



FOWPI
FIRST OFFSHORE WIND
PROJECT OF INDIA

Environmental Scoping Report and Consent Register



EUROPEAN UNION

This Project is funded by The European Union

1 About FOWPI

The First Offshore Wind Project of India (FOWPI) is part of the “Clean Energy Cooperation with India” (CECI) programme, funded by the European Union (EU). The programme aims at enhancing India's capacity to deploy low carbon energy production and improve energy efficiency, thereby contributing to the mitigation of global climate change. Project activities will support India's efforts to secure the energy supply security, within a well-established framework for strategic energy cooperation between the EU and India.

FOWPI is defined as a conceptual offshore wind farm near the coast of Gujarat, 25 km off Jafarabad. The project scope focus is on preliminary investigations and advisory for the wind farm including wind turbine foundation, electrical network, metocean modelling, wind study, environmental scoping, financial modelling and other relevant technical studies. FOWPI uses the outputs from Facilitating Offshore Wind in India (FOWIND) project (2013-2018) also supported by the European Union. FOWIND and FOWPI bring the vast experience of European countries in offshore wind, to support India with the creation of a national knowledge centre and with technical support for setting up the first offshore wind-farms.

FOWPI is led by COWI A/S (Denmark) with support from COWI Pvt Ltd India and WindDForce Management Ltd. (India). The project is implemented in close collaboration with the European Union, the Ministry of New and Renewable Energy- India (MNRE) and National Institute of Wind Energy- India (NIWE).

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The 14th annual Summit between India and the European Union (EU) was held in New Delhi on 6 October 2017. Both sides adopted a Joint Statement on Clean Energy and Climate Change, reaffirmed their commitments under the 2015 Paris Agreement, and agreed to co-operate further to enhance its implementation. India and the EU noted that addressing climate change and promoting secure, affordable and sustainable supplies of energy are key shared priorities and welcomed the progress on the Clean Energy and Climate Partnership, adopted at the 2016 EU-India Summit, and reiterated their commitment to its implementation and further development. In particular the EU is committed to continue cooperation in view of the cost-effective development of offshore wind in India.

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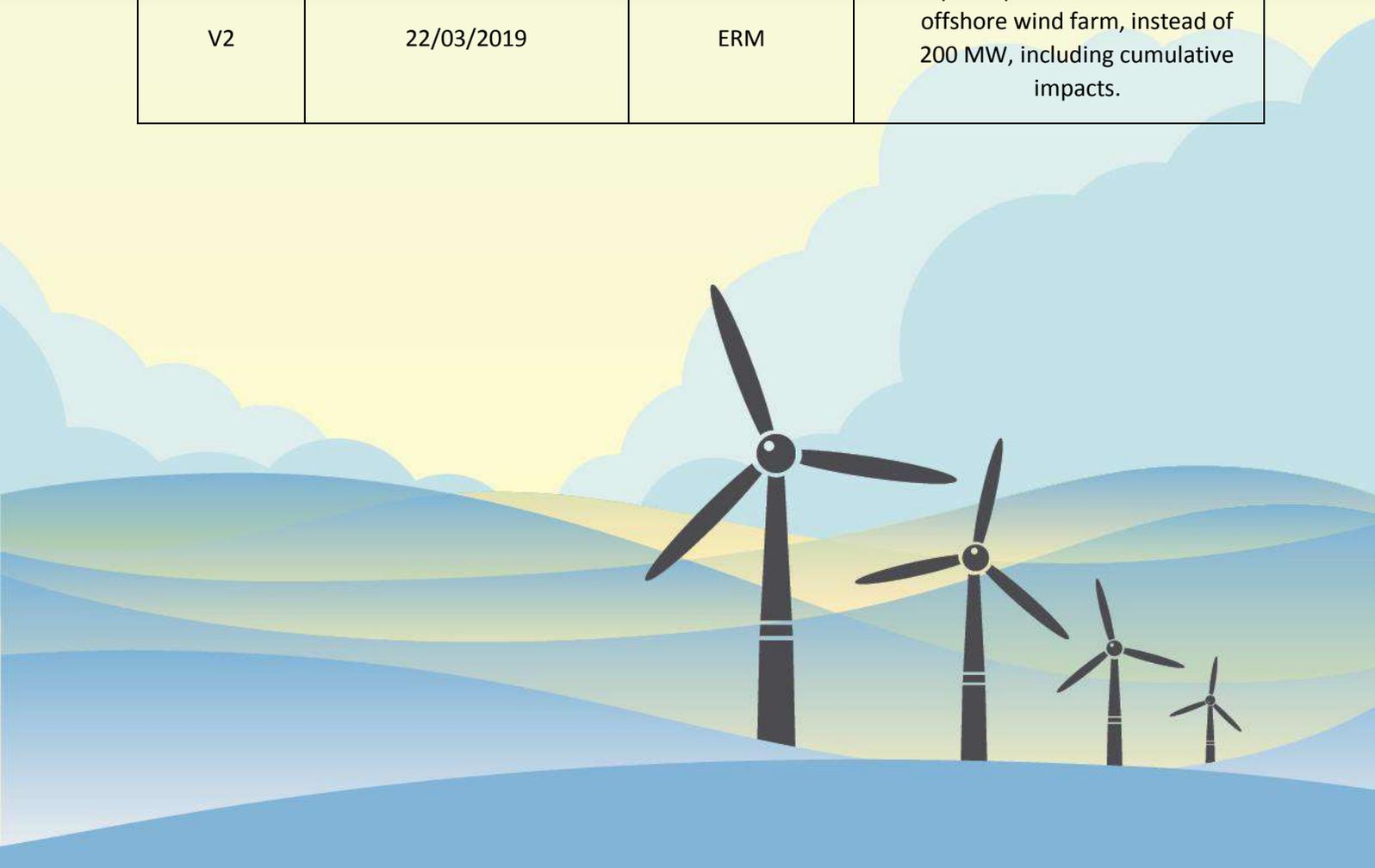
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Environmental Scoping Report and Consent Register

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Environmental and Social Scoping Study for First Offshore Wind Project of India (FOWPI) in the Gulf of Khambhat, Gujarat, India.

COWI India Private Limited

Final Report

28 February, 2019

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Environmental and Social Scoping for the First Offshore Wind Power Project in India (FOWPI) in Gulf of Khambhat, Gujarat, India

Final Report

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Acronyms and Abbreviations

Name	Description
AIS	Automatic Identification System
amsl	Above Mean Sea Level
BG	British Gas
CBM	Coal Bed Methane
CCE	Chief Controller of Explosives
CEA	Central Electrical Authority
CECI	Clean Energy Cooperation with India
CG	Coastal Guard
CGHQ	Coastal Guard Headquarters
CMS	Convention on the Conservation of Migratory Species
CMS	Control Monitoring System
COD	Commercial Operation Date
CPCB	Central Pollution Control Board
CRZ	Coastal Regulation Zone
CSR	Corporate Social Responsibility
CSTEP	Centre for Study of Science, Technology and Policy
DG	Diesel Generator
DGCA	Directorate General of Civil Aviation
DGH	Directorate General of Hydrocarbons
DGICG	Director General Indian Coast Guard
DISH	Directorate, Industrial Safety and Health
DoFE	Department of Forest and Environment
DoT	Department of Telecommunications
EAC	Expert Appraisal Committee
E&P	Exploration and Production
EC	Environmental Clearance
ECMWF	European Centre for Medium-Range Weather Forecasts
EEZ	Exclusive Economic Zone
E&S	Environmental and Social
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EoI	Expression of Interest
ESA	Ecologically Sensitive Area
ESIA	Environmental and Social Impact Assessment
EU	European Union
FODAG	Flag Officer Offshore Defence Advisor Group

Name	Description
FOWIND	Facilitating Offshore Wind in India
FOWPI	First offshore Wind Project of India
GCZMA	Gujarat Coastal Zone Management Authority
GETCO	Gujarat Energy Transmission Corporation Limited
GIS	Geographical Information Systems
GMB	Gujarat Maritime Board
GPCB	Gujarat Pollution Control Board
GPCL	Gujarat Power Corporation Limited
GSS	Grid Substation
GW	Giga Watt
GWEC	Global Wind Energy Council
Ha	Hectares
HTL	High Tide Line
IBBA	Important Bird and Biodiversity Area
ICMAM	Important Coastal Marine Area Management
ICMBA	Important Coastal and Marine Biodiversity Area
IFC	International Finance Corporation
IUCN	International Union for the Conservation of Nature
IWP	Indian Wildlife Protection Act, 1972
JV	Joint Venture
KBA	Key Biodiversity Area
kV	Kilo Volt
LTL	Low Tide Line
MARPOL	International Convention for the Prevention of Pollution from Ships
MEA	Ministry of External Affairs
MHA	Ministry of Home Affairs
MNRE	Ministry of New and Renewable Energy
MoD	Ministry of Defence
MoEFCC	Ministry of Environment, Forests and Climate Change
MFRA	Marine Fishing Regulation Act
MOPNG	Ministry of Petroleum and Natural Gas
MTPA	Million tonnes per annum
MW	Mega Watt
MZI	Maritime Zones of India
NCR	National Capital Region
NELP	New Exploration Licensing Policy
NGT	National Green Tribunal
NH	National Highway

Name	Description
NIWE	National Institute of Wind Energy
NoC	No Objection Certificate
NOWEP	National Offshore Wind Energy Policy
NP	National Park
ONGC	Oil and Natural Gas Corporation Limited
OSS	Offshore Substation
OWE	Offshore Wind Energy
OWESC	Offshore Wind Energy Steering Committee
PA	Protected Area
PESO	Petroleum and Explosives Storage Organization
PHC	Primary Health Care
PIB	Press Information Bureau
PMT	Panna Mukta Tapti
PRCL	Pipavav Rail Corporation Limited
PS	Performance Standard(s)
PSC	Production Sharing Contracts
PSL	Pipavav Shipyard Limited
PSS	Pooling Substation
RIL	Reliance Industries Limited
RTFCTLARR	Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement
RoW	Right of Way
SCZMA	State Coastal Zone Management Authority
SEAC	State Environmental Appraisal Committee
SEIAA	State Environmental Impact Assessment Authority
SOLAS	Safety of Life at Sea
SPCB	State Pollution Control Board
SS	Substation
TJB	Transition Joint Bay
ToR	Terms of Reference
UNCLOS	United Nations Convention on the Law of the Sea
VTMS	Vessel Traffic Management Systems
WBG	World Bank Group
WF	Wind Farm
WFMS	WinDForce Management Services
WISE	World Institute of Sustainable Energy
WTG	Wind Turbine Generators

0. EXECUTIVE SUMMARY

ERM India Pvt. Ltd. has been commissioned by COWI India Pvt. Ltd. (COWI) to undertake an Environmental and Social (E&S) Scoping Study for the First Offshore Wind Power Project in India (FOWPI) proposed in the Gulf of Khambhat, Gujarat, India. The wind farm components are expected to be sited in and around the existing Pipavav Port in Taluka Rajula, District Amreli in Gujarat, India.

0.1 Objectives and Scope of Study

The main objective of the E&S Scoping Study is to identify environmental and social sensitivities associated with the project and to determine the scope of the Environmental and Social Impact Assessment (ESIA). The scope of work broadly covers:

- Desk-based review to identify environmental, social and ecological receptors and resources;
- Discussion with key stakeholders;
- Development of environmental and social regulatory and institutional framework applicable for the project;
- Determination of potentially significant environmental and social risks and impacts to be further assessed in ESIA based on preliminary project design including associated facilities; and,
- Preparation of draft Terms of Reference (ToR) for the ESIA study.

0.2 Applicable Reference Framework

The applicable reference framework for the study is as follows:

- EU¹ Guidance Note on EIAs for offshore wind farms;
- WBG² EHS³ guidelines for Wind Energy;
- WBG General EHS guidelines; and
- WBG EHS Guidelines for Electric Power Transmission and Distribution.

Key relevant national and state laws and regulations have been provided below:

- **Environmental Clearance (EC):** EC as required under the EIA Notification 2006 and as amended is not specifically required for onshore/ offshore wind farm projects. Any construction activity (including pooling substation and site office) that has a total built-up area of more than 50,000 m² will require an EC for that project component. Projects with a built-up area of ≥ 5,000 m² and less than 50,000 m² need to submit a self-declaration form indicating how the construction has abided by the requirements of Appendix XIV of the 13th March, 2018 MoEFCC notification ⁽⁴⁾; and
- **Coastal Regulation Zone Clearance (CRZ):** CRZ clearance is required under the CRZ Notification 2011 because of the project components falling within the CRZ (e.g. part of wind farm, export cable, landfall point, onshore cables and pooling substation).

¹ European Union

² World Bank Group

³ Environment, Health and Safety

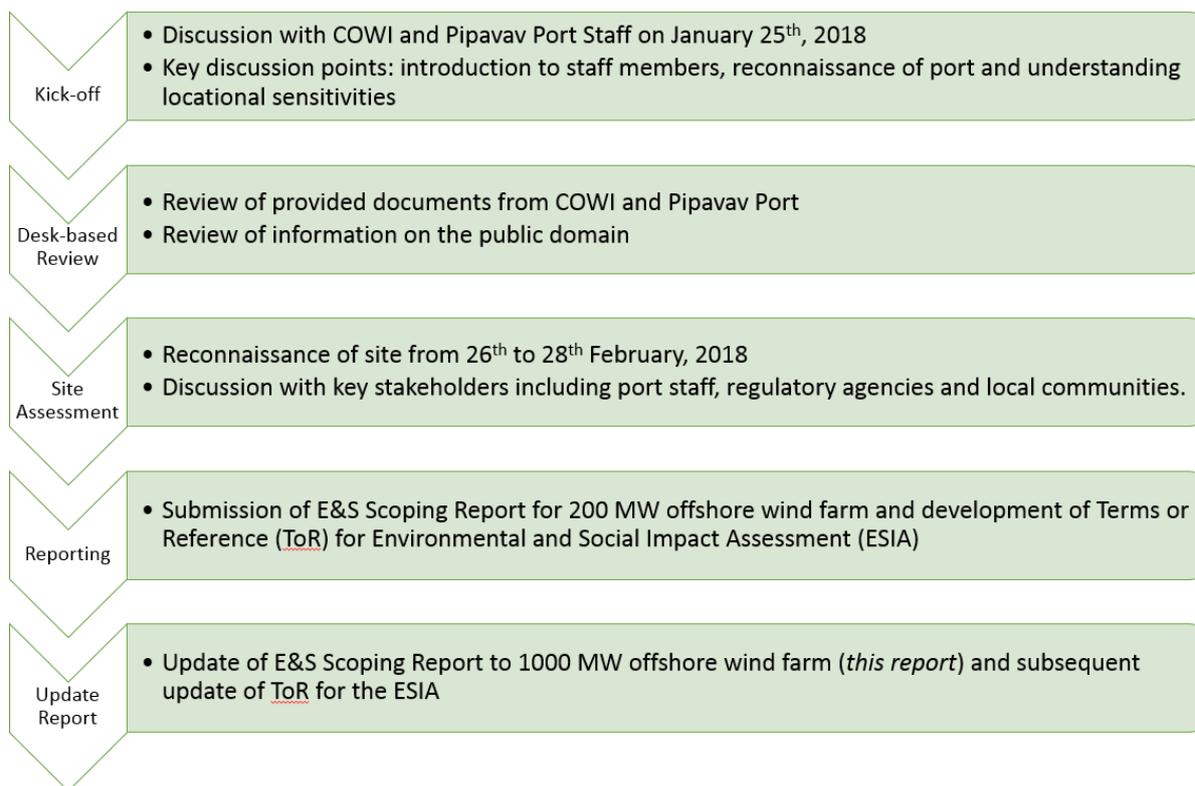
(4) The Ministry of Environment, Forests and Climate Change (MoEFCC) 13th March, 2018 notification has modified the built-up area requirement for obtaining an Environmental Clearance for Building and Construction Projects. The notification was challenged by the National Green Tribunal but has since been implemented in the MoEFCC 15th November, 2018 notification.

A complete list of E&S laws and regulations that are relevant for the project has been provided in **Appendix D** of this report.

0.3 Approach and Methodology

The approach and methodology has been summarized in the figure below:

Figure 0.1 Approach and Methodology



0.4 Study Area

Ten (10) km radius as required in the Standard Terms of Reference for EIAs by the Ministry of Environment, Forests and Climate Change (MoEFCC). The 10 km radius has been taken from the project footprint that includes offshore wind turbines, export cables, onshore landing point, tentative pooling substation, and Pipavav Port.

0.5 Project Description

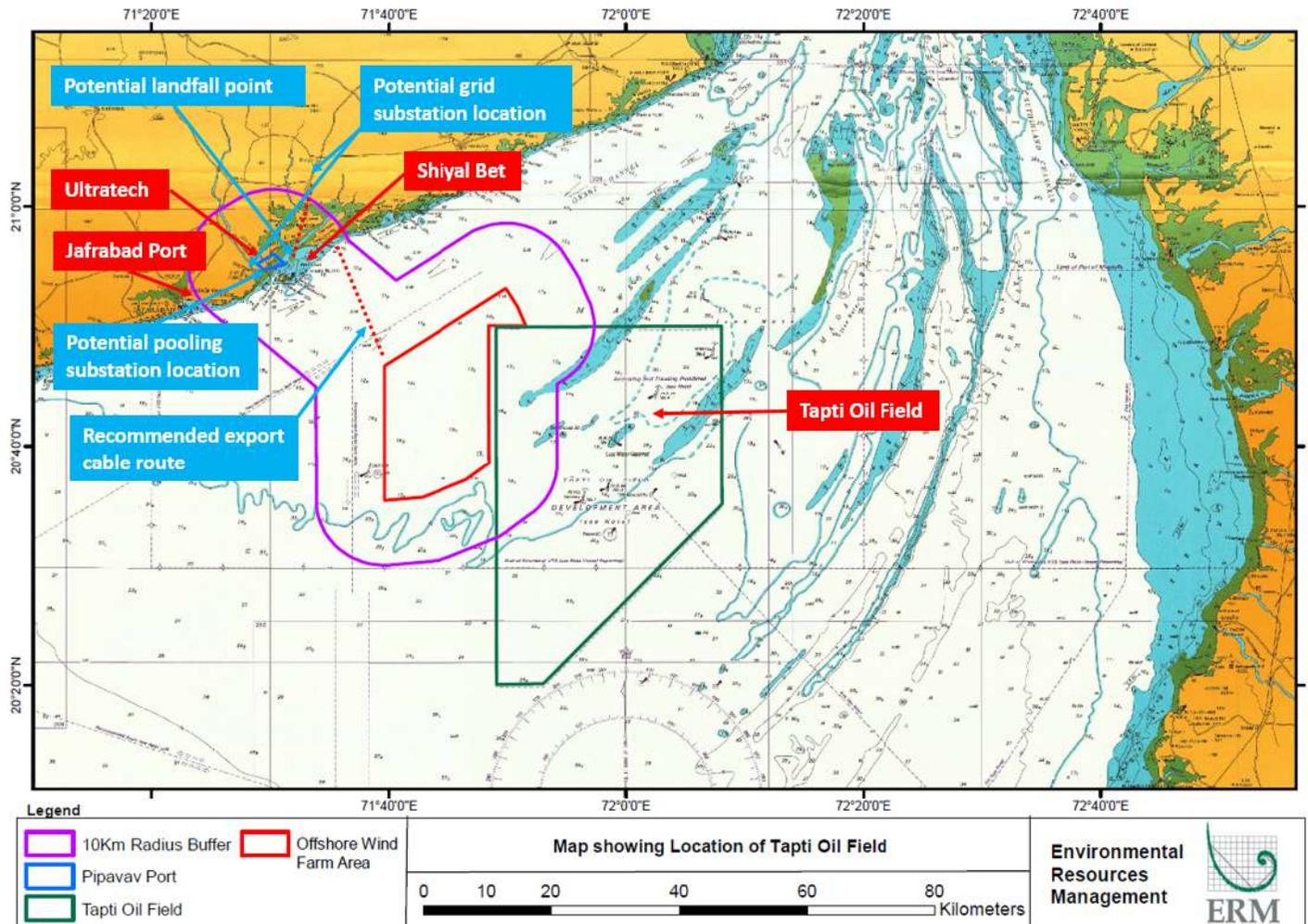
The salient features of the project has been summarized in **Table 0.1** and mapped in **Figure 0.2**

Table 0.1 Salient features of the project

Salient Features of the Project			
Offshore Location	Gulf of Khambhat, 9.0 to 23.5 nautical miles from Pipavav Port, Taluk Rajula, District Amreli in Gujarat	Sea Lease Requirement	About 400 km ²
Onshore Location	In and around Pipavav Port in Village Rampara, Taluk Rajula, District Amreli in Gujarat, India	Land Requirement	50,000 m ² plus land to be obtained for Pooling Substation and storage area. Additional land may be identified for transmission line laying.

Salient Features of the Project			
No. of Turbines	Wind turbines of approximately 3 to 6 MW in capacity are expected, corresponding to roughly 150 to 300 units.	Project Status	Proposed commissioning date is expected to be 5 years after award of project
Total Capacity	1000 MW	Contractor	None at this stage

Figure 0.2 List of project components and sensitivities



Note: Locations marked in blue are potential Project components identified at this stage. Locations marked in red are key sensitivities namely, existing developments and communities in the area.

0.6 Environmental and Social Sensitivities

0.6.1 Offshore Physical Environment

Key aspects of the offshore physical environment has been summarized below ⁵:

- Water depth within the proposed site boundary ranges from 10 to 22 m.
- Tides are of mixed semi-diurnal types with large diurnal inequality and varying amplitude with mean tidal heights of 4.7 m in Mahuva Bandar, 6.5 m at Gopnath Point and 10.2 m at Bhavnagar. The maximum tide recorded in Gulf of Khambhat is at Bhavnagar is 12.5 m.
- Predominant wind direction is SW-WSE with wind speeds of 3 m/s to 8 m/s and reaches 12 m/s during southwest monsoon.
- The average current speed is 0.6 m/s and maximum current speed of 1.5 m/s is found near the proposed wind farm area.
- The average significant wave height of 0.8 to 1.1 m and maximum wave height of 2.5 to 3.2 m from the SW direction has been identified in the wind farm area.

0.6.2 Onshore Physical Environment

Key aspects of the onshore physical environment has been summarized below ⁶:

- Land use of the proposed onshore components is mudflat, mangroves, and industrial land.
- The onshore components lie in very high damage risk zone for wind and cyclone, medium risk zone for earthquakes and is not liable to flooding.
- The groundwater resources of the district are classified as 'safe' by the Central Ground Water Authority.
- Soil type of the district is medium to deep black soil.
- The project does not have aviation radars or military aviation base activity in the area. The closest designated helipad is at Pipavav Shipyard Limited that is located at a distance of 23 km from the wind farm area.

0.6.3 Offshore Ecological Environment

The Gulf of Khambhat is characterized by high plankton diversity near river outfalls, low benthic diversity and diverse commercial fish species that is dominated by Bombay Duck (*Harpadon nehereus*). Some species of conservation importance identified in the project study area and their status as per International Union for Conservation of Nature (IUCN) and the Indian Wildlife (Protection) Act has been provided below.

Table 0.2 Species of conservation importance in study area (offshore)

S.N.	Common Name	Scientific Name	IUCN Status	IWP Status
1.	Olive Ridley Sea Turtle	<i>Lepidochelys olivacea</i>	VU	I
2.	Humpback Whale	<i>Megaptera noveangliae</i>	EN	NE
3.	Beaked Whale	Species unidentified	-	NE
4.	Whale Shark	<i>Rhincodon typus</i>	EN	I

Note: VU = Vulnerable, EN = Endangered, NE = Not Evaluated, I = Schedule I

⁵ COWI, FOWPI - Metocean Study, Version 1, September 2017.

⁶ Summary of information from multiple sources as provided in **Section 4** of the main report.

