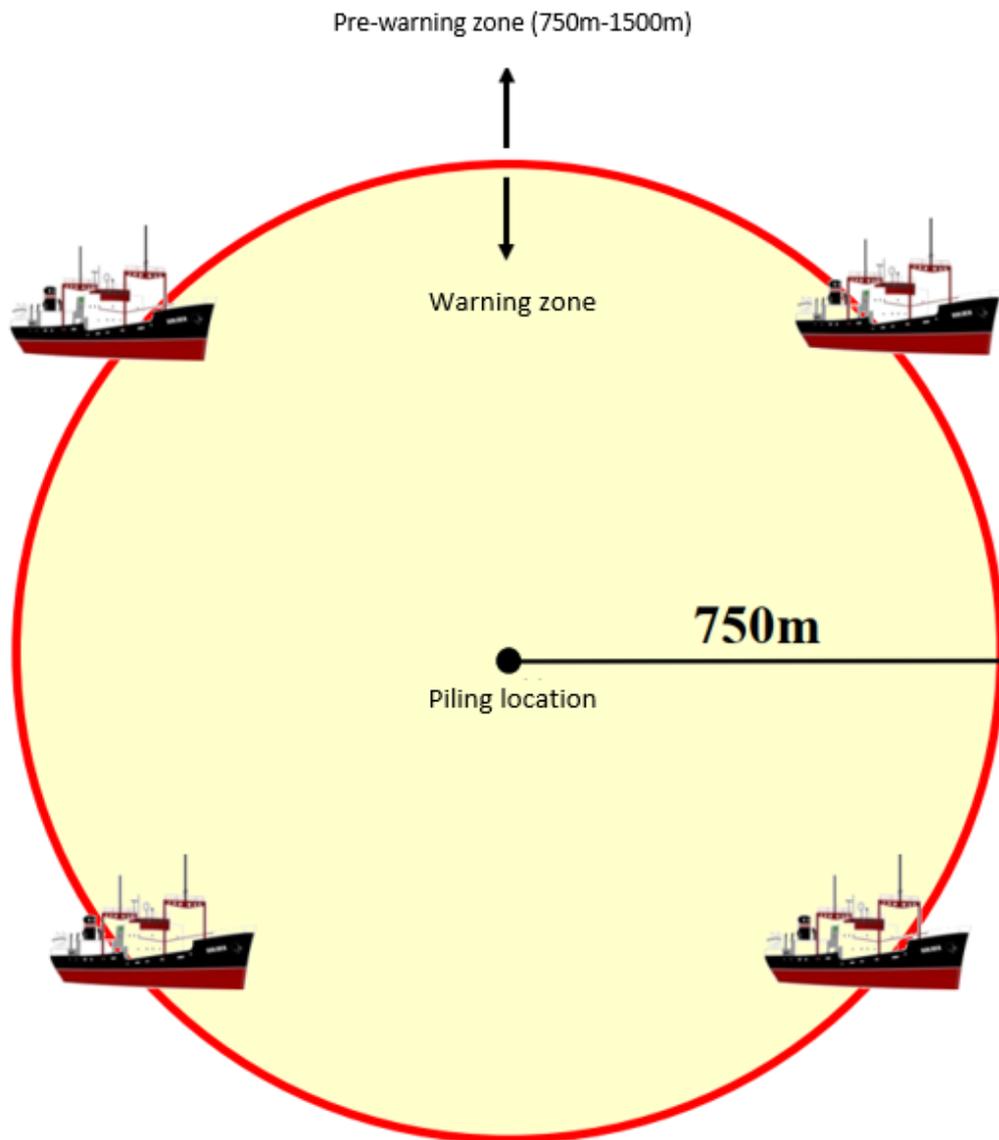
B CETACEAN AND SOUND LEVEL MONITORING STATIONS AND WARNING ZONES



Acoustic monitoring stations

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Boat locations for visual cetacean monitoring during piling