0.6.4 Onshore Ecological Environment

The Project footprint is located approximately 35 km from Gir National Park and 115 km from Bhavnagar Salt pans and Bhal Area. All three sites are also Important Bird and Biodiversity Areas (IBAs). Several migratory bird species were observed utilizing water bodies along the coast between Jafrabad and Mahuva. The only species of conservation importance to be identified within the study area (onshore) is the Asiatic Lion (*Panthera leo persicus*) (Endangered under the IUCN Red-list v. 2018-2)

0.6.5 Offshore Social Environment

Fishing is the primary source of livelihood in the coastal areas of the study. The fishing status of the study area has been summarized below:

- There are no designated fishing zones and fishing can occur in the region between Alang Port in Gulf of Khambhat and open seas to the west and south of Kathiawar Peninsula;
- Movement across the offshore project area can occur where fisher folk need to access fishing grounds;
- Intensity of fishing in the project area however, might be less due to proximity to Tapti Oil Field, which has fishing restrictions;
- The main type of commercial fishing is dolnets and gillnets and the fishing typically lasts for 7-15 days;
- The main type of artisanal fishing is shore-based and is located around Shiyal Bet, Mahuva and Chanch in the study area;
- The main fishing season is between October and February but fishing does occur all year round;
- The main fish catch is Bombay Duck but other fishes including shrimp, lobster, cuttlefish, squid, silverbar, hilsa, shark, catfish and mullets does occur;
- Primary fishing communities in the region are kharwas and kolis and majority of the fishing households are in Jafrabad; and
- A typical fishing trip fetches approximately INR 50,000 to 3 lakhs depending on type of fishes.

0.6.6 Onshore Social Environment

The key sensitivities from the onshore social assessment has been summarized below:

- The study area consists of 15 villages consisting of 39,519 people (7,048 households) from two districts i.e. Rajula and Jafrabad;
- 4.4% of the total population is Scheduled Caste and 25 people belong to a Scheduled Tribe Community;
- As per Census of India 2011, the study area has a Work Participation Ratio of 42.3% with 53% engaged in agriculture and 47% involved in industries, services and self-employment; and
- The cultural heritage sites found in the area include *Ransod Temple* located 6-7 km from the site and Savai bet in the island of Shiyal bet.

0.7 Stakeholder Mapping

An initial stakeholder mapping exercise was undertaken for the study to determine some key concerns. The concerns have been summarized below:

- Fishing communities were concerned about any potential impacts on access to their fishing grounds or direct impact on fishing grounds due to increased vessel movement, dredging etc.

- Non-fishing villages such as Rampara No.2 reported expectations revolving around increased employment and business opportunities;
- Regulatory authorities expect the project to undertake all associated assessments for obtaining permits, licenses and clearances.
- Pipavav Port: the main expectations of the port authority was optimum utilisation and sharing of resources such as energy, water, workforce etc. Concerns revolved around increase in number of vessels, additional ship docking requirements; storage areas including storage of hazardous materials (example oil, diesel etc.). Land lease arrangement for any potential siting of project components during construction or operations phase within Pipavav Port land.

An indicative stakeholder identification process for the proposed ESIA study has been provided in **Table 7.2**

0.8 Emerging Themes for Detailed Assessment

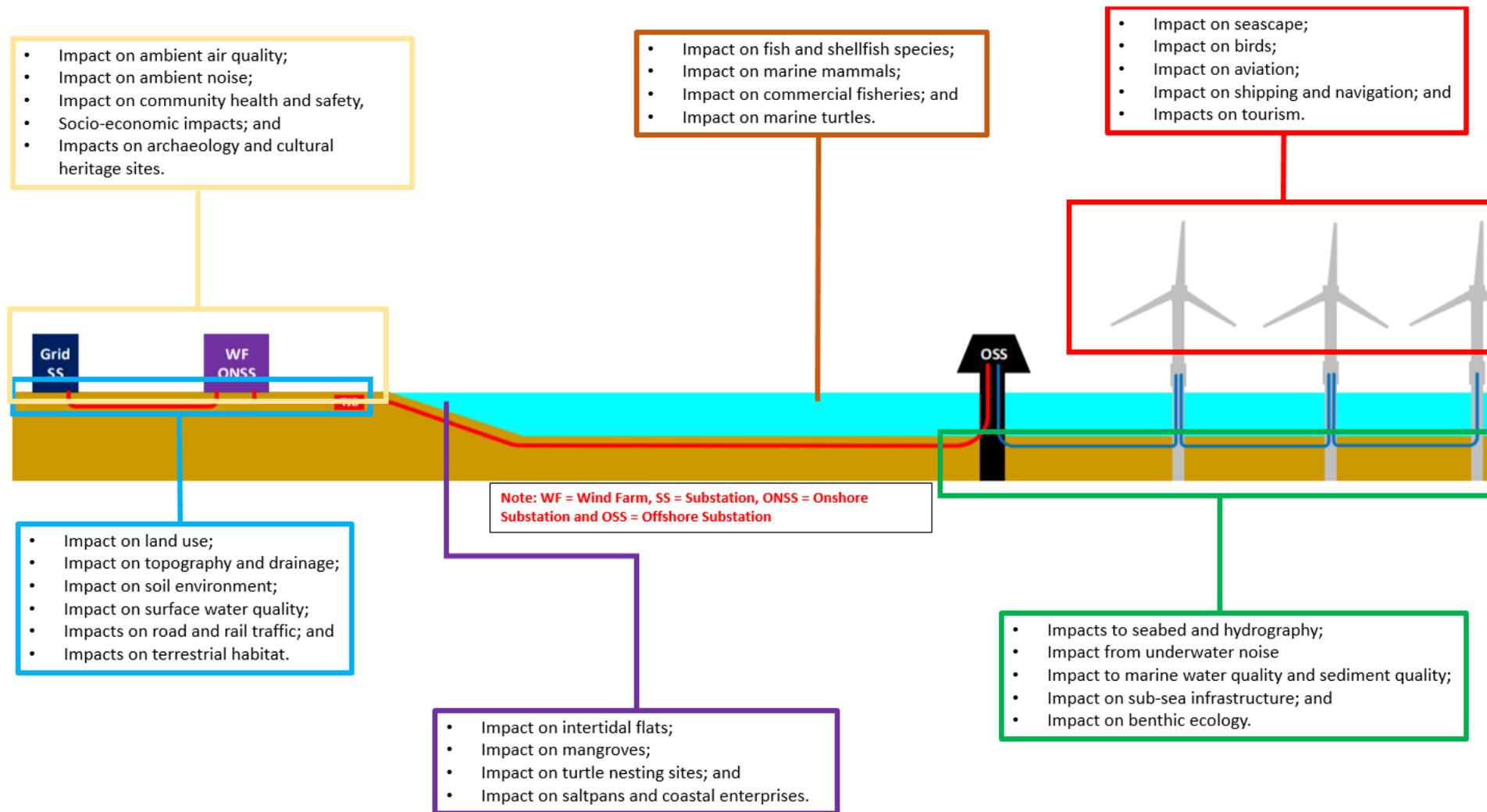
An environmental and social scoping of the study was undertaken by understanding the interactions between the project activities and resources/receptors to determine resultant impacts. The impacts were captured for the pre-construction, construction, operation and maintenance and decommissioning phases of the project. The impacts have been divided into 'emerging themes' and is summarized in **Figure 0.3**. The specific impact with respect to the emerging theme has been provided in the main report (**Table 6.2** to **Table 6.7**). The key impacts that have been identified for the Project are summarized in the table below.

Table 0.3 Key impacts identified

S.N.	Impact	Phases Relevant	Mode of Assessment	Why is it significant?
1.	Disturbance of seabed from piling, excavation for foundation establishment, trenching and dredging	Construction	<ul style="list-style-type: none"> ■ Bathymetry study should be undertaken for the Project site; ■ Metocean data to be updated for 1 GW project; ■ Seabed sediment sampling; ■ Benthic habitat survey 	Physical disturbance to seabed and hydrography will be a primary concern and it will have indirect impacts to aquatic ecology, structural integrity and tidal regimes.
2.	Underwater noise and vibrations	Construction and Operation	<ul style="list-style-type: none"> ■ Underwater noise modelling; ■ Cetacean movement in the region ■ Identification of key fishing grounds, spawning habitat and fish movement 	Noise and vibration can have impacts on existing aquatic ecology and affect fishing success for dependent communities.
3.	Impacts to Avifauna (including seabirds) -collision risk -displacement	Construction and Operation	Ecology baseline survey in migratory season (October to March) and breeding season (April to June) should be undertaken.	The avifaunal survey will be a year-long study that has to identify sensitivities associated with multiple seasons and needs to be planned as a year-long assessment. The proximity to internationally recognized Important

S.N.	Impact	Phases Relevant	Mode of Assessment	Why is it significant?
				Bird Areas (IBAs) makes the Project a risk for collision with turbine blades for avifauna and may result in bird avoidance behaviour.
4.	Loss of Turtle Nesting Sites	Construction	Mapping of turtle nesting sites across the Project impact area should be undertaken. Consultations with experts on potential nesting sites should be used to support the mapping data.	The laying of cables, landfall point and coastal components (including potential grid and pooling substation) may disturb these turtle nesting sites. Conservation of turtle nesting sites is a significant initiative globally and in India and loss of such sites will have detrimental effects on the survivability of the species and attract media/NGO attention to the Project.
5.	Loss or damage of fishing grounds or access to fishing grounds	Construction and Operation	<ul style="list-style-type: none"> ■ Socio-economic surveys of fishing households; ■ Consultations with fishing households, key community representatives and government agencies ■ 	The Gulf of Khambhat is a significant source of fishing income to dependent communities and loss of these fishing grounds or net displacement of fish species from the area would be a significant impact and source of conflict with local communities.

Figure 0.3 Emerging Themes



Source: Developed on FOWPI Electrical Concept Design

0.8.1 Cumulative Impact

Three sources of cumulative impacts have been identified for the project:

- Impacts on water quality, marine ecology and fishing due to the simultaneous expansion of the Pipavav Port;
- Impacts on water quality, sediments, marine ecology and vessel movement because of the decommissioning of the Tapti Field located on the eastern side of offshore wind farm area; and
- Impacts on marine ecology and fishing because of increased wind power development in Zone B of Gujarat and phase-wise implementation of the 1 GW project.

0.9 Conclusion and Recommendations

The environmental and social scoping study has identified several site sensitivities associated with FOWPI as shown in **Figure 0.2**. The key interactions between proposed project activities and the site sensitivities has been highlighted in the form of emerging themes (graphically represented in **Figure 0.3**) and listed in **Table 0.3**. The emerging themes will need to be further assessed during the proposed Environmental and Social Impact Assessment (ESIA) and a Terms of Reference (**Appendix E**) has been provided for the study. The mode of assessment as provided in **Table 0.3** has been provided in more detail with respect to assessment purpose and parameters in the Terms of Reference.

1. INTRODUCTION

ERM India Private Limited (ERM) has been commissioned by COWI India Private Limited (*hereinafter referred to as 'COWI' or 'Client'*) to undertake an Environmental and Social (E&S) scoping study for the First Offshore Wind Project in India (FOWPI) proposed to be located in the Gulf of Khambhat in Gujarat, India. The E&S Scoping is part of several technical studies on feasibility analysis that are being undertaken for the proposed offshore wind project.

The purpose of the E&S Scoping study is threefold:

- To screen environmental, ecological and social (E&S) receptors and sensitivities associated with the construction and operation of FOWPI and its associated facilities;
- To identify preliminary interactions between project activities and the E&S receptors and potentially significant impacts; and
- To determine the scope of a comprehensive Environmental and Social Impact Assessment (ESIA) along with any additional studies in order to develop mitigation measures.

The proposed offshore wind turbines, export cables, onshore cables, substations and ancillary components (e.g. site office) (*hereinafter referred to as 'Project'*) have been described in the subsequent sections.

1.1 Project Background

FOWPI is part of the Clean Energy Cooperation with India (CECI), which aims at enhancing India's energy generation capacity with least carbon residual, thereby contributing towards the mitigation of global climate change. The project is funded by the European Union (EU) Delegation to the Joint Venture SACO (SAFAGE-COWI). COWI A/S is part of the JV SACO-consortium and is leading the project implementation with local support from Indian Company WinDForce Management Ltd and COWI India Ltd. The Project is also supported by the Ministry of New and Renewable Energy (MNRE) and National Institute of Wind Energy (NIWE) in India.

FOWPI will undertake coastal surveys, environmental studies, cost-benefit analysis, transmission layouts, wind farm components and its conceptual design, safety measures and other relevant technical studies as identified for the project. The Project is in a preliminary stage. The following salient features are assumed based on the preliminary design, at this stage of the Project:

- The wind farm will be sited approximately 9.0 to 23.5 nautical miles from Pipavav Port in Rajula, Amreli District, Gujarat, India;
- The offshore components of the Project will occupy a total seascape area of approximately 400 km² and 10-22 m average depth of water in the Gulf of Khambhat, Gujarat, India;
- The make and model of the wind turbines are yet to be finalized but the individual capacities being considered at this stage are 3.0 MW and 6.0 MW;
- The spacing between wind turbines is expected to be between 500 m to 1000 m;
- The wind farm will be connected to one or more Onshore or Offshore Pooling Substations (PSS). The location of the offshore pooling substation(s) is undetermined but a potential location for the onshore pooling substation has been identified near Pipavav Port; and
- The Project has identified a 400/220 kV proposed Grid Substation (GSS) by Gujarat Energy Transmission Corporation Limited (GETCO) near Pipavav Village and approximately 16 km northeast of Pipavav Port. The proposed substation is in the pre-planning stage and is expected to be operational prior to the commissioning of the Project. Alternatively, an existing GETCO substation located approximately 2-3 km south of the Pipavav Port in Village Kovaya will be considered for the evacuation of the Project.

1.2 Objectives and Scope of the Assessment

The main objective of the E&S Scoping Study is to identify environmental and social sensitivities associated with the project and to determine the scope of the ESIA (in terms of the area of influence, potentially significant interactions, baseline studies required and any other studies over and above the impact assessment).

1.2.1 Scope of Work

The scope of work required to address the above objective is as follows:

- Conduct a desk-based review to identify environmental, social and ecological receptors and resources that will interact with the Project during its life cycle;
- Discuss the Project with key stakeholders to understand any concerns associated with land procurement, interference with navigation channels, impacts on fishing, export cables laying, etc.;
- Determine relevant permits and licenses required for the Project as well as recommendations from the applicable institutional and regulatory framework for the establishment and operation of the offshore wind farm;
- Identify the potentially significant environment, ecological and social impacts and risks that will require further assessment in the Environmental and Social Impact Assessment (ESIA) study;
- Identify areas that are not likely to be significantly affected by the development of the project and can be scoped out during the ESIA study; and
- Prepare a draft Terms of Reference (TOR) for ESIA suggesting key required studies and constituent parameters.

1.2.2 Applicable Reference Framework

The E&S Scoping Study has been undertaken using the following reference framework:

- Relevant environmental and social laws, regulations and policies of India including:
 - National Offshore Wind Energy Policy 2015;
 - EIA Notification 2006 and as amended;
 - Coastal Regulation Zone Notification 2011 and as amended;
- European Union (EU) Guidance Note on Environmental Impact Assessments of offshore wind farms;
- World Bank Group (WBG) Environmental, Health and Safety (EHS) Guidelines for Wind Energy, 2015; and,
- WBG EHS Guidelines for Electric Power Transmission and Distribution 2007.

1.3 Approach and Methodology

The approach and methodology utilized for the E&S Scoping Study has been provided in the subsequent sections.

1.3.1 Kick-off Meeting

ERM undertook a kick-off meeting with COWI and Pipavav Port staff on 25th January 2018. The kick-off meeting included a reconnaissance of the Pipavav Port and discussions with senior staff of the Client Company and Port. The focus of the kick-off meeting was as follows:

- Introduction to key staff members working on the Project;

- Visit and discussions around infrastructure within the Port that would be required for the Project including storage yard, grid substation and upgrading of the deck strength; and
- Understanding location sensitivities including navigation channels, installed radar capacity and the presence of a coal storage and transfer facility.

1.3.2 Desk-based Review

ERM undertook a review of data made available by COWI and secondary information available about the Project site to determine any E&S sensitivities relevant to the proposed project. The list of items reviewed for the purpose of the study has been presented in **Table 1.1**.

Table 1.1 List of documents reviewed for the scoping study

S. N.	Document
1.	First Offshore Wind Project of India Official Website - http://www.fowpi.in/ (FOWPI, 2017)
2.	COWI, FOWPI Leaflet, November 2016
3.	FOWPI Inception Report (FOWPI, 2017)
4.	COWI, FOWPI - Metocean Study. Version 1, September 2017
5.	COWI, FOWPI - Advisory Electrical Concept Design. Version 1, August 2018
6.	COWI, FOWPI - Advisory Foundation Concept Design. Rev 3.0, June 2018
7.	COWI, FOWPI - Wind Turbine, Layout and AEP Report. Version 1, September 2018
8.	COWI, FOWPI - Procedures for Offshore Wind. Rev. 2.0, September 2018.
9.	Environmental Impact Assessment of the Proposed Expansion of Pipavav Port, Gujarat dated January 2011 (Aquatech Enviro Engineers, 2011)
10.	Saravanan, K., Kuppusamy, S.. and Choudhury, K. 2013. Important Coastal and Marine Biodiversity Areas of India. Wildlife and Protected Areas. Vol. 15, Wildlife Institute of India, Dehradun (Saravanan, 2013)
11.	Gujarat Forest Department Website - https://forests.gujarat.gov.in/march-asiatic-lion.htm (Wildlife Division, Sasan Gir, 2015)
12.	Integrated Coastal and Marine Area Management (ICMAM). 2002. Critical Habitat Information System for Gulf of Khambhat – Gujarat. Department of Ocean Development, Government of India. (Department of Ocean Development, Government of India, 2002)
13.	Status of shoreline change due to erosion/ accretion, Gujarat Coast prepared by Institute for Ocean Management , Anna University, Chennai (Institute for Ocean Management, Anna University, Chennai)
14.	Marine traffic details website - http://map.openseamap.org/ (Open Sea Map- the free nautical chart, 2018)
15.	Gujarat State Disaster Management Authority (GSDMA) – website http://www.gsdma.org/ (Gujarat state Disaster management Authority (GSDMA), 2018)
16.	Census of India, 2011 -Primary Census Abstract (Census Organisation, Ministry of Home Affairs, 2011)
17.	Tribal Research and Training Institute Gujarat website https://trti.gujarat.gov.in/ (Tribal Research and Training Institute, n.d.)
18.	District Websites of Amreli and Gir-Somnath https://amrelidp.gujarat.gov.in/Amreli/english/ https://girsomnath.gujarat.gov.in/about-gir-somnath (District websites of Amreli and Gir-Somnath, n.d.)

S. N.	Document
19.	Department of Fisheries, Amreli District data https://www.districtsofindia.com/gujarat/amreli/agriculture/fisheries/index.aspx (Department of Fisheries, Amreli District data, n.d.)
20.	International Chart Series - Approaches to Port Pipavav (Scale: 1: 50,000)
21.	National offshore-Wind Energy Policy http://mnre.gov.in/file-manager/UserFiles/National-Offshore-Wind-Energy-Policy-Gazette-notification.pdf (Ministry of New and renewable Energy Notification, 2015)
22.	http://environmentclearance.nic.in/writereaddata/Form-1A/HomeLinks/TGM_Offshore%20Onshore_010910_NK.pdf (ILFS, 2010)
23.	https://www.pppinindia.gov.in/toolkit/ports/module2-fgost-oeiaaec.php?links=fgost3
24.	http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx (IMO, n.d.)
25.	http://www.moef.gov.in/sites/default/files/final%20Booklet.pdf (MoEF&CC, 2015)
26.	http://www.business-standard.com/article/companies/ongc-reliance-british-gas-to-abandon-tapti-gas-field-11404200005_1.html (Business Standard, 2014)
27.	https://economictimes.indiatimes.com/industry/energy/oil-gas/ongc-to-take-over-tapti-gas-field-facilities/articleshow/46975525.cms (The Economics Times, 2015)
28.	https://economictimes.indiatimes.com/industry/energy/oil-gas/35-decline-in-gas-output-from-tapti-field-in-past-3-years/articleshow/9622474.cms?intenttarget=no (The Economics Times, 2011)
29.	http://environmentclearance.nic.in/writereaddata/Online/TOR/14_May_2017_01240750098AF474_ZPrefeasibilityReport.pdf (PMT JV, 2017)
30.	http://www.livemint.com/Industry/XJUFJSAJfnQRIBKJd0IBnK/Shell-India-drops-plan-to-sell-30-stake-in-PannaMukta.html (Livemint, 2018)
31.	Ground Water Brochure, District Bhavnagar, 2013 (CGWB, 2013)
32.	Ground Water Brochure, District Junagadh, 2014 (CGWB, 2014)
33.	BirdLife International (Birdlife International, n.d.)
34.	Wildlife Trust of India. 2014. Conservation of Whale Shark (<i>Rhincodon typus</i>) in Gujarat. Conservation Action Series. (Wildlife Trust of India, 2014)
35.	Vaccharajani, K.D. and Mankodi, P.C. 2007. Plankton Diversity at Gopnath, Gulf of Khambhat, Gujarat. Indian Journal on Environment and Ecoplanning. 14 (1-2): 101-108 (Vaccharajani, 2007)
36.	ICMAM. 2002. Critical Habitat Information Systems for Gulf of Khambhat, Gujarat. (ICMAM, 2002)
37.	Worldwide Fund India. 2013. Marine Turtles along the Indian Coast. Distribution, Status, Threats and Management Implications (Worldwide Fund India, 2013)
38.	Checklist of sharks for Gujarat and Maharashtra by Rima Jabado, IUCN Shark Specialist Group Member and Gulf Elasmobranch Project Head (Jabado)
39.	https://en.wikipedia.org/wiki/Scheduled_Castes_and_Scheduled_Tribes (Wikipedia, n.d.)
40.	https://trti.gujarat.gov.in/scheduled-tribe (Tribal Research and Training Institute, n.d.)
41.	http://www.censusindia.gov.in/2011census/dchb/DCHB_A/24/2413_PART_A_DCHB_AMRELI.pdf (Census Organisation, 2015)
42.	https://www.gpcb.gov.in/pdf/GPPLtd_EIA_Report_Part_II.pdf (GPPL Limited)
43.	https://en.wikipedia.org/wiki/Port_Pipavav (Wikipedia)
44.	https://economictimes.indiatimes.com/industry/transportation/shipping/-/transport/ngo-to-challenge-green-nod-to-gujarat-pipavav/articleshow/26950588.cms (The Economic times, 2013)

S. N.	Document
45.	Marine Fisheries Advisory by ESSO INCOIS - http://www.incois.gov.in/MarineFisheries/PfzAdvisory
46.	Eol for 1000 MW Offshore Wind Farm in Gujarat by NIWE - https://mnre.gov.in/sites/default/files/tenders/EOI_for_Development_of_1000_MW_Offshore_Wind_Farm_in_Gujarat.pdf
47.	https://www.apmterminals.com/en/operations/asia-pacific/pipavav

1.3.3 Site Assessment

ERM undertook a visit to the Project site from 26th to 28th February 2018. The team consisted of an environmental, ecology and social specialist. The schedule of activities undertaken during the site assessment has been presented in **Table 1.2**. A study area was delineated for the purpose of the assessment, the justification for the study area has been provided in **Box 1.1**.

Table 1.2 Schedule of activities undertaken at the Project site

Date	Activities Undertaken
26 th February, 2018	<ul style="list-style-type: none"> ■ Discussion with the environmental team of Pipavav Port to understand land use, location sensitivities and previously conducted E&S studies; and ■ Discussion with the electrical engineering team to understand connection of the export and onshore cables with the grid substation in the Pipavav Port.
27 th February, 2018	<ul style="list-style-type: none"> ■ Discussion with the marine team of Pipavav Port to understand harbour navigation, physical oceanography characteristics and siting of the subsea pipeline; ■ Consultation with Gujarat Maritime Board on the movement of vessels in the region; and ■ Discussions with commercial fisher folk in nearby Jafrabad to understand used fishing gear, commonly caught fish species and preferred fishing grounds.
28 th February, 2018	<ul style="list-style-type: none"> ■ Discussions with fisherman in nearby Mahuva Port to understand fishing gear, commonly caught fish species and preferred fishing grounds; ■ Consultation with Rajula Forest Department to understand ecological sensitivities in the region; ■ Consultation with residents of Shiyal Bet to understand boat movement and fishing practices; and ■ Visit to three proposed Grid Substations to determine location sensitivities and feasibility.

Photo-documentation of the site assessment has been presented in **Appendix A**.

Box 1.1 Study area for the E&S Scoping Study

A study area of 10 km radius has been selected for the purpose of the E&S Scoping Study. The 10 km radius is based on the Standard Terms of Reference (ToR) that are used for Environmental Impact Assessment projects that require an Environmental Clearance (EC) in India and as identified by the Ministry of Environment, Forests and Climate Change (MoEFCC).

The 10 km radius has therefore been delineated with respect to the following Project components:

- Offshore Wind Turbine Generators (WTGs);
- Export cables that connect the WTGs to a landfall point at the shore;
- Onshore/ Offshore Pooling Substation; and
- Pipavav Port.

The study area does not include the connection to the grid (including onshore cables and grid substation) because the exact location has not been confirmed at this stage of the process. Instead, ERM has provided exclusion criteria for the cabling route to ensure that key environmental, social and ecological sensitivities along a straight line route from the port area to the grid substation is highlighted.

1.3.4 Reporting

The results of the E&S assessment has been provided in this report. The E&S Scoping Report also includes a Terms of Reference for the Environmental and Social Impact Assessment (ESIA).

1.4 Limitations

The following limitations have been identified with the above Approach and Methodology:

- No primary environmental, ecological and social surveys were undertaken for the purpose of the E&S Scoping. All information on this report is based on limited consultations with stakeholders, reconnaissance of the Project site and review of information available in the public domain.
- Site visit was limited to on-shore components. No visit was made to offshore areas.
- Information pertinent to the location sensitivities of the proposed project has been obtained from the public domain.
- Grid sub-station and route of onshore cables from onshore landing point is not final at this point of time, therefore, ERM has provided exclusion criteria for the cabling route to ensure that key environmental, social and ecological sensitivities along a straight-line route from the onshore landing point to the selected grid substation. Furthermore, approach to be followed for environmental, ecological and social assessment for any selected route and location has been provided.
- The detailed stakeholder consultations for the Project has been identified as the next phase of the assessment. ERM was not able to undertake consultations with important stakeholders including saltpan owners/workers, Gujarat Energy Transmission Corporation Limited (GETCO) and land sellers for the Pipavav Port during the scoping site assessment.

1.4.1 Uses of the Report

ERM is not engaged in consulting or reporting for the purpose of advertising, sales promotion, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity purposes. Client acknowledges that none of its advertising, sales promotion, or other publicity matter containing information obtained from this assessment and report will mention or imply the name of ERM. Nothing contained in this report shall be construed as a warranty or affirmation by ERM that the site and property described in the report are suitable collateral

for any loan or that acquisition of such property by any lender through foreclosure proceedings or otherwise will not expose the lender to potential environmental or social liability.

1.5 Structure of the scoping report

The remainder of this report is structured as follows:

<i>Section 2</i>	<i>Project Description</i>
<i>Section 3</i>	<i>Administrative Framework</i>
<i>Section 4</i>	<i>Environmental and Social Sensitivities</i>
<i>Section 5</i>	<i>Assessment of Alternatives</i>
<i>Section 6</i>	<i>Identification of Potential Environmental and Social Impacts</i>
<i>Section 7</i>	<i>Stakeholder Screening and Mapping</i>
<i>Section 8</i>	<i>Way Forward</i>
<i>Section 9</i>	<i>References</i>
<i>Appendix A</i>	<i>Photo-documentation</i>
<i>Appendix B</i>	<i>Details of the Pipavav Port Expansion</i>
<i>Appendix C</i>	<i>Details of the proposed grid substation locations</i>
<i>Appendix D</i>	<i>Consent Register</i>
<i>Appendix E</i>	<i>Terms of Reference (ToR) for Environmental and Social Impact Assessment (ESIA)</i>

2. PROJECT DESCRIPTION

2.1 Project Context

The details of the Project including location, make and model of the Wind Turbine Generators (WTGs), power evacuation and status that is known at this stage of the assessment has been provided in **Table 2.1**.

Table 2.1 Key information known about FOWPI

S.N.	Aspect	Details
1.	Location of the Project	<p><u>Onshore Project Components</u>: the landfall point ⁽⁷⁾, proposed onshore pooling substation, stock yard, storage area and site office is located within a 10 km radius of the Pipavav Port in Village Rampara, Taluk Rajula, District Amreli in Gujarat, India.</p> <p><u>Offshore Wind Turbines</u>: 150 to 300 turbines and potentially one or more offshore pooling substation(s) will be located approximately 9.0 to 23.5 nautical miles in the southeast direction from Pipavav Port in the Gulf of Khambhat, off the coast of Gujarat, India.</p>
2.	Type of WTGs	The make and model of the wind turbine generators are unknown at this stage of the Project. Two Turbine capacities namely 3.0 MW and 6.0 MW are being considered for the wind farm at this stage. The turbines will be sited about 0.5 km apart (for 3 MW option) to 1.0 km apart (for 6 MW option).
3.	Power Evacuation	<p>Power generated from the offshore wind turbines will be evacuated through subsea export cables (length and capacity unknown) to an onshore Pooling Substation (PSS) near the onshore landing point. Alternatively, the use of array cables (length and capacity unknown) to connect the individual turbines to one or more offshore PSS near the wind turbines will be considered.</p> <p>The Project will be connected to the grid through onshore cabling (length and capacity unknown) that connects the onshore/offshore PSS to an under-planning 400/220 kV substation being planned by GETCO at Village Pipavav, Taluk Rajula, District Amreli or existing GETCO substation near the Ultratech Unit in Village Kovaya, Taluk Rajula, District Amreli. The onshore cabling will be either buried or overhead.</p>
4.	Seascape	A total Project area of approximately 400 sq. km. has been determined for the offshore wind turbines.
5.	Land Requirement	<p><u>Offshore Components</u></p> <p>The Project Developer/s will have to enter into a contract/lease with the National Institute of Wind Energy (NIWE) for seabed allocation. The total area required will depend on the finalized WTG components and offshore pooling substation.</p> <p><u>Onshore Components</u></p> <p>In case of onshore PSS requirement, the Project will require a single land parcel of undetermined area for the construction of the PSS. Additionally, Right of Way (RoW) needs to be obtained for the landfall point and export cabling route leading up to the PSS.</p>

(7) Point where the export cabling route touches the shore

S.N.	Aspect	Details
		For the offshore PSS and/or onshore cabling from the onshore PSS, RoW needs to be obtained to establish the onshore cables upto the selected GSS location. Furthermore, to meet the requirement of area during construction as well as operation and maintenance phases of the Project, FOWPI is in discussion for obtaining approximately 50,000+ m ² area within the Pipavav Port.
6.	Project Status	The project is in the planning stages and is presently undergoing multiple technical studies to determine feasibility. The tentative Commercial Operation Date (CoD) is five (05) years from the awarding of the Project.
7.	Contractor and Subcontractors	Not determined at this stage of the project

Source: (FOWPI, 2017) and Kick-off Meeting

2.2 Project Proponents

COWI A/S (Denmark) is the main contract holder and working as the project manager for FOWPI. Having partnered with WinDForce Management Service Pvt. Ltd., an Indian based wind energy consultant is working as a sub-supplier to the project. COWI A/S has also a local workplace in India, 'COWI India' based in NCR region (Gurgaon).

COWI is a leading multidisciplinary consultancy group, which has significant experience within the offshore wind energy sector and provide complete service package from identification of project sites to planning and design, contracting assistance, construction services, assistance during operation and maintenance, and decommissioning. COWI provides services to a range of clients including developers, turbine manufacturers, contractors, international financial institutions, development banks, investors and utility companies.

WinDForce Management Services (WFMS) is an independent wind energy consultant, which provides expert technical and management consulting services to various stakeholders involving in wind energy projects. WFMS is providing technical and management support to COWI for the FOWPI project.

Ministry of New & Renewable Energy (MNRE) is be the nodal ministry for development of Offshore Wind project in India and act as one of the government entities, among others, for development and use of maritime space within the Exclusive Economic Zone (EEZ) of the country.

National Institute of Wind Energy (NIWE), one of the arm of MNRE will act as the nodal agency for the development of the offshore wind energy in the country.

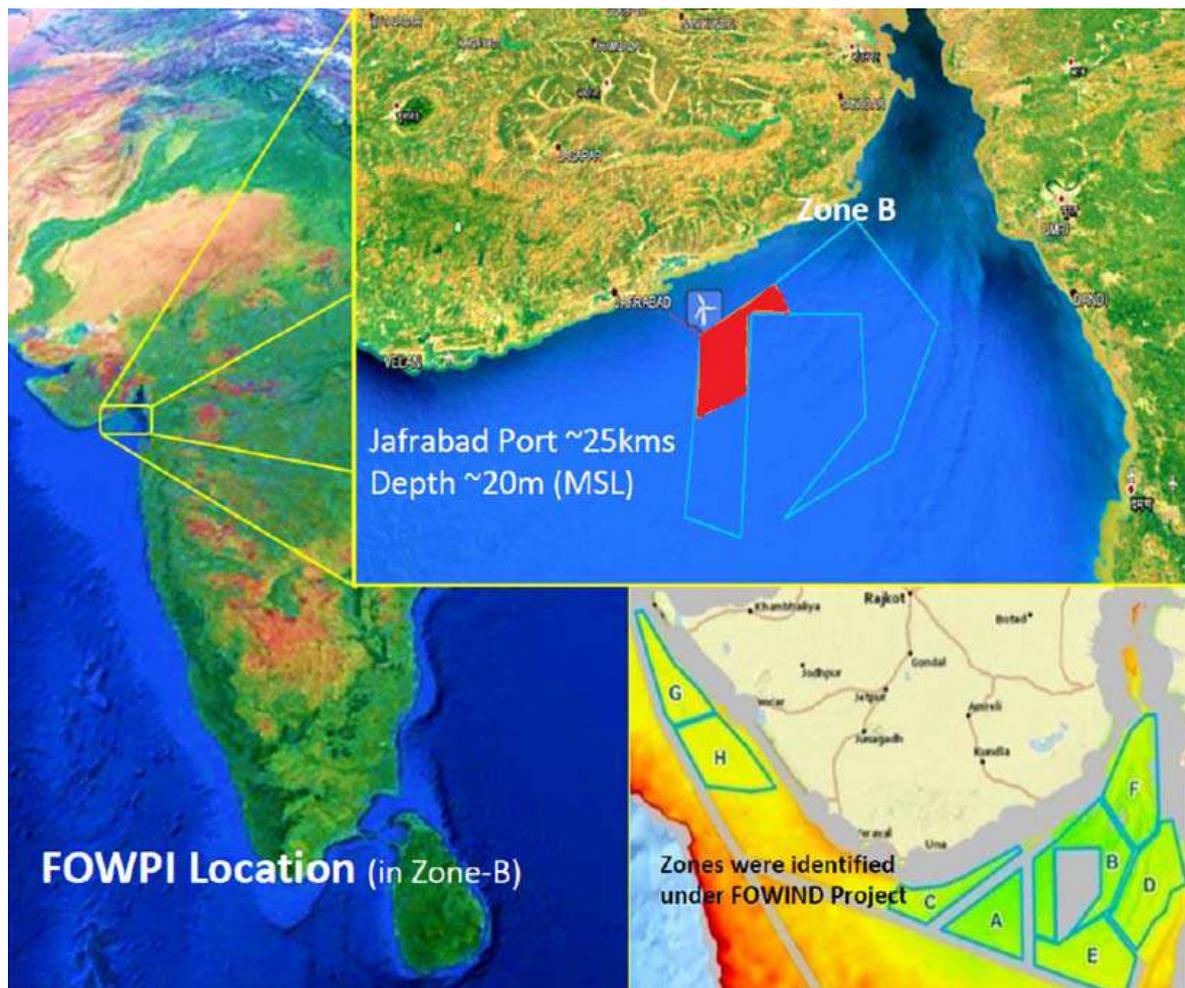
Gujarat Energy Transmission Corporation Limited (GETCO) will be responsible for Grid Connection plan for the Project.

2.3 Site Setting

The project is planned to be carried out within Zone B out of the eight zones identified near Gujarat Coast for development of offshore wind energy projects based on wind potential analysis by FOWIND Project⁸. Map showing location of all the eight zones identified on Gujarat coast is presented in **Figure 2.1**.

⁸ Facilitating Offshore Wind in India (FOWIND) project was conceptualised under the Indo-European co-operation on Renewable Energy Program and is funded through a grant from European Union. The aim of this project was to facilitate offshore wind power development in India with focus on the States of Gujarat and Tamil Nadu for identification of potential zones for development through techno-commercial analysis and preliminary resource assessment. Global Wind Energy Council (GWEC) led the project implementation consortium. The other consortium partners include the Centre for Study of Science, Technology and Policy (CSTEP), DNV GL, the Gujarat Power Corporation Limited (GPCL) and the World Institute of

Figure 2.1 Location of zones identified on the coast of Gujarat



Source: http://www.fowind.in/FOWIND_leaflet.pdf

Tentative project location for the FOWPI project is about 9.0 to 23.5 nautical miles in the southeast direction from Pipavav Port with an average depth of 10-22 m. Geographical coordinates of the proposed Project site are:

Table 2.2 Coordinates of proposed offshore wind park area

Boundary Point	Latitude	Longitude
1.	20° 35' 23.4724" N	71° 39' 36.0604" E
2.	20° 35' 40.3142" N	71° 42' 48.9256" E
3.	20° 37' 8.6836" N	71° 46' 32.2712" E
4.	20° 38' 33.8318" N	71° 48' 27.8889" E
5.	20° 44' 35.4573" N	71° 48' 27.0911" E
6.	20° 50' 2.6047" N	71° 48' 26.4892" E
7.	20° 50' 2.4566" N	71° 51' 34.0013" E
8.	20° 51' 38.8328" N	71° 50' 51.3695" E
9.	20° 53' 11.1231" N	71° 49' 52.7061" E
10.	20° 51' 17.5642" N	71° 46' 54.6909" E
11.	20° 49' 9.3229" N	71° 43' 30.8629" E
12.	20° 46' 42.3267" N	71° 39' 35.7641" E

Sustainable Energy (WISE). National Institute of Wind Energy (NIWE) joined the consortium as knowledge partner on 15 June 2015.

Boundary Point	Latitude	Longitude
13.	20° 43' 16.9636" N	71° 39' 35.0917" E
14.	20° 38' 36.9260" N	71° 39' 36.6028" E

Source: (NIWE, n.d.)

The project location map showing the main project components has been provided in **Figure 2.2**.

2.3.1 Pipavav Port

The Pipavav Port has been operational since April 2002 catering to steel and chemical plants. The Project proponent is in discussion with the Pipavav Port staff to provide infrastructure and resources for the offshore wind farm construction, operation and maintenance including:

- Provision of space within the port for storage of materials (including wind turbine components), construction of monitoring room/site office and storage yard for maintenance equipment during operational phase; and
- Docking area for dedicated Project vessels.

Pipavav port is expected to be the main port supporting the installation and O&M of the 1 GW Offshore Wind Farm and thus is the focus of this report. Other ports in the area could also be supporting in the construction and operation of the Project.

Several industries are currently operational within the port premises including:

- Reliance Shipbuilding Yard;
- Reliance Special Economic Zone;
- Narmada Cement;
- Ultratech Cement; and
- Coal Storage Yard.

The port is in the process of undergoing an expansion as shown in **Box 2.1**. The map showing the Pipavav Port and main industries is provided in **Figure 2.3**.

Box 2.1 Expansion of Pipavav Port

In 2010, Pipavav Port applied for expansion of the 590 ha land to accommodate additional cargo handling facilities, back-up infrastructure and port services. The port obtained an Environmental Clearance in January 2011 for the same. The expansion will occur in two phases, at the completion of the second phase, the following infrastructure will be upgraded:

Aspect	Pre-expansion Infrastructure	Post-expansion Infrastructure
Bulk Terminal		
No. of Berths	2	3
Quay Length	390 m	800 m
Capacity	5 mtpa	26 mtpa
Storage Area	17 ha	27 ha
Container Terminal		
No. of Berths	2	4
Quay Length	685 m	1470 m
Capacity	850,000 TEUs	4,000,000 TEUs
Storage Area	16 ha	66 ha
Liquid Cargo Terminal		
No. of Berths	1	2
Capacity	2 mtpa	4 mtpa

The first phase of expansion has already been completed and the second phase of the expansion is currently under planning and should be initiated in the next couple of years as confirmed by Pipavav Port Staff. The layout maps for the Pipavav Port Expansion has been provided in **Appendix B**.

Source: (Aquatech Enviro Engineers, 2011)

Figure 2.2 Project Location Map

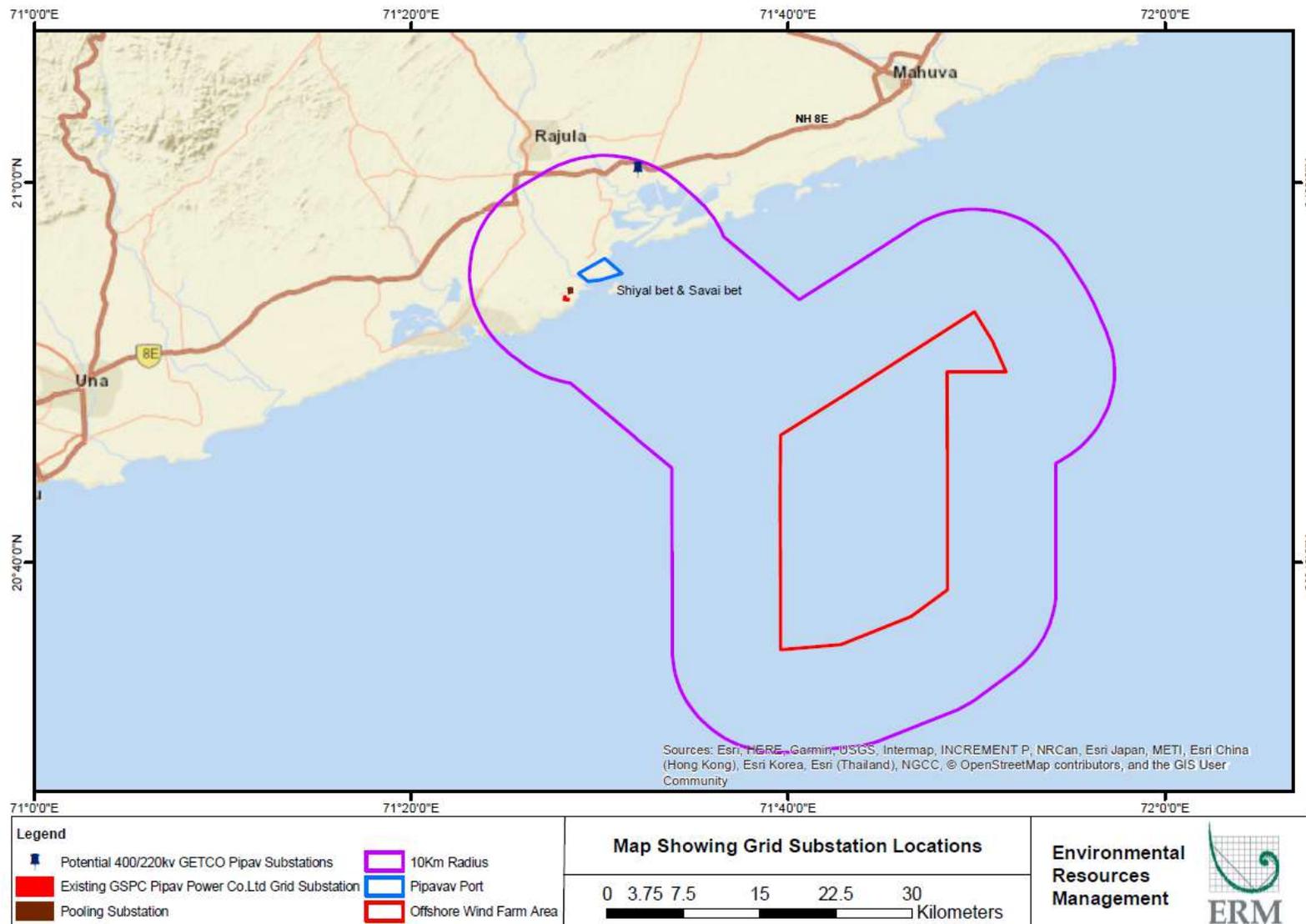
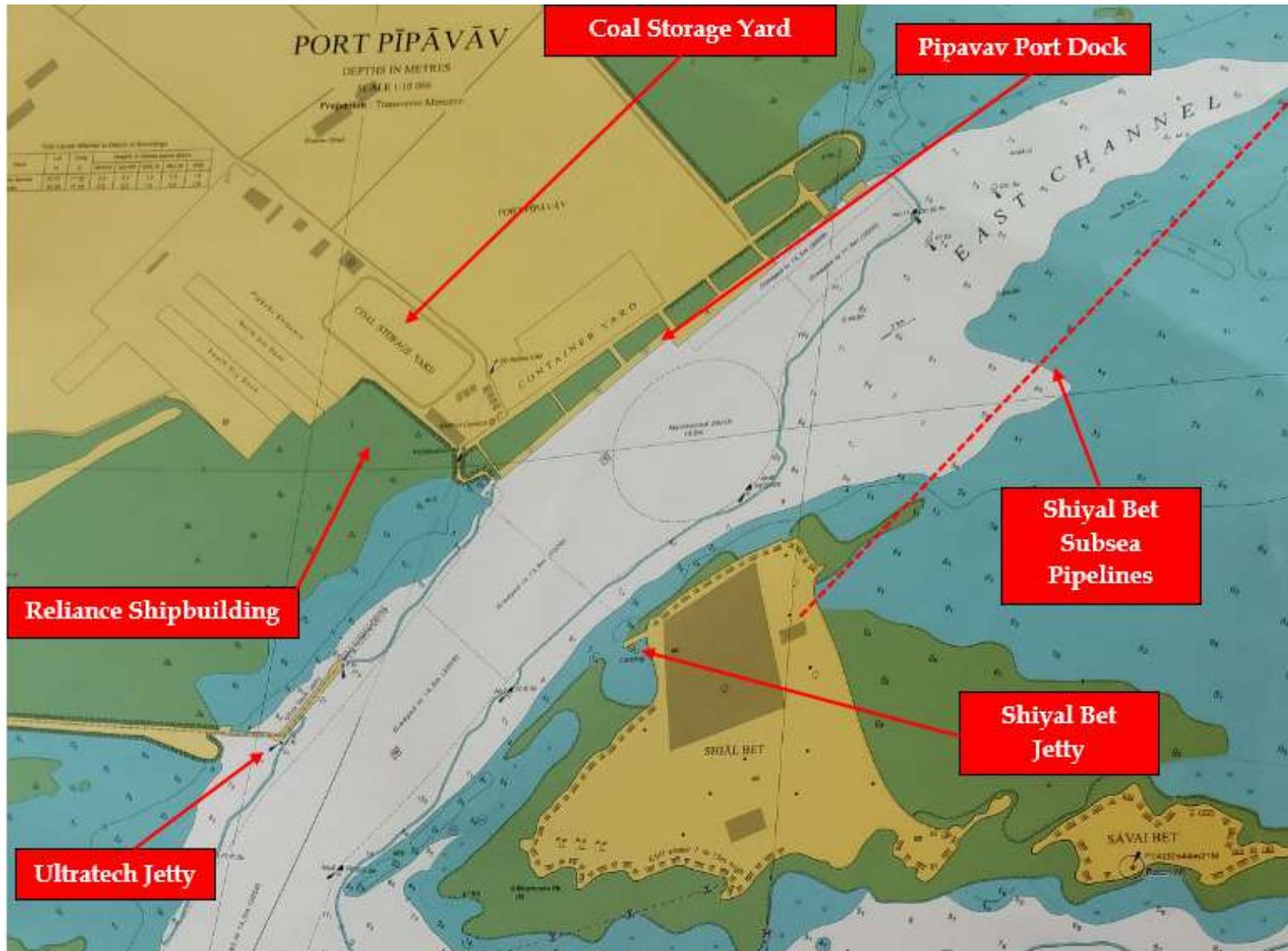


Figure 2.3 Project Location Map (zoomed into Pipavav Port Shipping Channel)



2.3.2 Fence-line Communities

Fence-line communities are affected/potentially affected communities living in the immediate vicinity of the project footprint and vulnerable to potential offsite implications of onsite hazards.

2.3.2.1 Shiyal Bet

The settlement of Shiyal Bet is located on an island approx. 500 metres south of the APM Terminals jetty. As per Census of India 2011, there are 832 households (5,096 population) in Shiyal Bet. The only access to Shiyal Bet is the Shiyal Bet jetty located adjacent to the Pipavav Port jetty. At the eastern end of Shiyal Bet is a rocky island called Savai Bet, detached at high tide. There is a tomb of a Pir or Muslim Saint called Savai Pir in Savai Bet.

2.3.2.2 Rampara No.-2

Rampara No.-2 is located adjacent to Pipavav port boundary in north-west direction. Most of the land acquired for the port was from Rampara No-2. Total population of Rampara No-2 as per Census of India 2011 is 3559.

A description of socio-economic baseline of the island of Shiyal Bet and Rampara No-2 is provided in **Section 4.7**

2.3.3 Oil and Gas Exploration Block

The mouth of the Gulf of Khambhat is also an Oil and Gas Exploration block that is dominated by the Panna – Mukta – Tapti Oil fields. The Tapti oil field, which is the furthest north of the three, is located within 5 km of the proposed wind farm area. The significance of the oil and gas exploration block has been discussed in **Section 4.2.5**.

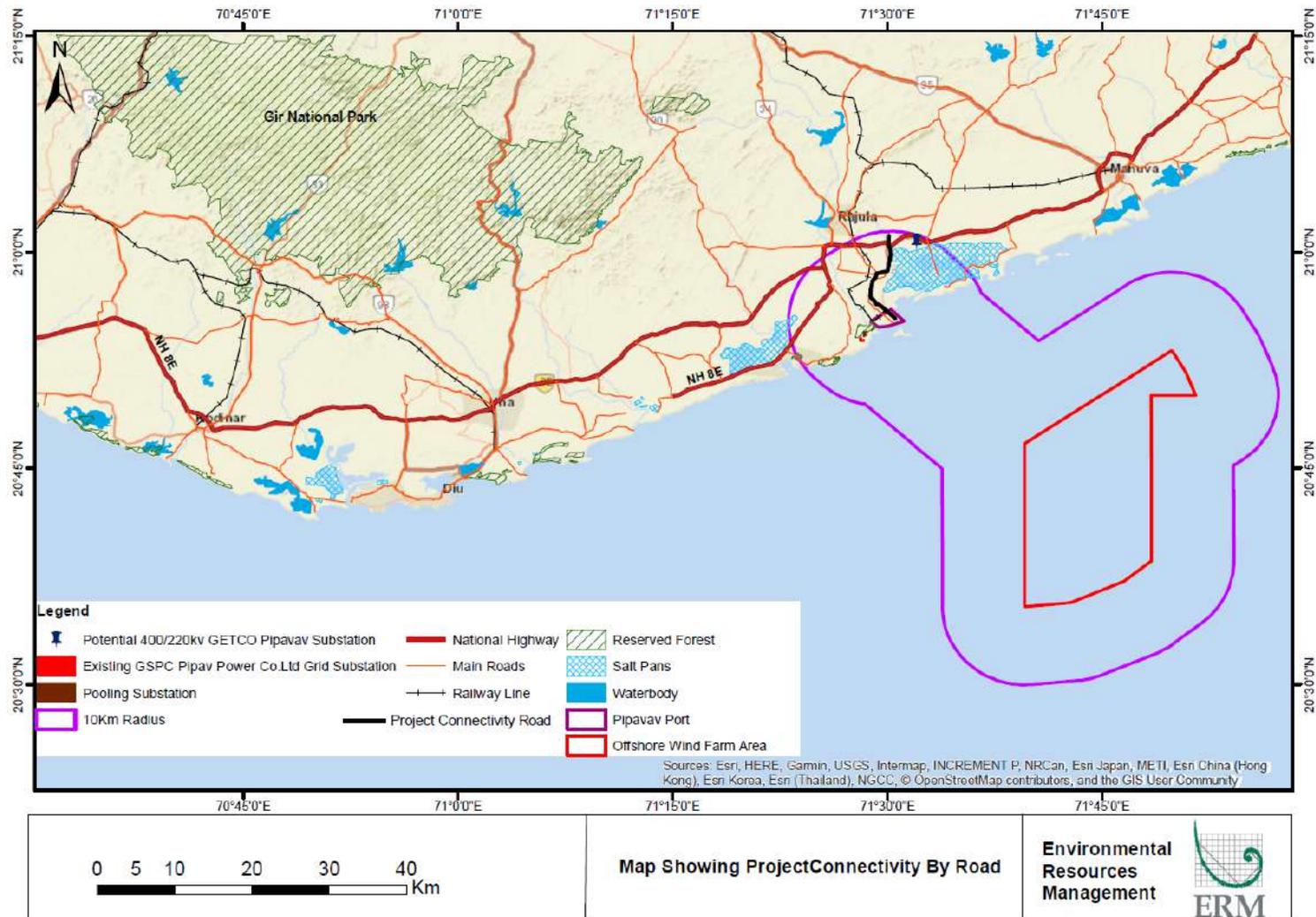
2.3.4 Accessibility

The proposed Project site can be accessed via the Pipavav port. Pipavav port is well connected via road as shown in **Figure 2.4**.

The Port has developed 11 km four-lane expressway, which connects the port to National Highway 8E, which is 455 km in length. National Highway 8E connects Bhavnagar to Dwarka via Somnath and Porbandar. The highway is currently two lanes; however, expansion work of highway from 2 lane to 4 lane is being undertaken.

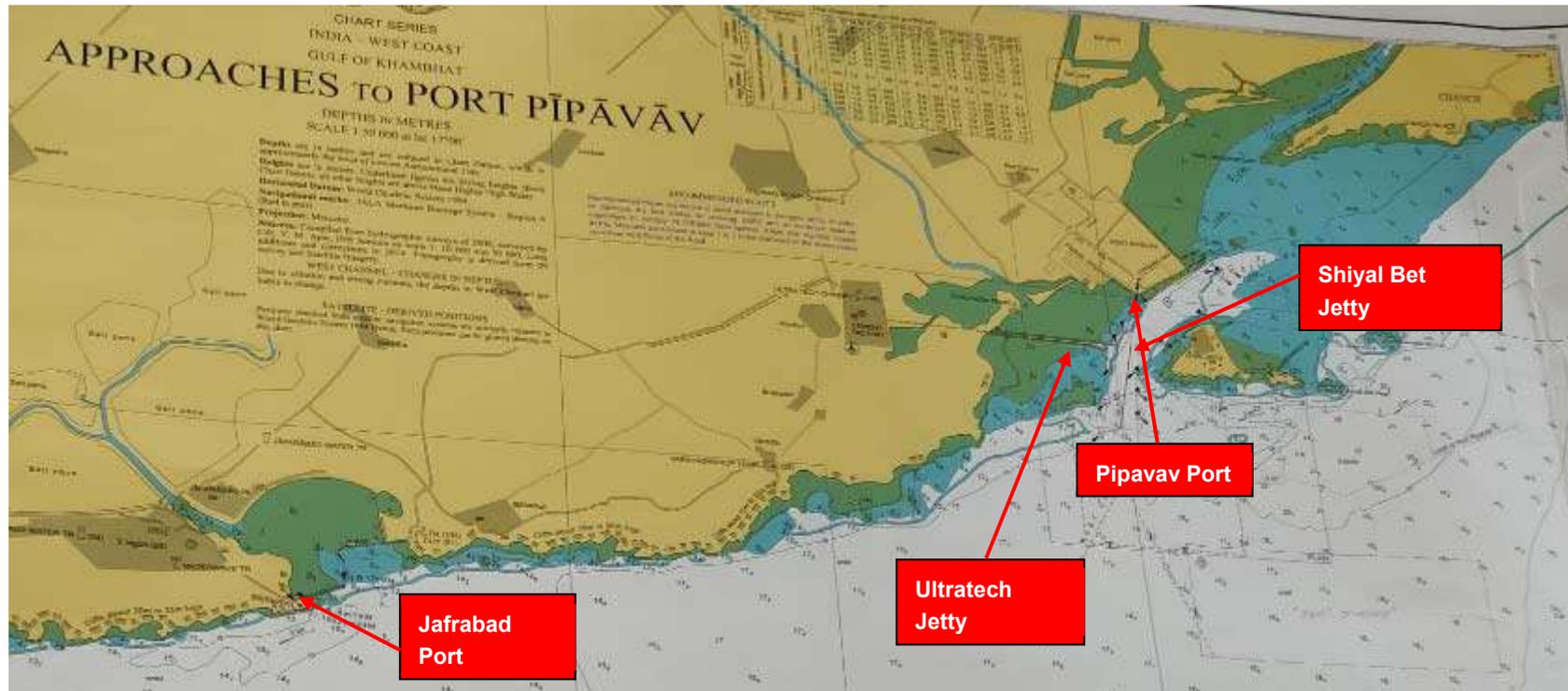
The Pipavav Port is part of several ports that are located in the region including Jafrabad Port and Mahuva Port as shown in **Figure 2.5**. Each of these ports are along the shipping navigation channel that connects the western border of the Gulf of Khambhat. In addition to that two jetties are located close to Pipavav port, namely Ultratech Jetty and Shiyal Bet Jetty.

Figure 2.4 Map showing road connectivity of Pipavav port



Note: Onshore Pooling Substation location is indicative only.

Figure 2.5 Ports along the Gujarat coast that are immediately north and south of Pipavav



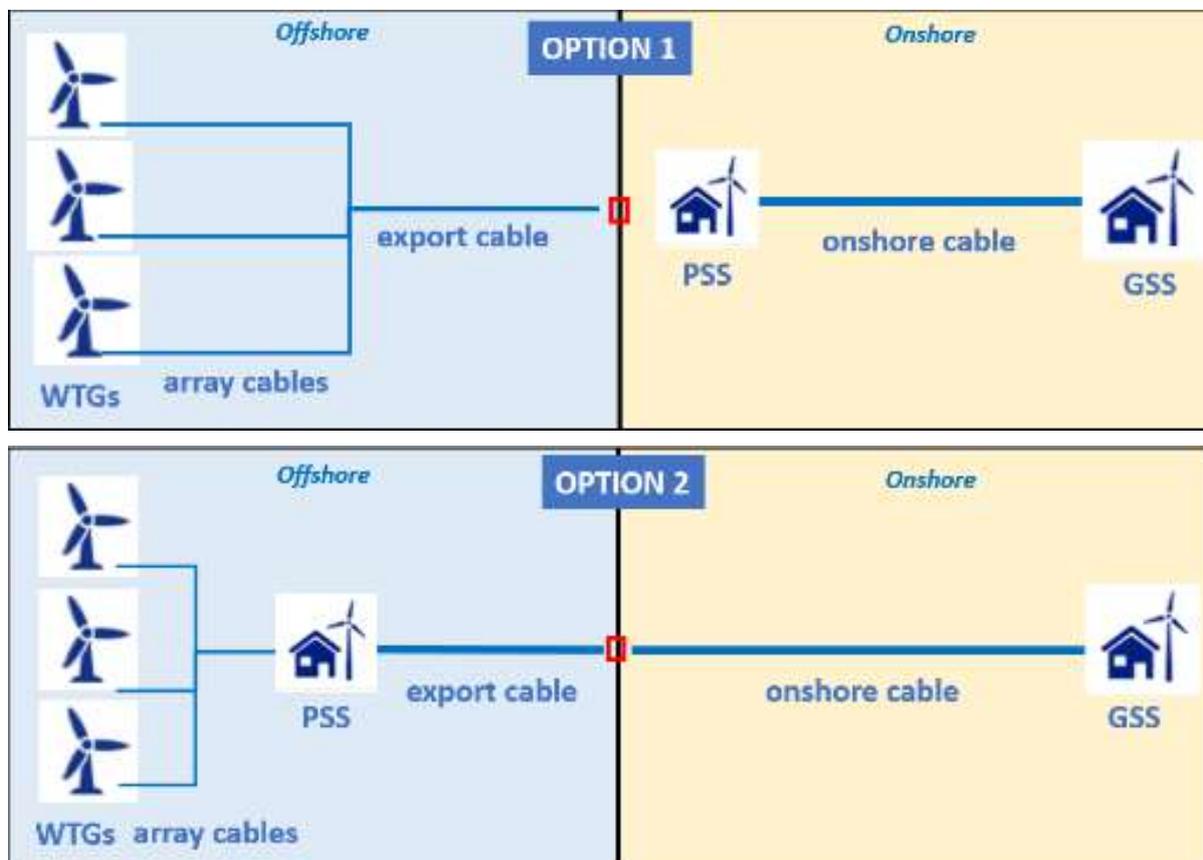
Source: Map #2100 as seen in Pipavav Port

Note: Mahuva Port is not shown but located 24 km further east of the map boundary.

2.4 Project Components

The key components of the Project have been provided in **Figure 2.6**. As shown in the figure, two options have been considered – offshore pooling substation and onshore pooling substation. Each of the options and the constituent components have been discussed in subsequent sections.

Figure 2.6 Components of the offshore wind farm



2.4.1 Wind Turbine Generators (WTGs)

The standard set of wind turbines manufactured in India are not designed for offshore use (COWI, FOWPI, 2018) and therefore detailed investigations are required prior to finalizing the make and model of the turbine for the Project. For the purpose of the E&S Scoping and other feasibility analysis, two configurations have been considered as shown in **Table 2.3**.

Table 2.3 Configurations of the wind turbine generators under consideration

S.N.	Rated Capacity (MW)	Rotor Diameter (m)	Hub Height (m)
1.	3	112	86
2.	6	154	107

Source: FOWPI Wind Turbine Layout and AEP Report

2.4.2 Turbine Foundations

The turbine foundation is determined through several factors including water depth, wind turbine MW class, cost, ground conditions and installation vessels availability. Typically, the foundation concepts used in offshore wind farms has been presented in **Figure 2.7**.

Based on initial communications from the Client, three of the foundation concepts have been considered – (i) monopiles, (ii) jacket and (iii) concrete gravity based.

Figure 2.7 Foundation Concepts for Offshore Wind Farms



Source: (FOWPI, 2017)

Note: From left to right the following structures have been illustrated – one concrete gravity based (deeper water), one jacket foundation, two monopiles and two concrete gravity based (one shallow water and one offshore substation)

The details of the three selected foundation concepts have been presented in **Table 2.4**.

Table 2.4 Details of selected foundation concepts

S.N.	Foundation Concept	Advantages	Disadvantages
1.	Monopile Foundations	Monopiles are commonly used for offshore wind farms and can be adapted to sites up to 40 meters deep and for 6-8 MW wind turbines. It is suitable for a wide variety of seabed	The foundation consists of a 50-80 m long steel pile of 5-8 m diameter, which is driven into the seabed soil. Grouting ⁽¹⁾ is likely to be used to connect the foundation to the WTG through a transition piece.
2.	Jacket Foundations	Jackets can be used for sites up to 30-50m depth and is suited for larger WTGs. Jacket foundations require smaller foundations piles on each leg than a single monopole	The establishment of the foundation requires welding and assembly of structural components and therefore has a higher cost requirement. The process is also longer because of the labour involved and is not normally utilized for shallower waters.
3.	Concrete Gravity Based Foundations	The gravity-based foundation is proven for up to water depths of 40 m and features a reduced fatigue and corrosion sensitivity. The structures are placed on a prepared seabed and therefore avoid the need for piling.	There is a need for robust substrate at the seabed and the fabrication process is slow and highly space demanding. The need for heavy lifting and transportation can restrict its application. At the Project site, the soft seabed will need to be removed and replaced with a gravel bed to provide stable support. The heavy foundation

(1) Mixture of cement, water and sand employed to fill gaps and connect sections.

S.N.	Foundation Concept	Advantages	Disadvantages
			structures can also be a hazard. It also has a greater footprint and therefore results in more benthic habitat loss than other methods.

Source: (FOWPI, 2017)

Monopiles have been preferred by the Client as the least costly and best time saving option as well as the most commonly used foundation concept. The disadvantages of the foundation concept is the seabed penetration from monopile driving and the use of grouting, which can create noise during piling and water quality issues respectively. The assessment of the chosen configuration with respect to the environment has been covered in **Section 5.1**.

2.4.3 Array Cables

The array cables connect the wind turbines with one another. The length of the cables will be less than a km in most cases as the maximum distance between two wind turbines of 6 MW capacity. If an offshore pooling substation is selected, then longer array cables (~3-5 km length) will be required for connecting the turbines to the offshore pooling substation. The array cables will likely be buried and covered with a rock beam. Two options for the array cables have been considered:

- 33 kV array cables; or
- 66 kV array cables.

The total number and overall length of array cables has not been determined at this stage of the Project.

2.4.4 Pooling Substation

As shown in **Figure 2.6**, two options have been considered for the Pooling Substation – onshore and offshore. The power evacuation details are still under consideration but the likely configuration of the pooling substation is going to be 33/220 kV or 66/220 kV. The locations of the offshore pooling substation(s) is unknown but is likely to be within 3-5 km of the wind farm area. A potential location for the onshore pooling substation has been determined but is tentative and likely to change depending on the preferred configuration for power evacuation. The tentative location has been provided in **Figure 2.8**.

Figure 2.8 Onshore pooling substation location



2.4.5 Export Cables

The export cables will connect the WTG with the onshore pooling substation or the offshore pooling substation with the grid (See **Figure 2.6**). The options considered in **Figure 2.6** have been described below:

- Ten (10) to twenty (20) export cables will be required to connect the WTGs to the onshore pooling substation; and
- One export cable will be required to connect the offshore substation with the grid ¹.

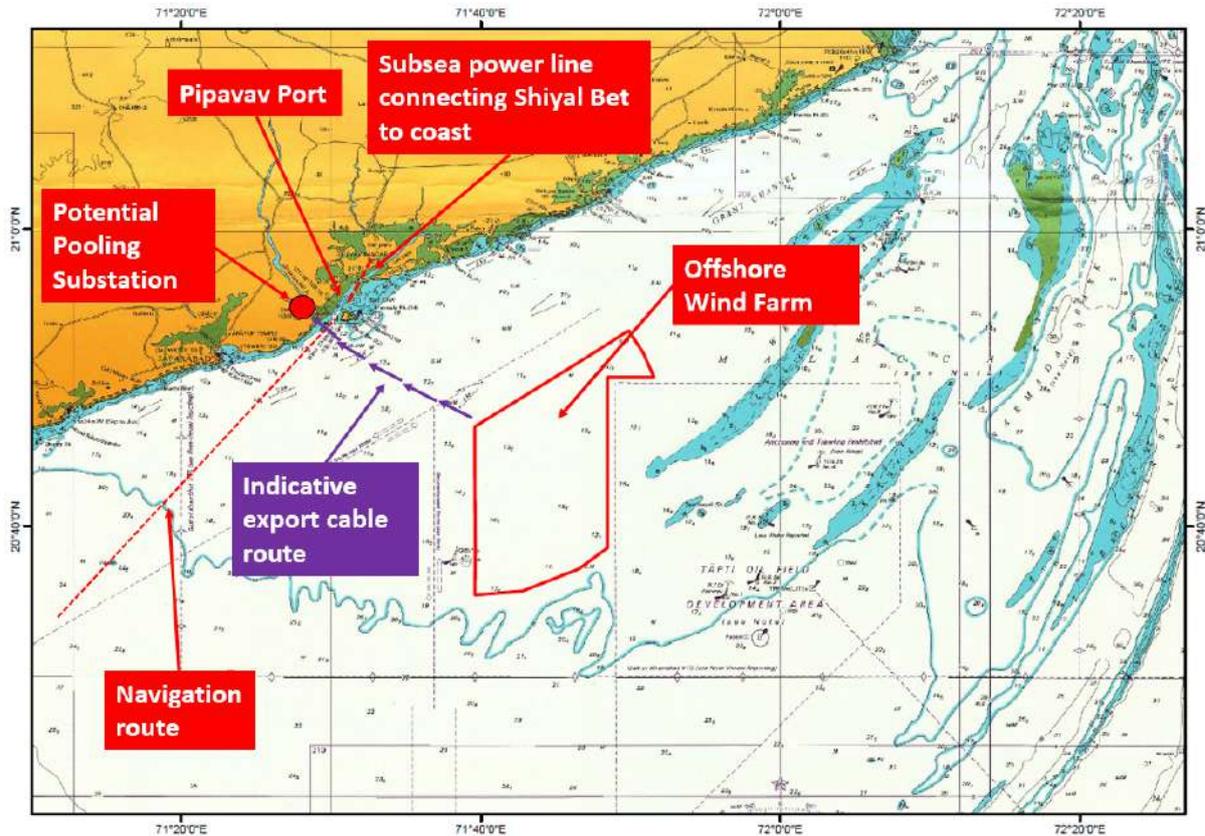
The shortest possible route that connects the wind farm/offshore substation with the coast, taking into consideration environmental, social and technical constraints has been considered as the export cable route. The cables will have to be buried through pre-trenching or post lay burial.

The shortest possible route from the wind farm area to the coast has been provided in **Figure 2.9**. Based on consultations with the Pipavav Port staff, it is understood that due to ongoing dredging activities, the above route is not probable and have recommended an alternate route for the export cable that is also shown in **Figure 2.9**.

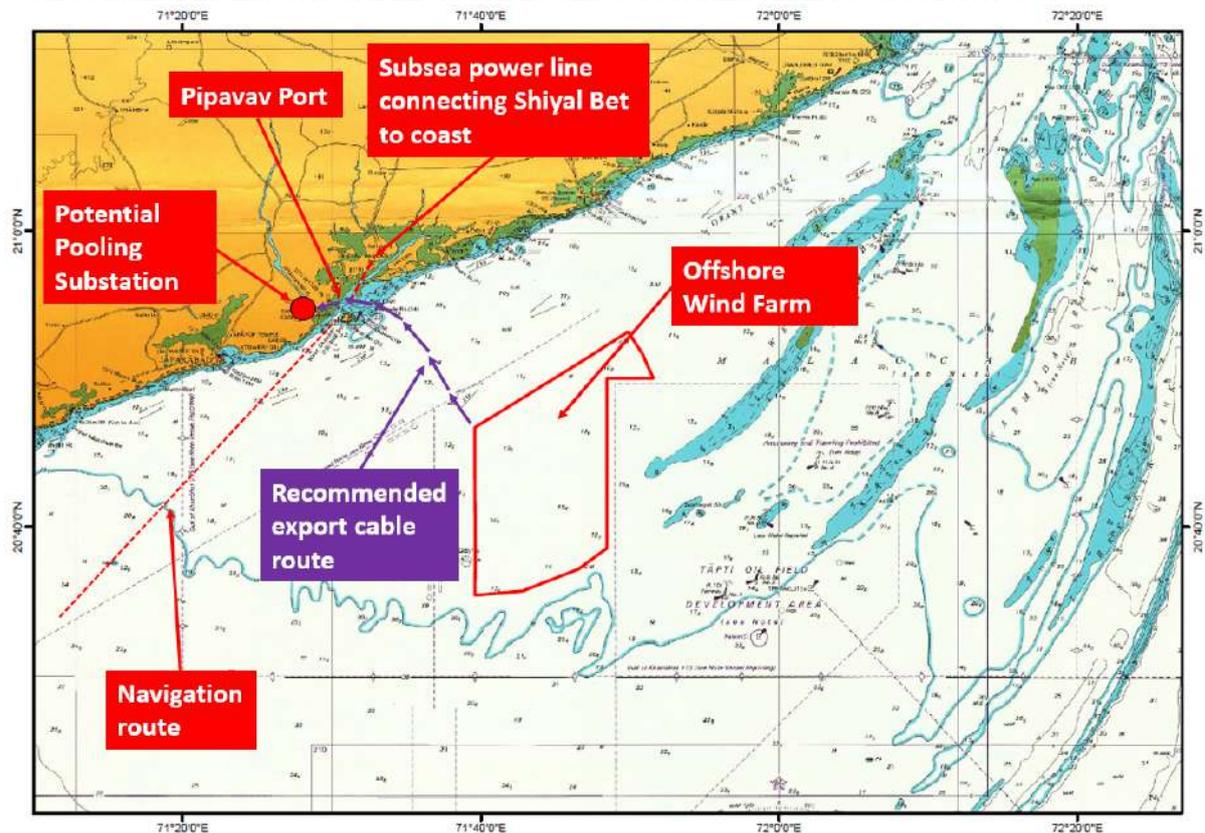
¹ Note: in the case where multiple offshore grid substations are envisaged, one export cable per offshore substation is anticipated for connection to the grid.

Figure 2.9 Shortest and recommended export cable route

INDICATIVE EXPORT CABLE ROUTE AS SHOWN IN ELECTRICAL REPORT:



RECOMMENDED EXPORT CABLE ROUTE BASED ON STAKEHOLDER CONSULTATIONS:



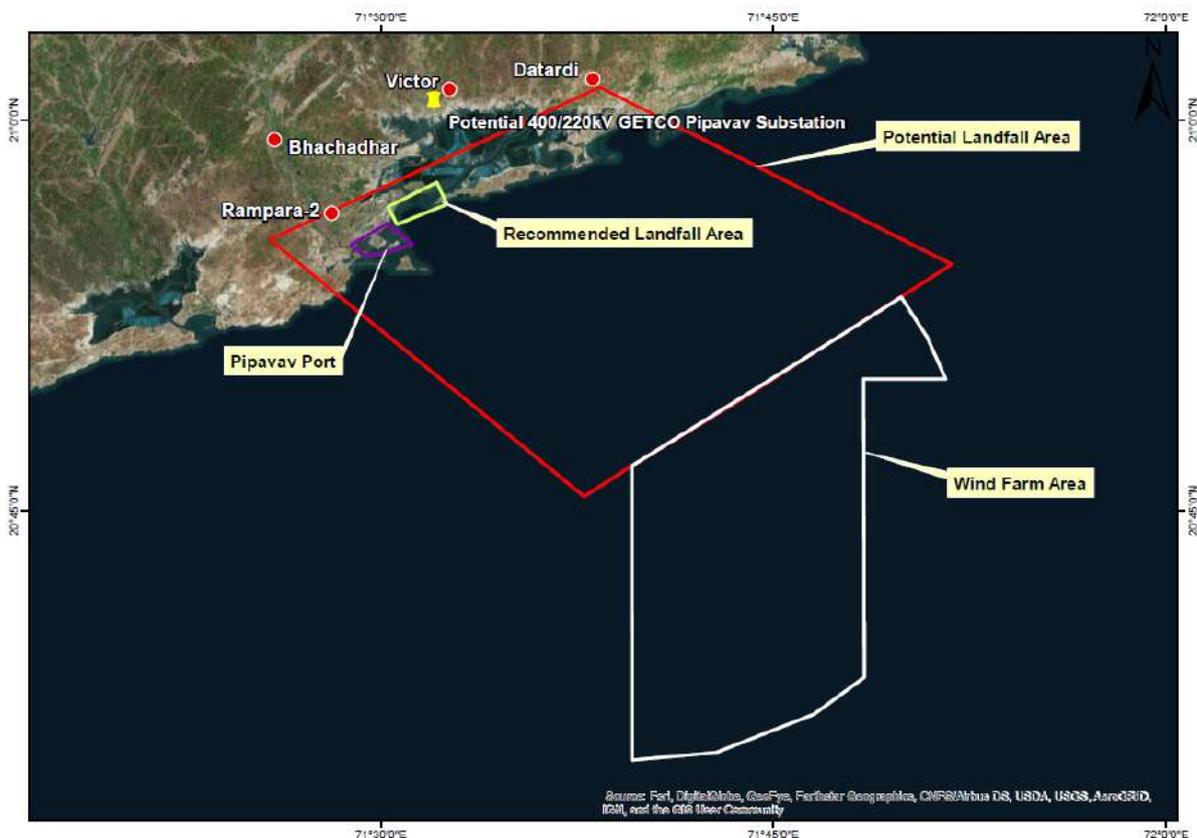
2.5 Landfall

The landfall is the location where the export cable touches the shore and connects to an onshore cabling system. Some key points that need to be identified for the landfall:

- Proximity to the Pooling or Grid Substation (depending on the chosen configuration);
- A flat topography to prevent any horizontal drilling at the landfall point;
- Low to no coastal communities to reduce impacts;
- Easy access to the site by construction machinery; and
- No shipping routes or navigation channels along the route.

As seen in **Figure 2.10**, the landfall point that has been recommended based on information currently available for the Project is north of the Pipavav Port. In discussions with the Pipavav Port Staff, it has been understood that the areas south of the port will not be possible for the landfall point because of the existing dredging and navigation channel. Further north of the port, is the Chanch Bandar salt pan site where permission for landfall will not be provided by the local authority and will receive opposition from communities, as indicated during consultations. The recommended landfall point at this stage of the Project is therefore between the port and salt pan area and has also been provided in **Figure 2.10**.

Figure 2.10 Potential and recommended location for the landfall area



2.5.1 Onshore Cables

The 220 kV onshore cable will be used to connect the onshore pooling substation with the grid. The location of the GSS is not finalized and therefore the exact route and length of the onshore cable is currently unknown. The onshore cables could be buried or overhead as informed by the Client.

2.5.2 Grid Substation

A proposed 400/220 kV Grid Substation in Village Pipavav, Taluk Rajula, District Amreli in Gujarat¹ had been visited as part of the site assessment. No suitable location had been identified within the village boundaries because of inadequate space for construction. Several open land parcels, however, were identified along the Pipavav Approach road and leading to National Highway 8E that could be potentially utilized for construction of the substation.

An alternate option being considered for evacuation to the grid is the GETCO Grid Substation that has been constructed for the evacuation of the 700 MW Gas-based Power Project in Village Kovaya, Taluk Rajula and District Amreli in Gujarat. In consultations between COWI and MNRE, it is understood that there is potential for expansion of this substation for evacuation of the 1 GW offshore wind farm.

Five Grid Substations (GSS) locations were selected for the construction of the original 200 MW offshore wind farm. The increased capacity of the wind farm to 1 GW has eliminated the other options and the proposed 400/220 kV GSS and existing Kovaya GSS has been considered as the potential choices for the Project. The details of the other GSS locations that were visited as part of the site assessment has been provided in **Appendix C**.

2.5.3 Ancillary Components

Typically, an offshore wind farm includes several ancillary components including:

- Site Office and Control Monitoring System (CMS);
- Access and internal roads;
- Storage and stock yard; and
- Batching plant and labour camp.

Additionally, there will be requirement for docking location for any vessels dedicated to construction/maintenance of the wind turbines. The Client has identified a deck with a strength of minimum 20 tons/m² for loading/unloading of piles for the turbines. The current infrastructure has a deck strength of 5 tons/m² but this could be upgraded during the proposed expansion of the port.

2.5.3.1 Site Office and Control Monitoring System

Details of the Site Office and Control Monitoring System has not been determined at this stage of the Project. The two components are likely to be sited within the Pipavav Port itself or adjacent to the proposed onshore pooling substation.

2.5.3.2 Access and Internal Roads

The Pipavav Port has existing paved roads leading from State Highway 34 and 105 that is at least 20 m in width and does not need to be modified/ upgraded for the transportation of wind turbine components.

2.5.3.3 Storage and Stock Yard

Reportedly, a 50,000 m² area within the Pipavav Port is being considered for the storage yard, construction and operation and maintenance activities.

¹ The potential grid substation has been indicated in the GETCO Grid Study available in Appendix F of the COWI, FOWPI – Advisory Electrical Concept Design Report (Version 1, August, 2018)

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2.5.3.4 Batching Plant and Labour Camp

The location, land requirement and capacity of the batching plant and labour camp(s) is unknown at this stage of the Project.

3. ADMINISTRATIVE FRAMEWORK

3.1 Introduction

This section provides legal and regulatory framework along with institutional framework for the Project, covering national requirements as well as applicable international treaties and conventions, guidelines and standards. The intent of this section is to lay out the regulatory and non-regulatory performance requirements for all stages of the Project. The section broadly focuses on:

- Institutional Framework for the implementation of the regulations; and
- Applicable national and international Environmental Standards.

Approval from various regulatory agencies authorized by the Central and State Governments, in the form of Licenses, Permits, or Authorizations, are required for the establishment and operation of proposed Project.

3.2 Institution Framework – Enforcement Activities

A brief description of the relevant enforcement agencies with respect to the institutional framework is described in **Table 3.1**.

Table 3.1 Enforcement agencies relevant to the Project

Agency	Functions	Relevance and Applicability to the Project
Central Level		
Ministry of New and Renewable Energy (MNRE)	<p>Ministry of New & Renewable Energy (MNRE) is the Nodal Ministry for development of Offshore Wind Energy in India and act as one of the government entities, among others, for Development and Use of Maritime Space within the Exclusive Economic Zone (EEZ) of the country. Role of MNRE includes but not limited to the following.</p> <ul style="list-style-type: none"> ■ Overall monitoring of the offshore wind development in the country. ■ Co-ordination with other Ministries/ Departments. ■ Issuing guidelines/directives for development of offshore wind energy. ■ Oversee working and to provide necessary support to the Nodal Agency i.e. NIWE for smooth functioning. ■ Development of International Cooperation. ■ Coordination towards tariff setting and regulatory issues. 	<p>Nodal Ministry - Project will be developed based on guidelines / directives for development of offshore wind farm issued by MNRE.</p>
National Institute of Wind Energy (NIWE)	<p>National Institute of Wind Energy (NIWE) is the Nodal Agency for the development of offshore wind energy in the country. NIWE is responsible for carrying out but not limited to the following:</p> <ul style="list-style-type: none"> ■ Carry out and also coordinate resource assessment and surveys in the EEZ of the Company ■ Demarcation of offshore wind energy blocks ■ Facilitation of project developers in getting clearance from the concerned ministries/ departments ■ Creation and maintenance of offshore wind energy database 	<p>NIWE is the nodal agency responsible for administration and facilitation of the offshore wind energy projects</p>

Agency	Functions	Relevance and Applicability to the Project
	<ul style="list-style-type: none"> ■ Capacity building in the offshore wind energy sector, etc. 	
<p>Ministry of Defence (MoD) – Indian Coast Guard</p>	<p>Indian Coast Guard (CG) was set up as an Armed Force of the Union of India in 1978 under the Coast Guard Act, 1978 (as amended in 2002) for preservation and protection of maritime zones of India. CG is responsible for keeping regular surveillance in order to prevent poaching/ smuggling, other illegal activities and pollution control at sea, search and rescue and protection of marine environment. The organization is headed by the Director General Indian Coast Guard (DGICG) exercising his overall command and superintendence from the Coast Guard Headquarters (CGHQ) located at New Delhi. The primary duties of Indian Coast Guard are:</p> <ul style="list-style-type: none"> ■ Protect ocean and offshore wealth including oil, fish and minerals; ■ Protect the artificial islands and off-shore installations; ■ Assist Mariners in distress and safeguard life and property at sea. ■ Enforce Maritime laws with respect to sea, shipping, poaching smuggling and narcotics. ■ Preserve maritime environment and ecology and to protect rare species; and ■ To collect scientific data. 	<p>Commencement of exploration/survey work is required to be notified to the Ministry of Defence (MoD).</p>
<p>Ministry of Defence – Indian Navy: Flag Officer Offshore Defence Advisor Group</p>	<p>Offshore Defence Advisory Group was constituted on 31 Dec 1983 to plan and advise Naval Staff and ONGC on security arrangements in the offshore regions. It functions as the nodal agency for all interaction with ONGC and other oil Exploration & Production (E&P) companies in matters relating to defence of offshore installations within the Maritime zones of India. The primary functions of FODAG include following:</p> <ul style="list-style-type: none"> ■ To advise the Government of India including the Ministries of Defence, Petroleum & Natural Gas and Shipping and Civil Aviation through the Chief of the Naval Staff on all planning and policy aspects of offshore security and defence covering territorial waters, the Continental Shelf, the Exclusive Economic Zone and other Maritime Zones of India as defined in the MZI Act 1981. These aspects include:- <ul style="list-style-type: none"> - Coordination of the functioning of offshore security arrangements; - Identification of various threats to offshore installations and terminals; 	<p>All vessels deployed in the area by contracted companies of the developer shall undergo naval security inspection of the concerned Naval Command, Flag Officer, Offshore Defence Advisory Group (FODAG) prior to their deployment.</p>

Agency	Functions	Relevance and Applicability to the Project
	<ul style="list-style-type: none"> - Identification and defining of military threats in situations short of war; and - Examination and proposing of appropriate security measures in respect of all entities engaged in offshore exploration and other measures necessary for the security of offshore installations and terminals <ul style="list-style-type: none"> ■ To exercise command and control over mobile forces and static defences in the defence of offshore installations, as directed by the respective Commander -in-Chief's. ■ To monitor mercantile traffic for transit through recommended routes/ fairways in the vicinity of offshore areas, in coordination with the concerned civil authorities. ■ To inspect vessels engaged in offshore work, prior to their being deployed, for the purpose of ascertaining compliance with the security clearance accorded by competent authority. 	
<p>Ministry of Petroleum and Natural Gas</p>	<p>Ministry of Petroleum and Natural Gas (MOPNG) is responsible for the exploration, production, refining, distribution, marketing, import, export, and conservation of petroleum, natural gas, petroleum products, and liquefied natural gas in India.</p>	<p>Since the Project is proposed near Oil & Gas block, necessary approvals are to be obtained from MoPNG.</p>
<p>Directorate General of Hydrocarbons (DGH)</p>	<p>The Directorate General of Hydrocarbons (DGH) was established in 1993 under the administrative control of Ministry of Petroleum & Natural Gas (MoPNG) through Government of India Resolution. Objectives of DGH are to promote sound management of the oil and natural gas resources having a balanced regard for environment, safety, technological and economic aspects of the petroleum activity.</p> <p>The DGH has been entrusted with several responsibilities such as implementation of New Exploration Licensing Policy (NELP), matters concerning the Production Sharing Contracts (PSC) for discovered fields and exploration blocks, promotion of investment in E&P Sector and monitoring of E&P activities including review of reservoir performance of producing fields. In addition, DGH is also engaged in opening up of new unexplored areas for future exploration and development of non-conventional hydrocarbon energy sources like Coal Bed Methane (CBM) as also futuristic hydrocarbon energy resources. DGH also advise Government on policy formulations in oilfield operations.</p>	<p>Project needs to obtain clearance for operating outside oil and gas exploration zones</p>

Agency	Functions	Relevance and Applicability to the Project
<p>Ministry of Environment, Forest and Climate Change (MoEFCC)</p>	<p>The Ministry of Environment, Forest and Climate Change (MoEFCC) is the nodal agency in the administrative structure of the Central Government for the planning, promotion, co-ordination and overseeing the implementation of India's environmental and forestry policies and programmes.</p> <p>The primary concerns of the Ministry are implementation of policies and programmes relating to conservation of the country's natural resources including its lakes and rivers, its biodiversity, forests and wildlife, ensuring the welfare of animals, and the prevention and abatement of pollution. While implementing these policies and programmes, the Ministry is guided by the principle of sustainable development and enhancement of human well-being.</p> <p>The broad objectives of MoEFCC include the following:</p> <ul style="list-style-type: none"> ■ Conservation and survey of flora, fauna, forests and wildlife; ■ Prevention and control of pollution; ■ Afforestation and regeneration of degraded areas; ■ Protection of the environment; and ■ Ensuring the welfare of animals. 	<p>Offshore windfarms are not covered under the Schedule I of EIA Notification, 2006 which requires an Environmental Clearance (EC) to be obtained. The offshore wind farm area starts from about 9 nm to 23.5 nm. Therefore, the offshore windfarm installation based on their distance to the coast (upto 12nm) will also require CRZ clearance to be obtained from the MoEF &CC and GCZMA.</p> <p>Also an Environmental Clearance (EC) may get triggered for the onshore structures likely to developed for the proposed project under the following circumstances:</p> <ul style="list-style-type: none"> ■ O&M building facilities designed with a total built-up area of $\geq 50,000$ sq. m.; and ■ Onshore cable line route that passes through any notified ecologically sensitive area. <p>All activities pertaining to laying of sub-sea power cables/onshore cables including setting up of sub-station for power evacuation from non-conventional energy sources within the coastal regulation zone (CRZ) will require necessary clearance to be obtained from Gujarat Coastal Zone Management Authority (GCZMA) and Ministry of Environment Forests & Climate Change (MoEFCC).</p> <p>All O&M building facilities that have a total built-up area of $\geq 5,000$ sq. m. to $< 50,000$ sq. m. will need to fill and submit a self-declaration form to the local authority showing compliance to the environmental conditions stated in the <i>MoEFCC 13th March, 2018 Gazette Notification Appendix XIV.</i></p>

Agency	Functions	Relevance and Applicability to the Project
Ministry of External Affairs (MEA)	The Ministry of External Affairs, also known as the Foreign Ministry, is the government agency responsible for the conduct of foreign relations of India. It also advises other Ministries and State Governments when the latter have dealings with foreign governments or institutions.	NOC from MEA to be secured, in case the Project involving deployment of any foreign nationals on vessels involved in the research, survey, exploitation and exploration of resources within MZI.
Directorate General of Civil Aviation	<p>Directorate General of Civil Aviation is the regulatory body governing the safety aspects of civil aviation in India. The main functions of DGCA are mentioned below:</p> <ul style="list-style-type: none"> ■ Formulation of standards of airworthiness for civil aircraft registered in India and grant of certificates of airworthiness to such aircraft; ■ Licensing of pilots, aircraft maintenance engineers and flight engineers, and conducting examinations and checks for that purpose; ■ To act as a nodal agency for implementing Annex 9 provisions in India and for coordinating matters relating to facilitation at Indian airports including holding meetings of the National Facilitation Committee; and ■ Granting approvals for operation of helipads and for air emissions through elevated chimneys of higher than 30m. 	Clearance for construction near aviation radars/ aerodromes. No clearance/NOC required for all other locations.
Ministry of Home Affairs (MHA)	The Ministry of Home Affairs (MHA) or Home Ministry is a ministry of the Government of India. It is mainly responsible for the maintenance of internal security and domestic policy.	Project will require necessary security clearance for the Company and the Directors to be involved in the development of the proposed project.
Directorate General of Shipping	The Directorate General of Shipping, India deals with implementation of shipping policy and legislation so as to ensure the safety of life and ships at sea, prevention of marine pollution, promotion of maritime education and training in co-ordination with the International Maritime Organization, regulation of employment and welfare of seamen, development of coastal shipping, augmentation of shipping tonnage, examination and certification of Merchant Navy Officers, Supervision and Control of the allied offices under its administrative jurisdiction.	The project will require approvals from Directorate General of Shipping for vessels operating within coastal and territorial waters.
Department of Telecommunication (DoT)	The Department of Telecommunications, is a department of the Ministry of Communications of the executive branch of the Government of India. DoT is responsible for formulating developmental policies for the telecommunication services and is responsible for frequency management in the field of radio communication in close coordination with the international bodies. It also enforces wireless regulatory measures by monitoring wireless transmission of all users in the country.	Project to obtain NOC from DoT for laying of sub-sea export cables/power cables which may fall outside the subsea communication cable zone.

Agency	Functions	Relevance and Applicability to the Project
<p>Petroleum and Explosives Safety Organization (PESO)</p>	<p>Petroleum and Explosives Safety Organization (PESO) falls under the Department of Industrial Policy & Promotion, Ministry of Commerce and Industry, Government of India, with its head office at Nagpur. The Chief Controller of Explosives (CCE) is responsible to deal with provisions of:</p> <ul style="list-style-type: none"> ■ The Explosive Act, 1884 and Rules, 2008; ■ The Petroleum Act, 1934 and the Rules, 2002; ■ The Static and Mobile pressure vessels {Unfired} Rules, 1981 and amendment 2000, 2004; ■ Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 and amendment, 2000. <p>The other major functions of PESO have been enumerated below:</p> <ul style="list-style-type: none"> ■ Ensure public safety in the areas of manufacture, transport, storage, handling, etc. of Explosives, Petroleum, Carbide of Calcium, Inflammable substances and Compressed Gases. ■ Advisory role in matters of safety to the government and semi-government bodies like Ports, Railways, Defence establishments & Ministry of Surface Transport, Environment & Forest, Petroleum Natural Gas, Pollution Control Authorities etc. coming within the purview of Explosives Act 1884 and Petroleum Act 1934 and the rules framed thereunder; and ■ Framing National Standards concerning public safety in collaboration with BIS, OISD & other apex bodies and harmonizing Indian standards with international standards. 	<p>Project needs to obtain approvals from PESO for importing/ stocking explosives required for different project activities.</p>
<p>Directorate General of Lighthouse and Lightships</p>	<p>The Directorate General of Lighthouses and Lightships is a subordinate office under the Ministry of Shipping. It provides General Aids to Marine Navigation along the Indian coast. The Headquarters of the Directorate is at Noida (U.P.) Their function is to provide safe and secure navigation in the Indian waters.</p>	<p>Project will be need to secure clearance for onshore construction from Director General of Lighthouse and Lightships</p>
<p>National Green Tribunal (NGT)</p>	<p>The tribunal will have jurisdiction over all civil cases relating to implementation of the following regulations:</p> <ul style="list-style-type: none"> ■ The Water Act, 1974; ■ The Water Cess Act, 1977; ■ The Forest Conservation Act, 1980; ■ The Air Act, 1981; ■ The Environmental Protection Act, 1986; ■ The Public Liability Insurance Act, 1991; and ■ The Biological Diversity Act, 2002. <p>The Act provides compensation on account of following:</p>	<p>U / s 17, any person responsible for any untoward incidents (defined in Schedule II of the Act) is liable to pay relief or compensation as determined by the tribunal, failing which a penalty (u/s 26 and 27) is imposable which may lead to imprisonment of up to 3 years or fine up to Rs. 10 crores or both and an additional fine of Rs. 25,000 per day for any delay which may be further increased to one lac per day.</p>

Agency	Functions	Relevance and Applicability to the Project
	<ul style="list-style-type: none"> ■ Relief and compensation to the victims of pollution and other environmental damage arising under enactment of the above acts; ■ Restitution of property damaged; and ■ Restitution of the environment. 	
Central Electrical Authority (CEA)	<p>The Central Electricity Authority (CEA) is a statutory organisation constituted under Section 3 of the repealed Electricity (Supply) Act, 1948, herein after replaced by the Electricity Act, 2003. Some of the functions performed by CEA include the following:</p> <ul style="list-style-type: none"> ■ Advise the Central Government on the matters relating to the national electricity policy, formulate short-term and perspective plans for development of the electricity system and coordinate activities of the planning agencies for the optimal utilization of resources to sub-serve the interests of the national economy and to provide reliable and affordable electricity to all consumers; ■ Specify the technical and safety standards for construction of electrical plants, electric lines and connectivity to the grid; ■ Specify the safety requirements for construction, operation and maintenance of electrical plants and lines; ■ Advise any State Government licenses or the generating companies on such matters which shall enable them to operate and maintain the electricity system under their ownership or control in an improved manner and where necessary, in coordination with any other Government license or the generating company owning or having the control of another electricity system etc. 	Project will be developed based on technical standards for CEA for electrical lines and grid connectivity.
State Level		
Gujarat Energy Transmission Corporation Limited (GETCO)	GETCO is currently responsible for overseeing the transmission infrastructure within the State.	Project needs to obtain necessary permission from GETCO for grid connectivity.
Gujarat Pollution Control Board (GPCB)	The GPCB is the statutory authority entrusted to implement environmental laws and regulations within the State of Gujarat, India. The board ensures proper implementation of statues, judicial and legislative procurement related to environmental protection within Gujarat.	<p>The Project would generate used oil from DG sets and WTG maintenance. Authorization needs to be obtained under Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 for the same.</p> <p>No Objection Certificate from the GPCB has to be obtained for project related activities that results in the discharge of effluents, solid wastes, sewage falling within CRZ limits defined (within 12 nautical miles).</p>

Agency	Functions	Relevance and Applicability to the Project
Gujarat State Coastal Zone Management Authority (GSCZMA)	<p>GSCZMA has been constituted to ensure livelihood security to the fisher communities and other local communities, living in the coastal areas, to conserve and protect coastal stretches, its unique environment and its marine area and to promote development through sustainable manner based on scientific principles taking into account the dangers of natural hazards in the coastal areas. The main functions of GSCZMA are:</p> <ul style="list-style-type: none"> ■ Take measure for protecting and improving the quality of the coastal environment and preventing, abating and controlling environmental pollution in areas of the State of Gujarat; ■ identify ecologically sensitive areas in the Coastal Regulation Zone and formulate area-specific management plans for such identified areas; ■ Co-ordinate for implementing conservation projects or projects related to upliftment of coastal population protection, etc.; ■ identify coastal areas highly vulnerable to erosion or degradation and formulate area-specific management plans for such identified areas and arrange for funding for the implementation of the same; ■ identify economically important stretches in the Coastal Regulation Zone and prepare integrated Coastal Zone Management Plans for the same 	<p>All activities pertaining to laying of sub-sea export cables/onshore cables including setting up of sub-station for power evacuation from non-conventional energy sources within the coastal regulation zone (CRZ) will require necessary clearance to be obtained from Gujarat Coastal Zone Management Authority (GCZMA) and Ministry of Environment Forests & Climate Change (MoEF&CC).</p> <p>Offshore windfarms are not covered under the Schedule I of EIA Notification, 2006 which requires an Environmental Clearance (EC) to be obtained. However the offshore windfarm installation based on their distance to the coast (<12nm) may require CRZ clearance to be obtained from the MoEF &CC and GCZMA.</p>
Gujarat Maritime Board (GMB)	<p>Gujarat Maritime Board was founded in 1982 under the Gujarat Maritime Board Act, 1981, to manage, control and administer the minor ports of Gujarat.</p> <p>GMB presently manages the 41 minor ports of the State with a vision 'To enhance and harness ports and international trade as vehicles for economic development'.</p>	<p>Project need to obtain necessary approvals for the activities required to be undertaken within port limits.</p>
Gujarat Fisheries Department	<p>Gujarat Fisheries Department is responsible for the aid, assistance, promotion, development and scientific management of fisheries and other aquatic products in the State of Gujarat.</p>	<p>The Project needs to include a consultation with the Gujarat Fisheries Department to understand if there are any concerns associated with loss of fisheries from the establishment of the offshore components.</p>
Gujarat Forest Department	<p>Gujarat Forest Department is responsible for the protection, conservation and development of forest and wildlife in the State of Gujarat.</p>	<p>The Project team needs to consult the Gujarat Forest Department to identify any concerns associated with establishment of the onshore components including use of the coastal areas and modification of</p>

Agency	Functions	Relevance and Applicability to the Project
		land for access road construction and onshore cables laying.
Labour Department	<p>Department of Labour in Amreli District is responsible for overseeing regulatory compliance to the following regulations</p> <ul style="list-style-type: none"> ■ Shops and Establishment Act 1958 ■ Contract Labour Regulation Act, 1971; ■ Building and Other Construction Workers Act, 1996 ■ Child Labour Act, 1986 and Bonded Labour Act 1976 ■ Minimum Wages Act, 1948; ■ Payment of Wages Act, 1936 ■ Equal Remuneration Act, 1976 ■ Workers Compensation Act, 1923 ■ Public Provident Fund Act, 1968 ■ Employees State Insurance Act, 1948 ■ Industrial Model Standing Orders Act, 1947 ■ Trade Union Act, 1926 ■ Industrial Disputes Act, 1957 ■ The Welfare Cess Act 1987 and Rules 1988 	Project will be required to obtain necessary licenses and comply with the laws as provided in adjacent column.
District Administration and Department of Land and Revenue	<p>For any government led land acquisition- Requirements as stated under the RTFCTLARR Act 2013 will have to be implemented for assessment, valuation and disbursement of compensation and provisions for Resettlement and Rehabilitation. The main nodal agency is the district administration which appoints a Land Acquisition Officer.</p> <p>For direct purchase of land, the Department of Land and Revenue and Registrar of Properties are relevant. Sale deeds, title transfers and registration of properties is undertaken by this department.</p>	<p>It is expected that government led land acquisition will not be triggered for this project.</p> <p>Direct Purchase of private land will follow the rules as down in Gujarat Land Revenue Rules 1972</p>
Inspectorate of factories/ Directorate, Industrial Safety and Health (DISH)	<p>The Directorate, Industrial Safety and Health looks after the implementation of following statute</p> <ul style="list-style-type: none"> ■ The Factories Act 1948 and Gujarat Factories Rules, 1963 ■ The Environment Protection Act, 1986 ■ The Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 ■ Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996 ■ The Payment of Wages Act, 1936 and Rules there under ■ The Maternity Benefit Act, 1961 and Rules there under ■ The Gujarat Physically Handicapped Persons (Employment in Factories) Act, 1982 ■ The Gujarat Payment of Unemployment Allowance to Workmen (in factories) Act, 1981 	Project will be required to obtain necessary licenses and comply with the laws as provided in adjacent column and report to DISH on compliance.

Agency	Functions	Relevance and Applicability to the Project
	<ul style="list-style-type: none"> ■ The Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and Rules there under 	

3.3 National Offshore Wind Energy Policy 2015

The Government of India has published The National Offshore Wind Energy Policy (NOWEP) (Ministry of New and renewable Energy Notification, 2015) document in 2015 in order to establish commitment. The Ministry of New & Renewable Energy (MNRE) has been authorized as the Nodal Ministry for use of offshore areas within the Exclusive Economic Zone (EEZ) of the country and the National Institute of Wind Energy (NIWE) has been authorized as the Nodal Agency for development of offshore wind projects. Government has paved way for development of the offshore wind farms up to the seaward distance of 200 Nautical Miles (within its Exclusive Economic Zone) from the base line. Responsibilities of MNRE includes:

- Overall monitoring of the offshore wind farm projects in the country;
- Co-ordination with other Ministries/Departments;
- Issuing guidelines/directives for the development;
- Oversee working and to provide necessary support to the Nodal Agency i.e. NIWE for smooth functioning;
- Development of International Cooperation; and
- Coordination towards tariff setting and regulatory issues.

NIWE will act as the nodal agency and will be responsible for carrying out the following activities for offshore wind power development in the country:

- Call for proposals for development of offshore wind power projects in the specified blocks;
- Entering into contract with the project developers for development of offshore wind power project within the EEZ;
- Collect lease from developer/owners as per specified guidelines;
- Carry out and also coordinate resource assessment and surveys in the EEZ of the country;
- Demarcation of offshore wind energy blocks;
- Compliance of Ministry of Defence (MoD) guidelines;
- Facilitation to project developers in getting clearances from concerned Ministries/Departments;
- Coordinate and monitor technical activities of the on-going projects;
- Promoting indigenous research for technology development;
- Technical & financial evaluation and review of development;
- Creation and maintenance of offshore wind energy database and archive system;
- Upgrade information database in the assessed areas; and
- Capacity building in the offshore wind energy sector.

Other implementing and monitoring agencies for the projects includes:

- Offshore Wind Energy Steering Committee (OWESC);
- Ministry of Shipping /State Maritime Board /State Government; and

- Central and State Transmission Utility

The policy requires submission of comprehensive decommissioning program and site restoration plan prior to commencing construction work. The same shall be a part of the EIA and necessary clearances will be required by MoEFCC.

3.4 EIA & Consenting Process and Regulatory Requirements

3.4.1 *The Environment (Protection) Act, 1986 and the Environmental Impact Assessment Notification, 2006 & 2010*

The Environmental (Protection) Act, 1986 is the fundamental legislation providing for the protection of the environment in the India. This act provides the Environment (Protection) Rules, which were formulated in 1986. Under “The Environment (Protection) Act”, 1986, the development project requires clearance from the State Pollution Control Board (SPCB) and Ministry of Environment, Forests and Climate Change (MoEFCC).

The Environmental Impact Assessment (EIA) Notification, 2006 and the various amendments thereto have been notified under this act. The Environmental Clearance (EC) process requires EIA to be conducted for proposed projects, depending on the risk category outlined Schedule of under Ministry of Environment, Forests and Climate Change (MoEFCC) notification S.O. 1533 dated 14th September 2006 and amendments thereof.

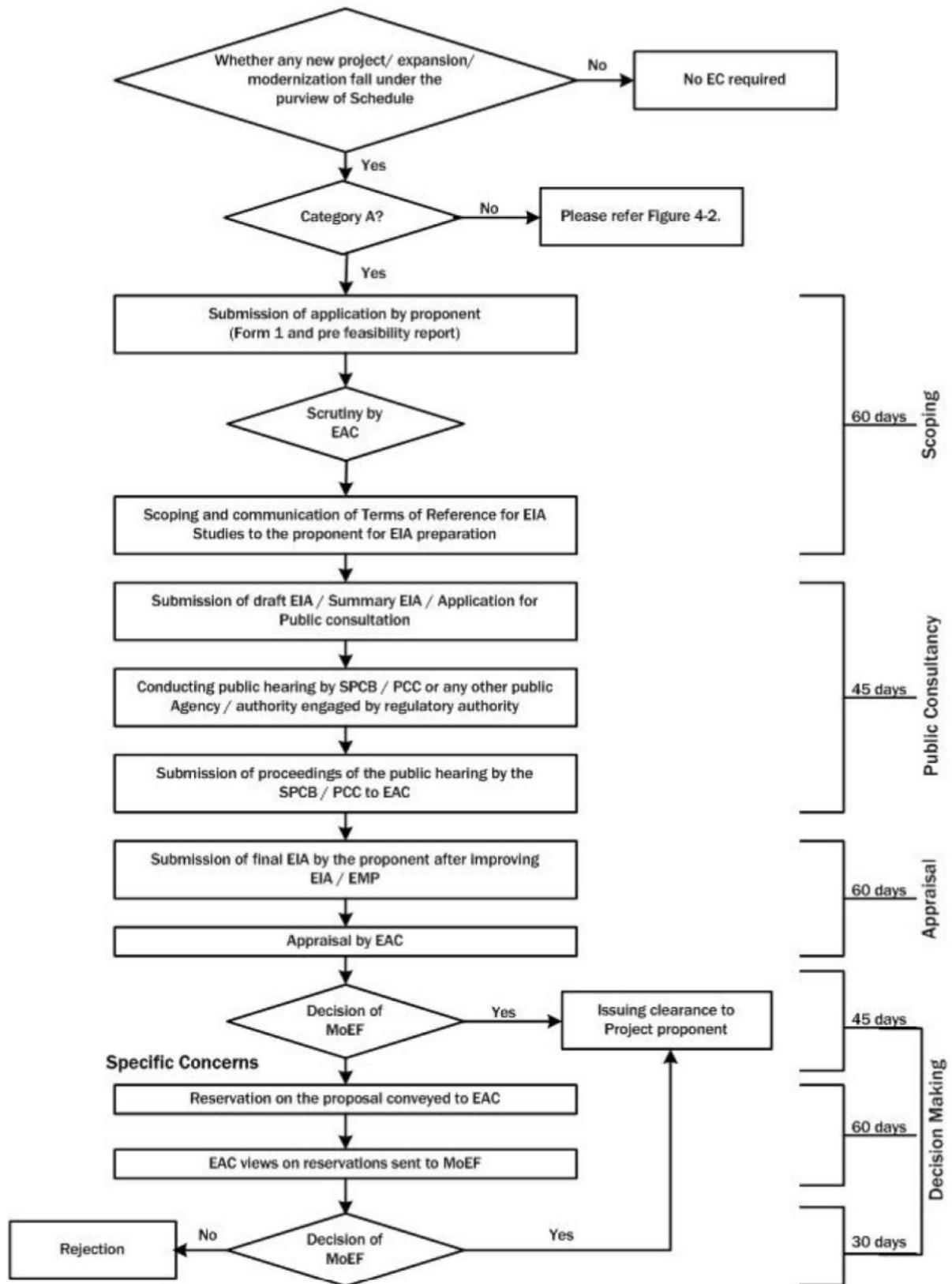
The process and requirements for EC, including definitions of whether projects are required to get clearance at the Central or State level, are covered in the EIA Notification.

3.4.2 *Categorization of project activities*

The EIA Notification categorises all projects and activities under Category A or Category B. The categorisation depends on the scale of the project and the degree of potential impacts on human health, natural resources. The specific thresholds for categorising projects are provided in the Schedule of the Notification.

All Category A projects require an ‘Environmental Clearance’ (EC) from MoEFCC. The process flow for the same has been presented in **Figure 3.1**.

Figure 3.1 Prior Environmental Clearance process for Activities under Category A



Source: (ILFS, 2010)

“**Category A**” projects include all physical infrastructures whose size is greater than minimum levels as defined in the Schedule.¹ Environmental Clearances for these projects are granted at the Central level.

“**Category B**” activities cover projects with lesser size or capacity, and moderately lower impacts than Category A. Environmental Clearances for Category B projects are granted at the State level. Each State has a dedicated department or Board as, required by law, which would grant the Clearance. The definitions for scale of the projects depends on the industrial sector and associated impacts. **Figure 3.2** presents process flow diagrams for obtaining Environmental Clearance.

Note 1: It is to be noted that under sub-rule (3) of Rule 5 of the Environment (Protection) Rules, 1986, MoEFCC can exercise its powers for imposing certain restrictions and prohibitions on new projects or activities, or on the expansion or modernization of existing projects or activities based on their potential environmental impacts.

3.4.3 Stages of Environmental Clearance process

The environmental clearance process for new projects consists of four stages, some of which may not be required for all projects. The four stages include the following:

- Stage (1) Screening (Only for Category 'B' projects and activities)
- Stage (2) Scoping
- Stage (3) Public Consultation
- Stage (4) Appraisal

3.4.3.1 Screening stage

At the screening stage (applies for Category B projects), the State Level Expert Appraisal Committee (SEAC) reviews the application to determine whether the project requires further environmental studies for preparation of an EIA report. This decision may depend on the nature and location of the project. Projects are further categorised according to whether they require an EIA (Category B1 or Category B2).

3.4.3.2 Scoping stage

At the scoping stage, detailed and comprehensive Terms of Reference (TOR) addressing all relevant environmental concerns for the preparation of an EIA report are determined. The TOR is prepared by the Expert Appraisal Committee (EAC) for **Category A** projects and by the State-level Expert Appraisal Committee (SEAC) for Category B1 projects. Scoping for B2 projects is not undertaken.

3.4.3.3 Public Consultation stage

This stage involves consultation with project-affected persons. Public consultation is mandatory for all **Category A** and **Category B1** projects, with some exceptions for projects involving expansion of Roads and Highways, which do not involve any further acquisition of land.

The concerns heard during the public consultation process are addressed in the Environmental Management Plan of the EIA report.

3.4.3.4 Appraisal stage

This stage sees the overall and detailed scrutiny of the final EIA report, which will have been presented to EAC or SEAC. The EAC or SEAC considers the environmental aspects of the project

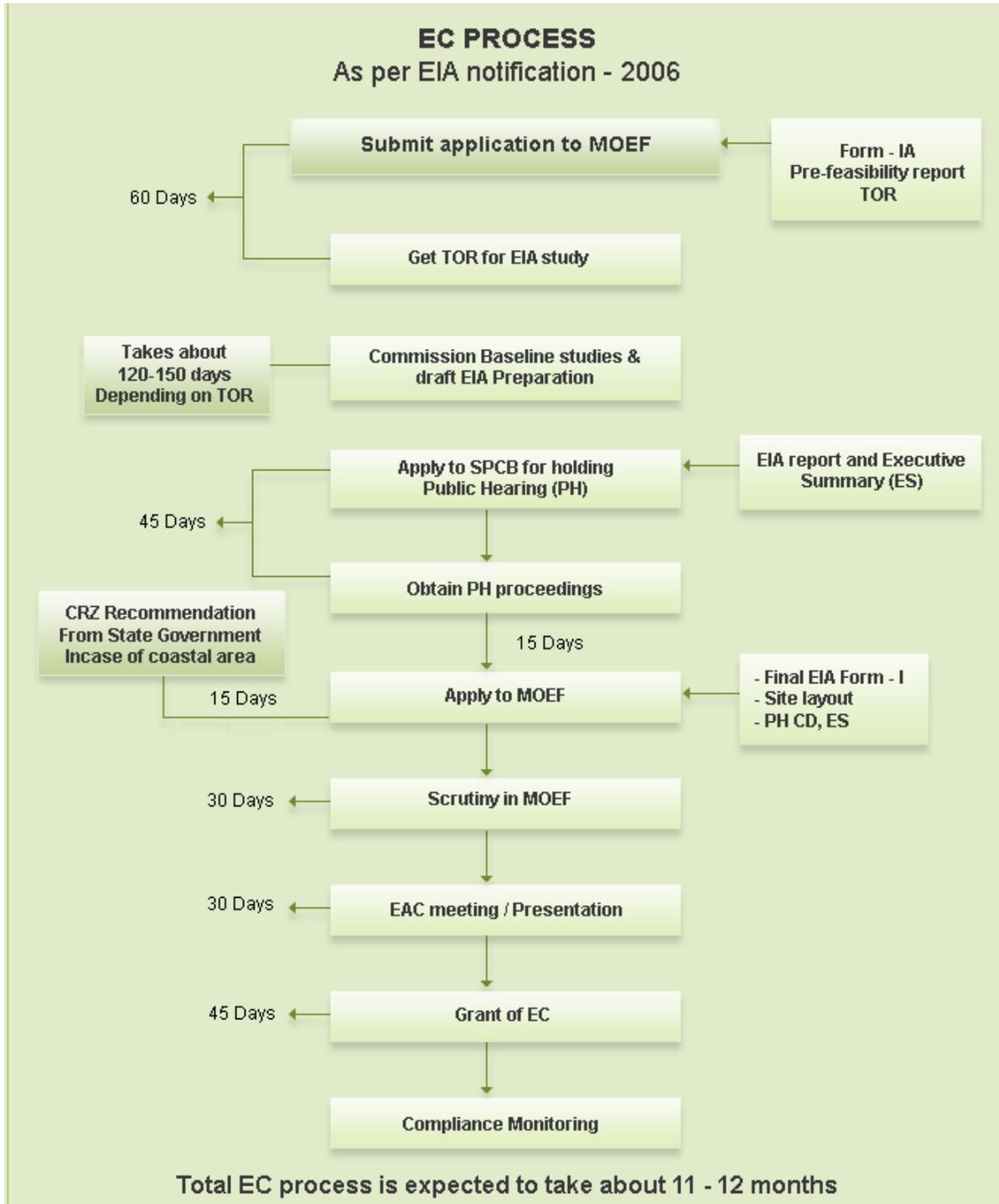
¹ Schedule of EIA Notification gives the list of activities or project requiring environment clearance

and makes a recommendation to the Regulatory Authority on whether prior EC should be granted or not.

3.4.3.5 EC process for existing projects

In the case of expansion, modernisation or changes to the product mix for existing projects the EAC or SEAC will decide on the requirements for EIA and public consultation.

Figure 3.2 Timelines for Environmental Clearance process in India



Source: (MoF, Govt. of India)

3.4.4 Coastal Regulation Zone (CRZ) Notification

The Government of India laid out the Coastal Regulation Zones Notification, 1991 for the protection of the coastal and marine environment. Section 3 (1) and 3 (2) (v) of the Environment (Protection) Act, 1986 and rule 5 (3) (d) of the Environment (Protection) Rules, 1986, declare coastal stretches of India as Coastal Regulation Zone (CRZ).

The coastal stretches of seas, bays, estuaries, creeks, rivers and backwaters influenced by tidal action (in the landward side) up to 500 meters from the High Tide Line (HTL) and the land between the Low Tide Line (LTL) and the HTL have been identified as Coastal Regulation Zone. This notification regulates activities like setting up and expansion of industries, operations or processes, etc. in the CRZ.

As per the 1991 CRZ notification, CRZ areas are classified in the following manner:

- CRZ-I - ecological sensitive;
- CRZ-II - built-up area;
- CRZ-III - rural area; and
- CRZ-IV- water area.

In the 2011 Notification the above classification was retained however, CRZ-IV was revised to include water areas up to the territorial waters and the tidal influenced water bodies.

The clearance process has been formally established by the MoEFCC; the same has been presented in

Figure 3.3.

The CRZ clearance is a parallel process along with the EC and is to be obtained by the project proponent, depending on applicability of both EIA Notification, 2006 and CRZ Notification, 2011. Restrictions and regulatory exemptions for project related activities as outlined in **Note 2**, shall be applicable to projects falling under CRZ. As presented in **Figure 3.2**, MoEFCC/SEIAA are solely responsible for extending the EC to the project proponent, whereas MoEFCC/SEIAA consult with the State Coastal Zone Management Authority (SCZMA) for extending the CRZ clearance.

Depending on the categorization of the project, the proponent is required to obtain the following consents:

- Category A – Approvals from SCZMA, MoEFCC and CRZ clearance; and
- Category B – Approvals from SCZMA, SEIAA and CRZ clearance.

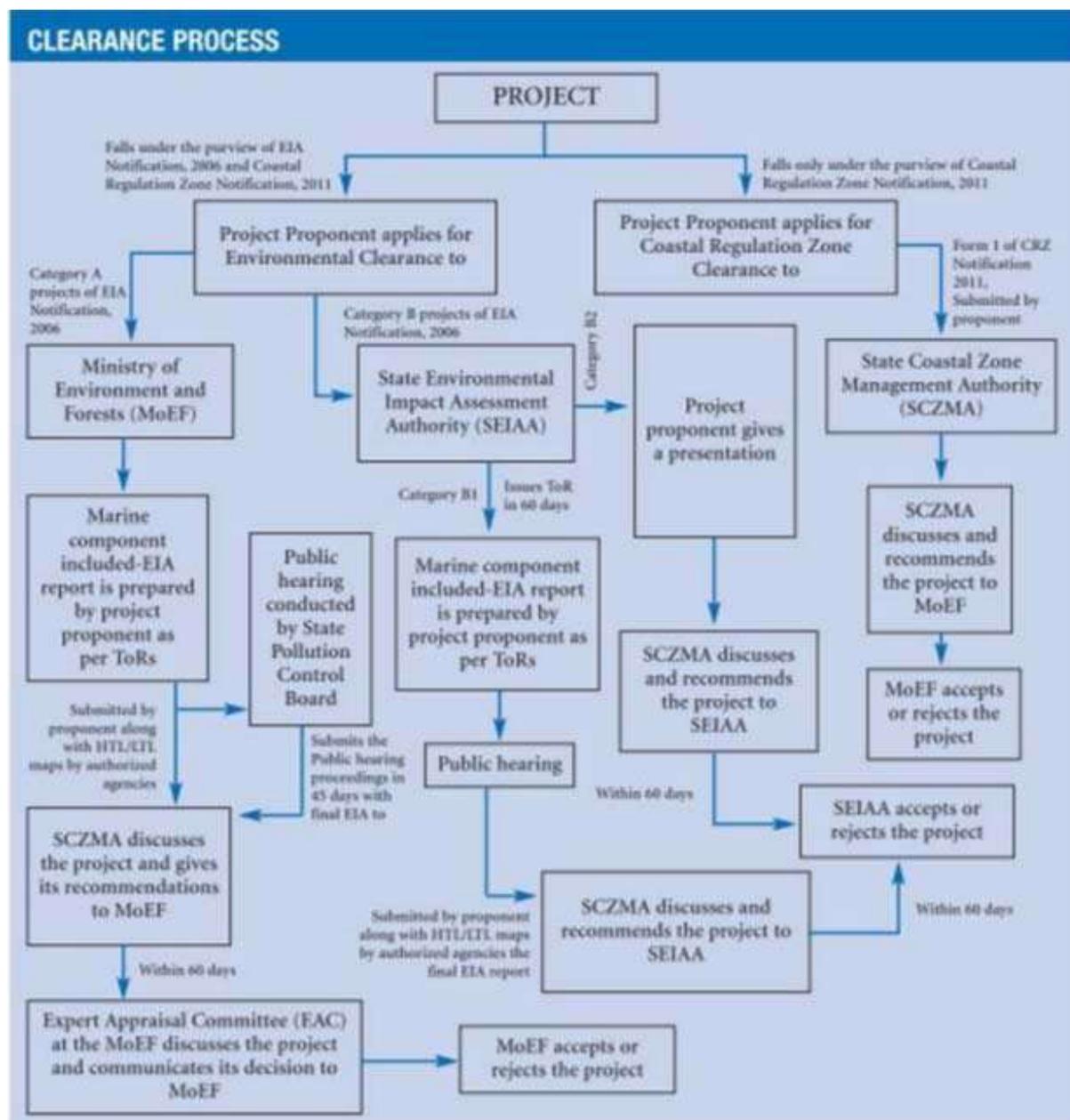
Note 2: As per the CRZ notification, Government of India places restrictions on certain development projects, and exempts others provided a clearance in this regard is obtained by Coastal Zone Management Authority (in absence of such authority, this will be considered as a Central issue). The water and the bed area between the LTL to the territorial water limit (12 Nm) in case of sea and the water and the bed area between LTL at the bank to the LTL on the opposite side of the bank, of tidal influenced water bodies fall under the CRZ and only works associated with OWE projects under the CRZ require a clearance. It must be noted that CRZ notification extends an exception to OWE projects (against the prohibition for setting up industries under the CRZ) under 3(i)(c) of the notification:

“.....facilities for generating power by non-conventional energy sources and setting up of desalination plants in the areas not classified as CRZ-I(i)¹ based on an impact assessment study including social impacts”

¹ The land area from High Tide Line (hereinafter referred to as the HTL) to 500mts on the landward side along the sea front.

Additionally, regulation of permissible activities in the CRZ area, as per 4(i)(h) of the notification is also extended to “Facilities generating power by non-conventional energy resources”, which includes OWE projects.

Figure 3.3 CRZ clearance process



Note 1: It must also be noted that the MoEFCC has published a draft CRZ Notification, 2018 on 18th April 2018. The same can be expected to be brought into force in 2019 post further deliberations by the MoEFCC. Projects that generate “power by non-conventional energy” are included under permissible activities under Section 5.1.2 – CRZ-I B Inter tidal areas, and CRZ-IV¹.

¹ As per the draft notification, the CRZ - IV areas constitute water area and are further classified as CRZ-IVA (water area and the sea bed area between the Low Tide Line up to twelve (12) nautical miles on the seaward side), and CRZ-IVB (water area and the bed area between LTL at the bank of the tidal influenced water body to the LTL on the opposite side of the bank,

3.4.5 Environmental regulations in India relevant to Offshore Wind Farm Projects

Table 3.2 Environmental regulations applicable in India

Regulation title	Application
The Environment (Protection) Act, 1986, as amended	Generally applicable to all pollution generating activities; also lays down standards for emission or discharge of environmental pollutants from various sources.
The Forest (Conservation) Rules, 2003, as amended	Applicable for conservation of forests when onshore activities related to offshore wind farm projects fall within scheduled forest areas
The EIA notification S.O. 1533, Dated 14 th September, 2006, as amended	For categorising the proposals of projects into Category 'A' or 'B' and indicating the mandate for Environmental Clearance (EC). This has not yet been established for offshore wind farm projects
The Water (Prevention & Control of Pollution) Act, 1974 (The Water Act), as amended	For all project activities concerned with any release or discharge of used or waste water or effluent from manufacturing/operational sites on the coast or at the intersection of land and sea
The Air (Prevention and Control of Pollution) Act, 1981, as amended	For all project activities concerned with release of pollutants in the air in terms of gases, fumes or particulate matter
Noise pollution standards outlined under Environmental Protection Act 1986	The present standards do not prescribe permissible limits for noise generated in sea or sea surface. However, this will be applicable for all activities generating noise onshore
The Wildlife Protection act, 1972	Applicable for the protection of marine and terrestrial wildlife from any development activities. It shall be applicable in the case of any cross- border movements of any living species which are categorised as endemic to India.
The CRZ Notification, 2011	Applicable with respect to the location of the site on land and the intersection of land and sea. CRZ clearance will be mandatory and EIA will have to be conducted
Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016	For prevention of movement for hazardous goods or commodities across the sea and to protect the environment and living organisms. Their movement can be executed with prior clearances as stated in this act.
Marine Fishing Regulation Act (MFRA)	For managing fisheries in the maritime states of India, within the territorial limits of 12 miles
The Maritime Zones of India (Regulation of Fishing by Foreign Vessels) Act, 1981	The Act is in consonance with The United Nations Agreement for the Implementation of the provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 which relates to Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks
The Territorial Waters, Continental Shelf, Exclusive Economic Zone and Other Maritime Zones Act, 1976	This Act has been formulated in relation to the territorial waters, the continental shelf, the exclusive economic zone or any other maritime zone of India. Here, the limit of the territorial waters is the line every point of which is at a distance of twelve (12) nautical miles from the nearest point

extending from the mouth of the water body at the sea up to the influence of tide, i.e., salinity of five parts per thousand (ppt) during the driest season of the year).

Regulation title	Application
	of the appropriate baseline, and the EEZ has been defined 200 nm from the baseline.

Note 2: *It must be noted that provision for environmental management of offshore wind farm projects has been established under The Territorial Waters, Continental Shelf, Exclusive Economic Zone and Other Maritime Zones Act, 1976. 4(a) of the Act establishes, India's sovereign rights for conservation and management of natural resources, both living and non-living as well as for producing energy from tides, winds and currents. Furthermore, as per provisions under 6(b)(ii) and 6(b)(iv) of this act, the Central Government of India may, by notification in Official Gazette, can make provisions as it may deem necessary for activities concerning with production of energy from tides, winds and currents and for protection of marine environment.*

Note 3: *Draft CRZ Notification, 2018 includes special provisions for Conservation, Protection and Management Framework for Ecologically Sensitive Areas (ESAs). These include provisions for conservation, protection, and management mangroves, Corals and coral reefs and associated biodiversity, The National Parks, marine parks, Sanctuaries, Salt marches, turtle nesting grounds, horse shoe crab habitats, sea grass beds, nesting grounds of birds (of specific importance to wind power projects), Geo-morphologically Important Zones, and structures of archaeological importance and heritage value sites. These requirements can be expected to be brought into force as part of the proposed Draft CRZ Notification in 2018 post deliberations by the MoEFCC. Additionally, salient features of the draft CRZ Notification, 2018 can be retrieved from <http://pib.nic.in/newsite/PrintRelease.aspx?relid=178791>.*

3.4.6 Consent Register

A consents register has been compiled to include all known consents, licenses and approvals that are applicable for the implementation of the First Offshore Windfarm Project in India. This includes but is not limited to consents relating to both offshore and onshore planning, construction, operation, grid connection, cable crossings, new harbour or port facilities, and seabed and landowner agreements. The register also identifies the relevant nodal authorities responsible for issuing such approval including any uncertainties associated with the applicability of any consent/approvals related to the project. Consent Register is enclosed as **Appendix D**.

3.5 International Standards and Guidelines related to Offshore Wind Farms

3.5.1 European Union (EU) Guidance Note on Environmental Impact Assessments of Offshore Wind Farms

In the European Union (EU), development, monitoring and consenting process for offshore wind farm projects is governed by multiple Directives. The responsibility for implementation of these Directives lie with the EU Member states. Member states adopt the requirements under these Directives in their regional laws and policies to meet goals established in the EU Directives.¹

The newly amended EIA Directive (2014/52/EU) entered into force on 15 May 2014 to simplify the rules for assessing the potential effects of projects on the environment. The EIA directive applies to a wide range of defined public and private projects, which are defined in Annexes I and II of the Directive. The EU offshore wind farm projects are covered in Annex II of the Directive and the competent authority ultimately decide requirement for EIA (screening procedure) based on the

¹ At present, there are no specific guidelines for environmental and social impact assessment of offshore wind power projects in India. Therefore, as an example of best practices EU Guidelines are provided here. FOWPI project is funded by the European Union.

information which the developer is required to supply, focussing on the key aspects that allow the competent authority to make its determination.

Where Member States decide to require a determination for projects listed in Annex II, the developer shall provide information on the characteristics of the project and its likely significant effects on the environment. The detailed list of information to be provided is specified in Annex IIA. The developer shall take into account, where relevant, the available results of other relevant assessments of the effects on the environment carried out pursuant to Union legislation other than this Directive. The developer may also provide a description of any features of the project and/or measures envisaged to avoid or prevent what might otherwise have been significant adverse effects on the environment.

As per the new directive, the screening procedure should ensure that an EIA is only required for projects likely to have significant effects on the environment. Furthermore, the selection criteria laid down in Annex III to Directive 2011/92/EU, which are to be taken into account by the Member States in order to determine which projects are to be subject to environmental impact assessment on the basis of their significant effects on the environment, should be adapted and clarified. For instance, experience has shown that projects using or affecting valuable resources, projects proposed for environmentally sensitive locations, or projects with potentially hazardous or irreversible effects are often likely to have significant effects on the environment.

As per the EU directives, Member States shall adopt all measures necessary to ensure that, before development consent is given, projects likely to have significant effects on the environment by virtue, inter alia, of their nature, size or location are made subject to a requirement for development consent and an assessment with regard to their effects on the environment.

As per Article 5(1), where an EIA is required, the developer shall prepared and submit an EIA report and it shall provide information as per Annex IV of the Directive. Furthermore, Article 6 provides the requirements of public consultation including stakeholders need to be consulted, mode of information disclosure, reasonable timeframes for information and for participation in decision-making and timeframe for consulting the public concerned.

As per Article 9(1), the public and authorities under Art. 6(1) shall be promptly informed about the decision taken by the competent authority and information shall be available to the public and to the authorities under Article 6(1). In addition to that, summary of the results of the consultations and the information gathered and how those results have been incorporated or otherwise addressed, in particular the comments received from the affected Member State, shall be made available as well.

3.5.2 World Bank Group (WBG) Environmental, Health and Safety (EHS) Guidelines for Wind Energy, 2015

The EHS Guidelines for wind energy include information relevant to environmental, health, and safety aspects of onshore and offshore wind energy facilities. It is applicable to wind energy facilities from the earliest feasibility assessments, as well as from the time of the environmental impact assessment, and continue to be applied throughout the construction and operational phases.

The key requirements stated in the EHS guidelines includes but not limited to following:

- Consideration should be given to turbine layout, size, and scale in relation to the surrounding landscape and seascape character and surrounding visual receptors;
- Assessments should be conducted to identify where and/or when underwater noise has the potential to impact marine life significantly and to identify appropriate mitigation measures;
- Site selection is critical to avoiding and minimizing potential adverse impacts on biodiversity. Site selection should include
 - Consideration of the proximity of the proposed wind energy facility to sites of high biodiversity value in the region;

- With respect to offshore facilities, siting would include a review of areas of importance to the life history of marine life, notably fish, marine mammals, and sea turtles (e.g., feeding, breeding, calving, and spawning areas) or other habitats, such as juvenile/nursery habitats, mussel/oyster beds, reefs, or sea grass and kelp beds. Siting would also include a review of productive fishing areas.
- Consultation with relevant national and/or international conservation organizations also helps to inform site selection
- The installation of the turbine foundations and subsurface cables may disturb the marine seabed and may temporarily increase suspended sediments in the water column, thereby decreasing water quality and potentially adversely affecting marine species and commercial or recreational fisheries. Hence appropriate preventive and control measures to be taken;
- Risk assessment to develop a safe system of work for all working-over-water tasks and allocate appropriate resources to mitigate the hazards to be undertaken and ensure all competent and trained workers are undertaking the tasks;
- Consult with the relevant aviation authorities before installation, in accordance with air traffic safety regulations;
- Consult with marine regulatory traffic authorities before installation, in accordance with marine traffic safety regulations;
- Use anti-collision lighting and marking systems on turbines and all other hazards. Use of guard vessels should also be considered. Lighting and marking should be determined with relevant marine authorities;
- Safety zones can be established around each turbine and construction vessel during the construction phase in order to minimize disruption to other sea users;
- Environment monitoring program to be implemented; etc.

3.5.3 WBG EHS Guidelines for Electric Power Transmission and Distribution 2007

The EHS Guidelines for Electric Power Transmission and Distribution include information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas. The Key requirements under this are as follows:

- Site Transmission and distribution rights of way, access roads, lines, towers, and substations to avoid critical habitat through use of existing utility and transport corridors for transmission and distribution, and existing roads and tracks for access roads whenever possible;
- Avoidance of construction activities during the breeding season and other sensitive seasons or times of day and revegetation of disturbed areas with native plant species;
- Aligning transmission corridors to avoid critical habitats (e.g. Nesting grounds, bat foraging corridors and migration corridors);
- Installing visibility enhancement objects such as marker balls, bird deterrents or diverters;
- Only allowing trained and certified workers to install, maintain, or repair electrical equipment;
- Deactivating and properly grounding live power distribution lines before work is performed on, or in close proximity, to the lines;
- Locating and siting cable routes, and shore access, to avoid critical marine habitats and coral reefs;
- Burying submarine cables when traversing sensitive intertidal habitat;

- Monitoring cable laying path for presence of marine mammals;
- Avoiding laying submarine cable during fish and marine mammals breeding periods, calving periods, and spawning seasons;
- Siting power lines and designing substations with due consideration to landscape views and important environmental and community features;
- Location of high voltage transmission and distribution lines in less populated areas, where possible;
- Avoiding the siting of onshore cables and towers close to airports and outside of known flight path envelopes; etc.

3.6 Applicable Environmental Standards

3.6.1 National Level Standards

Taking provision of the Environmental Protection Act (EPA), 1986, the Central Pollution Control Board (CPCB) has stipulated different environmental standards w.r.t ambient air quality, noise quality, water and waste water for the country as a whole. Following standards are applicable for the Projects and need to be complied with during the Project life cycle.

- National Ambient Air Quality Standards (NAAQ Standards), as prescribed by MoEFCC vide, Gazette Notification dated 16th November, 2009;
- Drinking water quality – Indian Drinking Water Standard (IS 10500: 2012);
- General standards for discharge as prescribed under the Environment Protection Rules, 1986 and amendments (G.S.R 422 (E) dated 19.05.1993 and G.S.R 801 (E) dated 31.12.1993 issued under the provisions of E (P) Act 1986);
- Noise standards specified by the MoEFCC vide gazette notification dated 14th February, 2000 (Noise Pollution (Regulation and control) Rules, 2000); and
- Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.

3.6.2 Discharge Standards stipulated under International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)

The Convention includes regulations aimed at preventing and minimizing pollution from ships - both accidental pollution and that from routine operations - and currently includes six technical Annexes (IMO, n.d.)

- Annex I: Regulations for the Prevention of Pollution by Oil;
- Annex II: Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk;
- Annex III: Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form;
- Annex IV: Prevention of Pollution by Sewage from Ships;
- Annex V : Prevention of Pollution by Garbage from Ships; and
- Annex VI: Prevention of Air Pollution from Ships.

3.7 Applicable International Convention

Environmental problems which migrate beyond the jurisdiction (Trans-boundary) require power to control such issues through international co-operation by either becoming a Contracting Party (CP) i.e. ratifying treaties or as a Signatory by officially signing the treaties and agreeing to carry out provisions of various treaties on environment and social safeguards. India is signatory to various international conventions which have been provided in Table below.

Table 3.3 Relevant International Conventions applicable for the Project

International Conventions	Salient Features
International Convention for Safety of Life at Sea (SOLAS), 1974 as amended	The main objective of the SOLAS Convention is to specify minimum standards for the construction, equipment and operation of ships, compatible with their safety. Project to comply with obligations under SOLAS.
International Convention for The Prevention of Pollution From Ships (MARPOL 73/78)	MARPOL 73/78 is the International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978. The Protocol desires to achieve the complete elimination of intentional pollution of the marine environment by oil and other harmful substances and the minimization of accidental discharge of such substances.
International Convention relating to Intervention on the High Seas on Cases of Oil Pollution Casualties	The 1973 Protocol entered into force in year of 1983 and affirms the right of a coastal State to take such measures on the high seas as may be necessary to prevent, mitigate or eliminate danger to its coastline or related interests from pollution by oil or the threat thereof.
Protocol to the International Convention on Civil Liability for Oil Pollution Damage, 1969 as renewed in 1992	India is ratified to the protocol, which has come into force from 19th June, 1975. This protocol was come into picture to ensure that adequate compensation would be available where oil pollution damage was caused by maritime casualties involving oil tankers (i.e. ships that carry oil as cargo)
Merchant Shipping (Minimum Standards) Convention, 1976	This convention prescribes a set of standards relating to safety, social security, and shipboard conditions of employment and living arrangements to be observed in merchant shipping registered under any signatory flag state.
United Nations Convention on the Law of the Sea (UNCLOS), 1982	The United Nations Convention on the Law of the Sea (UNCLOS), also called the Law of the Sea Convention or the Law of the Sea treaty, is the international agreement that resulted from the third United Nations Conference on the Law of the Sea (UNCLOS III), which took place between 1973 and 1982. The Law of the Sea Convention defines the rights and responsibilities of nations with respect to their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources. Project to prevent pollution damage by addressing particular sources of pollution, including those from land based activities, seabed activities, dumping, vessels and from or through the atmosphere
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (UN Treaty), 1992	The convention was adopted on 22nd March 1989 by the Conference of Plenipotentiaries in Basel, Switzerland. The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. Project to comply with the requirements under this convention and to reduce the movements of hazardous waste between nations and specifically to prevent transfer of hazardous waste.
Convention for the suppression of Unlawful Acts against the safety of Maritime Navigation (SUA)	The convention has been adopted on 10th march, 1998 and came into force on 1st march 1992. It is a multilateral treaty by which states agree to prohibit and punish behaviour which may threaten the safety of maritime navigation

4. ENVIRONMENTAL AND SOCIAL SENSITIVITIES

This section describes the existing environmental, social and ecological baseline of the study area, which includes the proposed offshore wind farm area and a 10 km radial area around the proposed project site. Study area also includes the associated facilities proposed onshore (comprising of pooling substation). This includes relevant components of the physical, biological and socio-economic environment.

4.1 Study Area

The study area that has been utilized for the purpose of the Project is 10 km radius from the coastal and onshore ⁽¹⁾ and offshore ⁽²⁾ components. A study area of 10 km is standard practice for Environmental Impact Assessment (EIA) projects (MoEF&CC, 2015) as it identifies perceived impacts on resources and receptors from various project activities including air emissions, water contamination, noise, ecology and affected communities.

Where resources and receptors that could potentially be affected by the Project extend beyond 10 km, the same has been captured in the locational sensitivities. These sensitivities that extend beyond the 10 km radius include fishing communities in Jafrabad and Mahuva as well as ecological receptors in the Gulf of Khambhat.

Study area with respect to the onshore cables to Grid Substation has not been provided because the Grid Substation location has not been finalized. Instead, a focus on excluding key environmental, social and ecological sensitivities along potential routes from the recommended landfall point (**Section 2.5**) to the Grid Substation (**Section 2.5.2**) has been provided in **Figure 5.1**

The environmental, ecological and socio-economic (human) baseline information based on secondary data are presented in the subsequent sections both for offshore as well as coastal and onshore environment.

4.2 Offshore Physical Environment

Key aspects of the physical offshore environment that are relevant to understanding the potential environmental impacts of construction and operation of the proposed wind farm include:

- Bathymetry;
- Metocean ⁽³⁾;
- Noise and vibration;
- Shipping and navigation;
- Offshore oil and gas platforms;
- Sub-sea infrastructure

4.2.1 Bathymetry

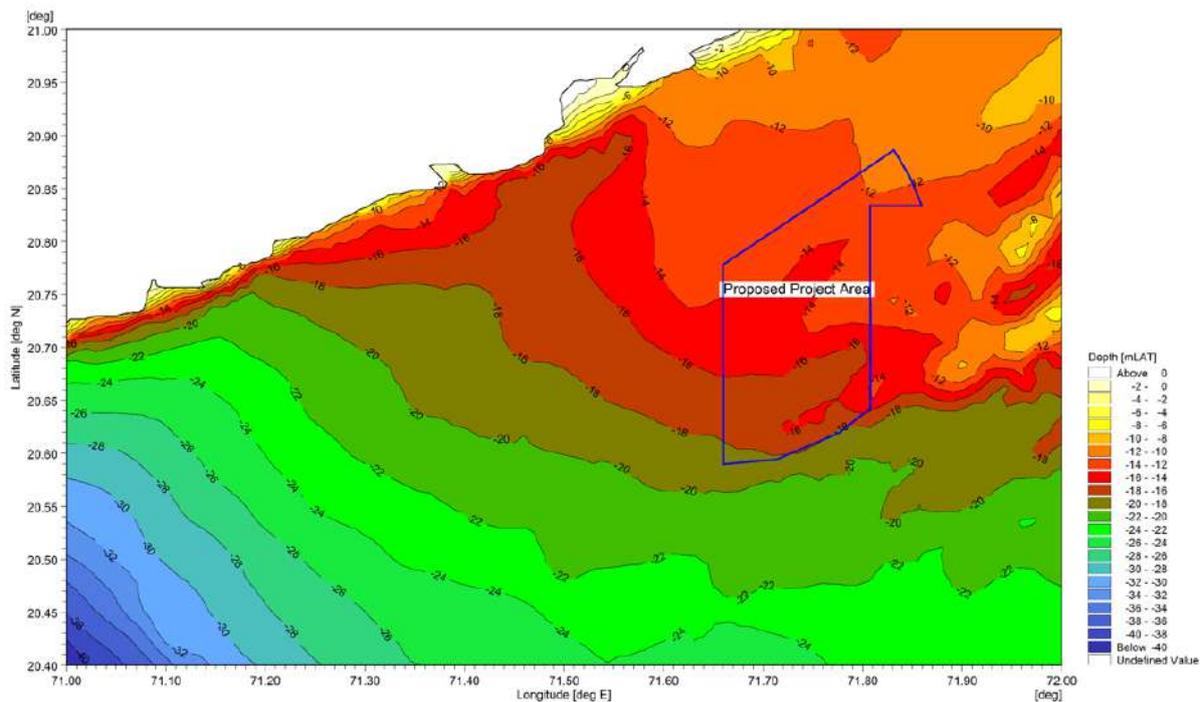
Map showing bathymetry of the proposed wind farm site is presented in **Figure 4.1**. Water depth within the proposed site boundary ranges from 10 to 22 m.

(1) The entire Pipavav Port has been considered for the coastal and onshore components. The study area around the Grid Substation and onshore Pooling Substation/onshore landing point have not been considered, because these locations have not been finalized at this stage of the study.

(2) Offshore components includes the wind farm area and a straight-line distance from the wind farm area to the landing point near Pipavav Port. As the exact export cables route has not been determined, a study area with respect to the exact route could not be determined at this stage of the study.

(3) Metocean is a portmanteau of meteorology and [physical] oceanography and estimates the wind, wave and climate conditions of a certain location.

Figure 4.1 Bathymetry of the offshore wind farm area



Source: COWI

4.2.2 Metocean Environment

Project has undertaken preliminary metocean study, details from the study are presented in sections below. Site-specific measurements of metocean data (wind, waves, current and water level) was not available, hence, measurements from a future campaign was considered for future validation and possible update of the data is presented in the report from the preliminary metocean study.

4.2.2.1 Tidal Current

The tides are of mixed semi-diurnal type, with large diurnal inequality and varying amplitude, which decrease from north to south. Because of its unique position (nearness to the Tropic of Cancer), Gujarat coast experiences very high tides; the highest anywhere along the Indian coast. Because of the funnel shape and the semi-enclosed nature at the head, the tidal height is amplified in the upper part of the Gulf. The mean tidal range during spring is 4.7 m at Mahuva Bandar, which rises to 6.5 m at Gopnath Point and 10.2 m at Bhavnagar. The maximum spring tide recorded at Bhavnagar is 12.5 m, which is second only to that of the highest tide recorded anywhere in the world (around 17 m at the Bay of Fundy on Newfoundland coast of Canada).

Long-shore currents dominate the open coasts at Gujarat facing the Arabian Sea. However, due to exceptionally strong flood and ebb tides, powerful tidal currents with a speed of 3 to 4 knots dominate the flow. Maximum velocities of 6 knots associated with high wave energy occur during mid-tide. Currents in the Gulf, though tidal, are monsoonal in origin and dominated by barotropic¹ tides². The flow adjusts its directional orientation with the changing direction of wind effected by changing seasons of the year. The turnover residence times are quite short because of its shallow depth, large tidal amplitude and strong tidal current.

¹ The barotropic tide is basically a large-scale wave with a wavelength of about 6000 km that sloshes around the ocean basins, while being forced by the gravitational forces of the moon and sun.

² Strong currents indicate potential for scouring around the foundations.

The proposed wind farm site being at the entrance to Gulf of Khambhat is primarily influenced by astronomical tidal variations. Project area is situated approximately 10 nm and 17 nm to the southeast of Pipavav and Jafarabad ports. The tidal elevation at the two ports is presented **Table 4.1**.

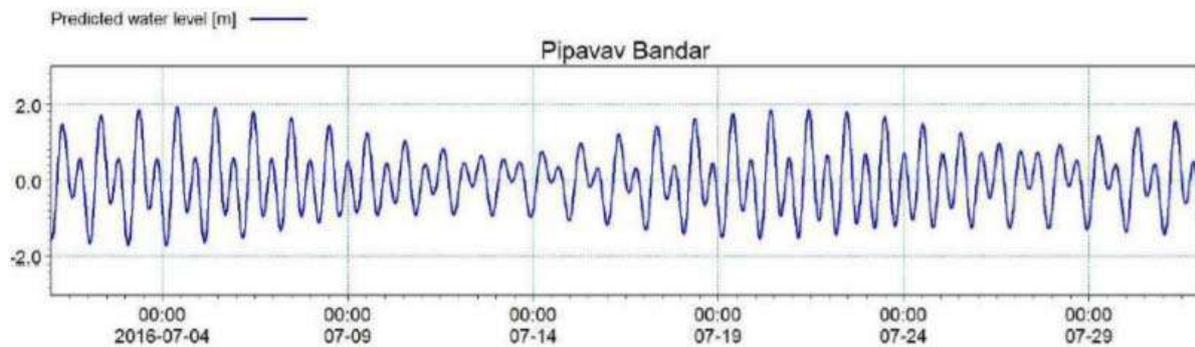
Table 4.1 Tidal elevation of Pipavav and Jafarabad Ports

Particular	Pipavav Port	Jafrabad Port
Mean Higher High Water (MHHW)	+3.2	+2.8
Mean Lower High Water (MLHW)	+2.4	+2.2
Mean Sea Level (MSL)	+1.8	+1.9
Mean Higher Low Water (MHLW)	+1.2	+1.5
Mean Lower Low Water (MLLW)	+0.5	+0.9

Source: British Admiralty Nautical Chart, Gulf of Khambhat

The predicted tide (based on the Admiralty Tide Table constituents) with respect to mean sea level at Pipavav port for a period of one month during July 2016 is presented in **Figure 4.2**. This shows that the spring and neap tide ranges during this period are 3.8 m and 2 m respectively.

Figure 4.2 Predicted tidal elevation at Pipavav during July 2016

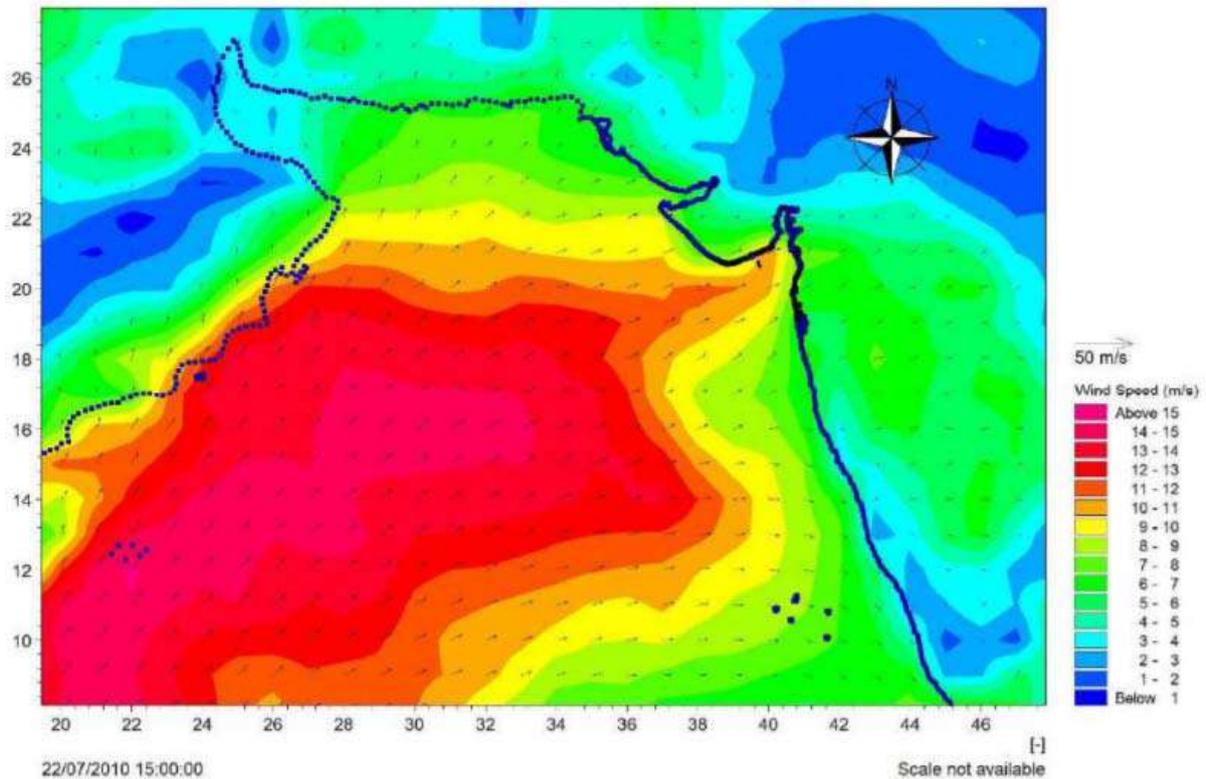


Source: Metocean Study, FOWPI

4.2.2.2 Wind Condition

Typical scenario of spatially varying wind speed in the Arabian Sea during a southwest monsoon period is presented in **Figure 4.3**.

Figure 4.3 Spatially varying wind in Arabian Sea from ECMWF¹ database during the month of July 2010 during south-west monsoon period



Source: Metocean Study, FOWPI

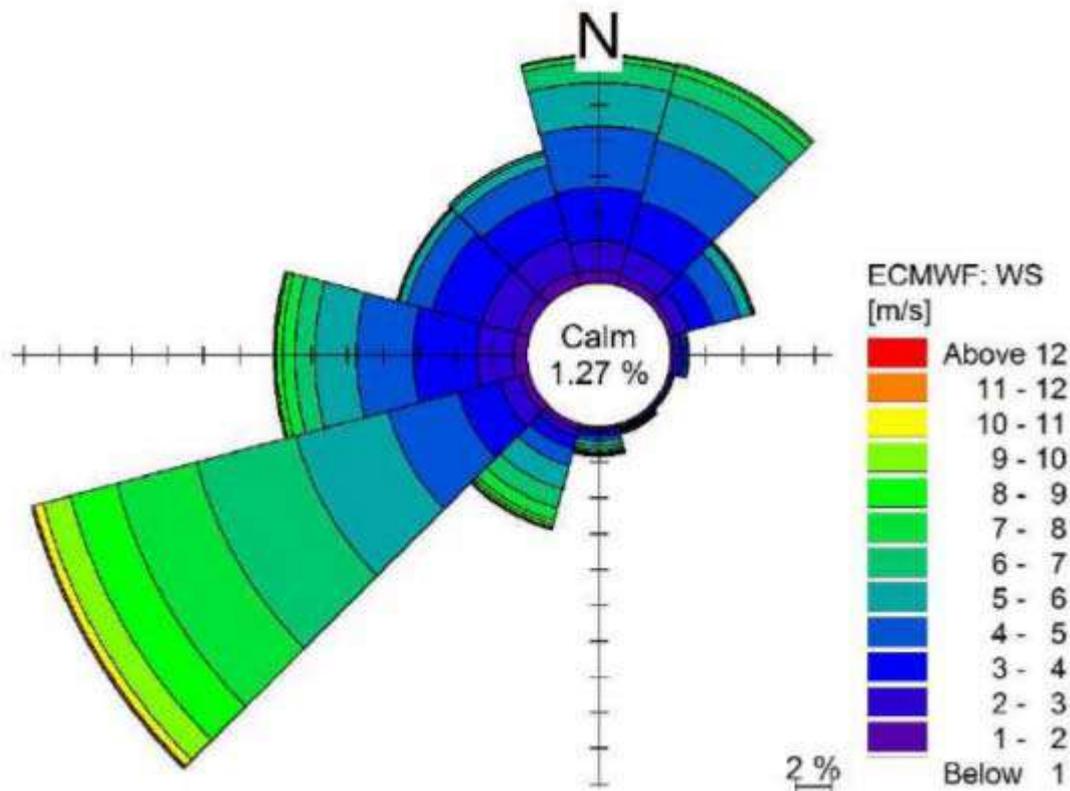
Note: Blue dots represents coast line

The wind rose at a location in the proposed wind farm site during 5 year (2010-2014) period is presented in **Figure 4.4**.

It is noticed that the predominant wind directions is from SW-WSW directions with frequent wind speeds of 3m/s to 8m/s which reach 12m/s during the southwest monsoon (May-August). A secondary peak can be seen from N-NNE direction, which is due to prevailing northeast monsoon (November-February) but not as strong as the southwest monsoon.

⁽¹⁾ The European Centre for Medium-Range Weather Forecasts

Figure 4.4 Wind rose at the proposed Project site for the period - 2010 to 2014



Source: Metocean Study, FOWPI

4.2.2.3 Current

Currents in Gulf of Khambhat are of monsoonal origin but tend to follow the trend of the coast. In December and January sets are north-westerly with rates up to 1 knot. In July and August, when the SW monsoon is well established, south easterly sets with rates of up to 2 knots are experienced. Exceptionally onshore sets of up to 1.5 knots are experienced during the NE monsoon and up to 3 knots during the SW monsoon ⁽¹⁾.

Currents in the proposed wind farm area are primarily driven by astronomical tide with little effect of wind condition. The flow predominantly being parallel to the coast, north-easterly during flood and south-westerly during ebb flow as shown in **Figure 4.5** and **Figure 4.6**. It is noticed that the intensity of current is higher during flood flow than the ebb flow in this region.

An average current speed of 0.6 m/s and maximum current speeds of up to 1.5 m/s are found near the proposed OWF area.

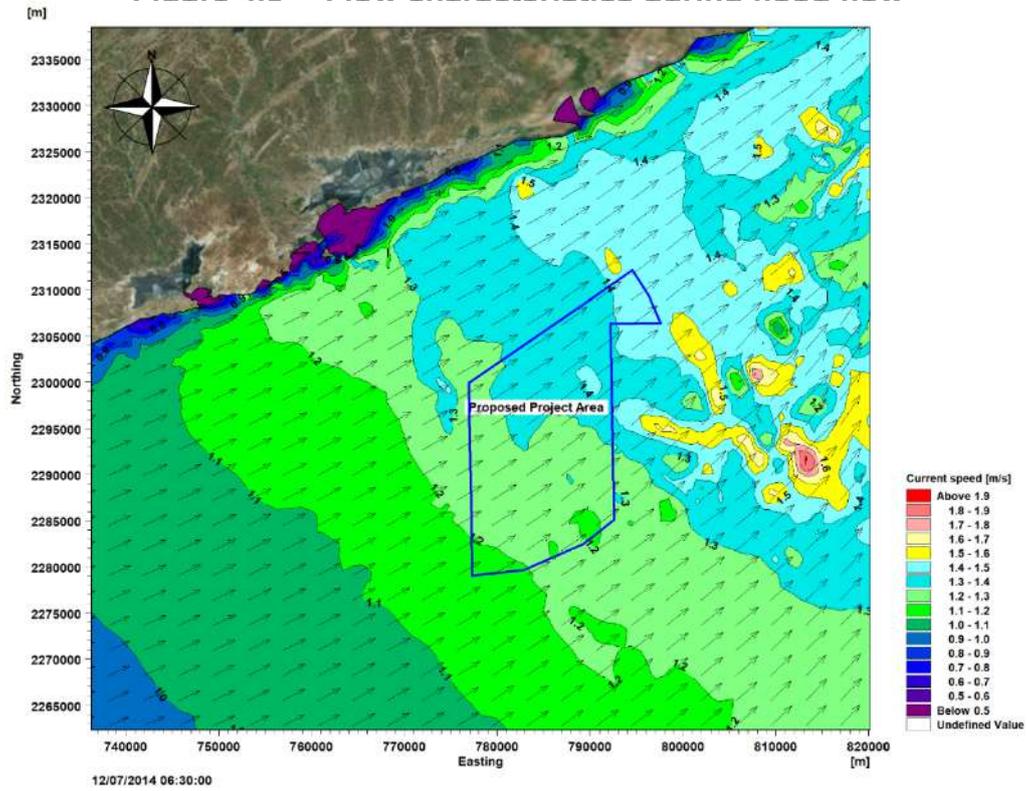
4.2.2.4 Wave Regime

Proposed offshore wind farm site is primarily exposed to waves from SW due to the exposure of the site during the southwest monsoon. The northeast monsoon has a minor effect due to the limited fetch towards NE.

Maximum significant wave height of up to 2.5-3.2 m and average significant wave height of 0.8-1.1 m from SW in the proposed offshore wind farm area as shown in **Figure 4.7** and **Figure 4.8**.

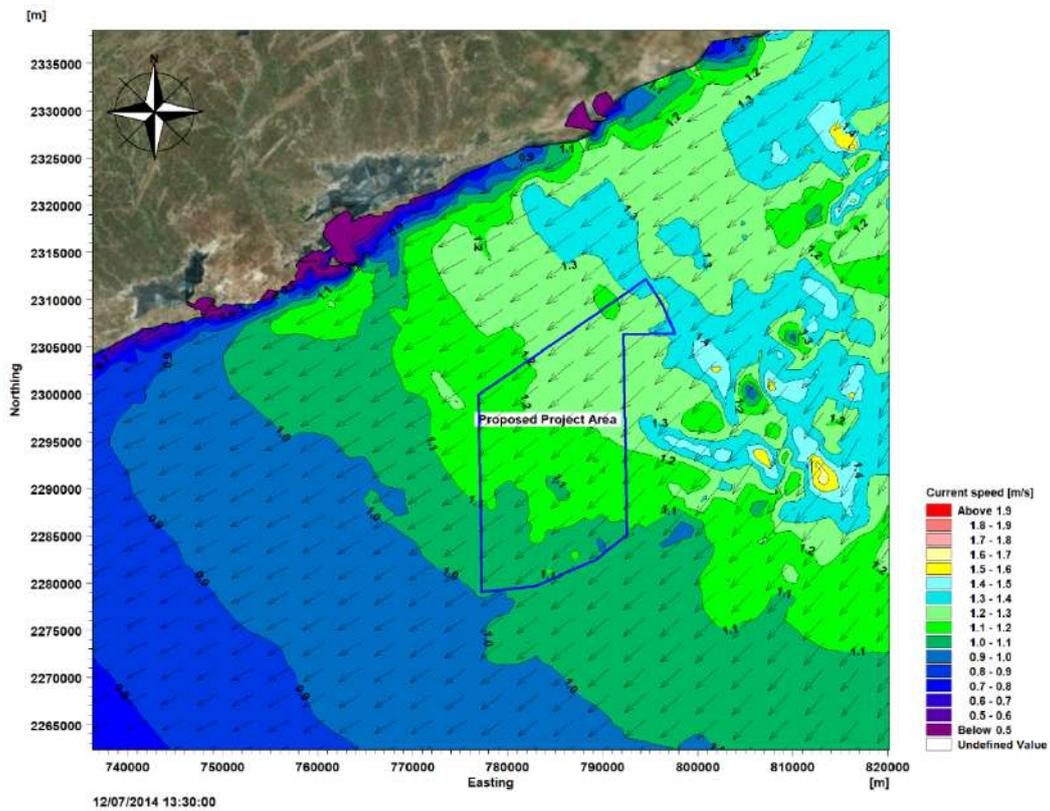
⁽¹⁾ British Admiralty Chart, Gulf of Khambhat

Figure 4.5 Flow characteristics during flood flow



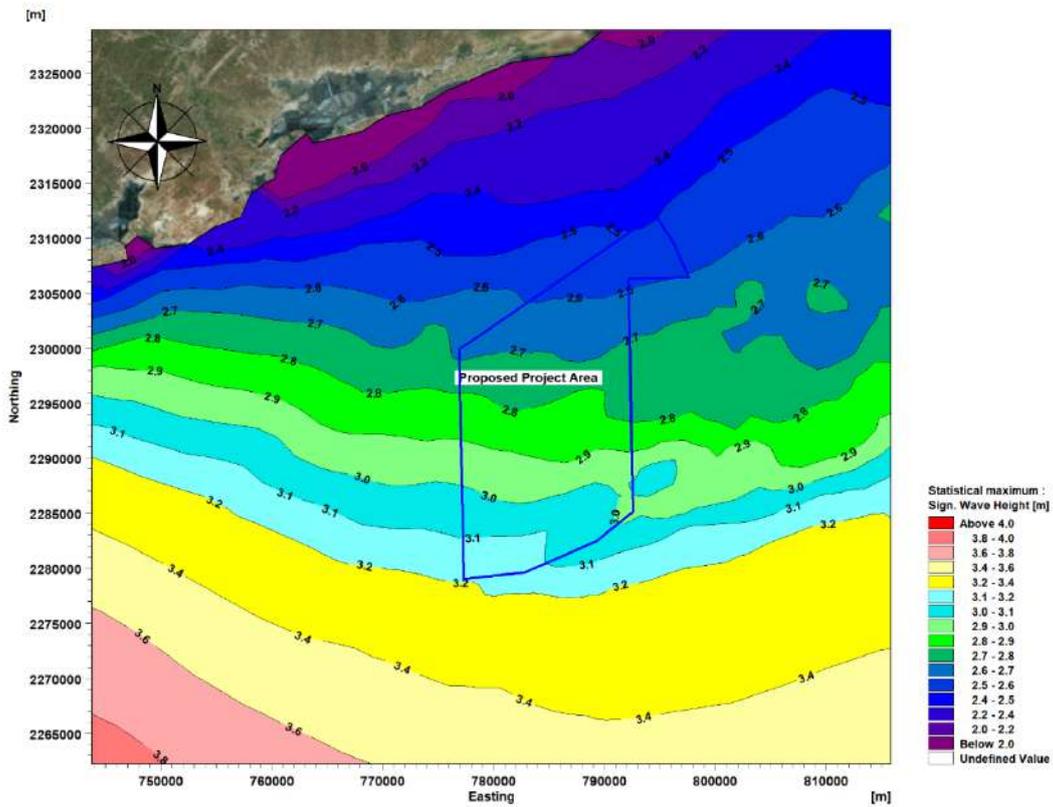
Source: **COWI**

Figure 4.6 Flow characteristics during ebb flow



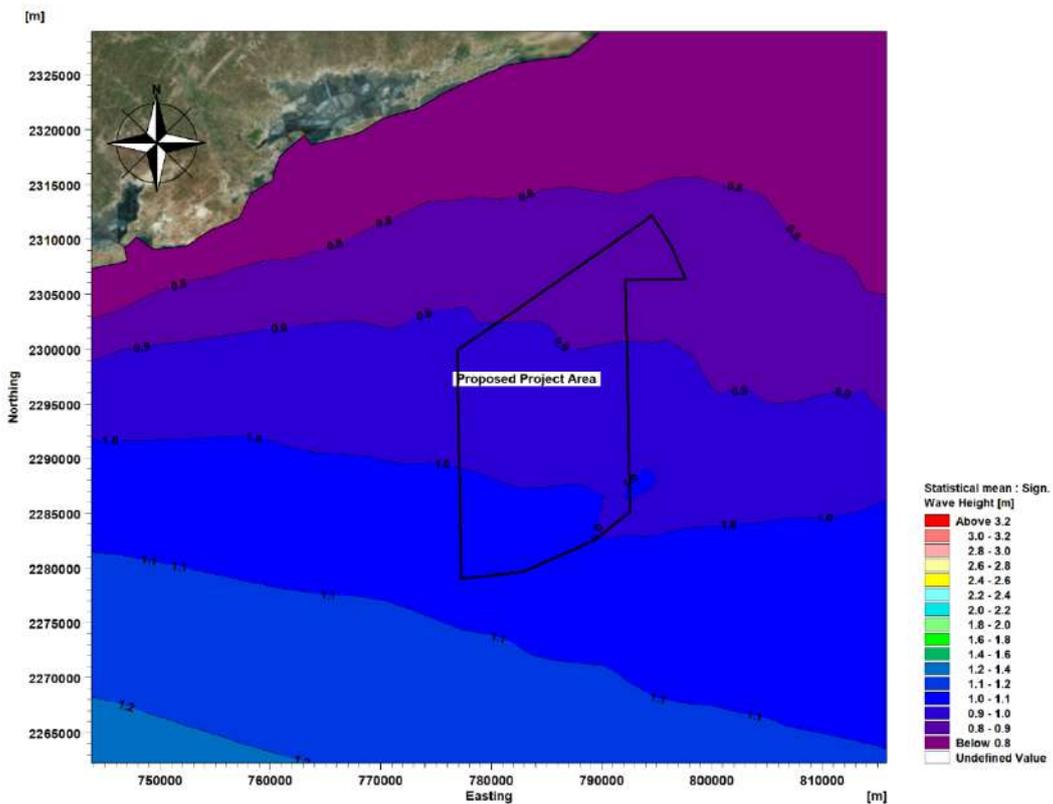
Source: **COWI**

Figure 4.7 Maximum significant wave height



Source: COWI

Figure 4.8 Mean significant wave height



Source: COWI

4.2.2.5 Cyclone

West coast of India has been struck by 27 cyclones during the period 1975 to 2015. During three of these cyclones significant wave height near the OWF site would have exceeded 7.0 m with tracks approaching land from south-westerly direction.

4.2.3 Noise and Vibration

The offshore noise and vibration assessment can be split between marine (underwater) and airborne noise and vibration.

4.2.3.1 Baseline – Marine

The existing noise environment at the proposed site is not known. Ambient and background noise levels in the marine environment are highly variable. Ambient sea noise comprises a variety of individual sources, some of which are natural and some man-made. Anthropogenic sources of noise include shipping and fishing activities and the nearby oil and gas activities. Naturally occurring noise includes waves, wind, rain and animal calls.

4.2.3.2 Baseline - Airborne

Nearest settlement of Shiyal Bet is at an aerial distance of 11 nautical miles from the wind farm site in north-west direction. Due to the distance between the wind turbines and these receptors, and anticipated background noise from wind, sea and other sources, disturbance caused by wind turbine noise is not expected to be significant.

4.2.4 Shipping and Navigation

Gulf of Khambhat is being used by variety of vessels (cargo handling both solid and liquid which includes crude oil, coal, containers, LPG, etc.) and fishing vessels (barges, tugs) being the most common. Presence of several ports including Jafrabad, Pipavav, Hazira and Surat on the coast line also attract number of commercial vessel traffic in the area. It is noted that project site does not intersect with the recommended route for navigation. It can also be noted that Tapti Oil Field Development Area adjacent to the site boundary (southeast direction), as seen in the **Figure 4.9**.

Vessels Traffic Management Systems (VTMS) are installed in Gulf of Khambhat to ensure safe navigation and more efficient traffic flow. VTMS provides vessel traffic information and navigation advice, monitoring of shipping lanes and separation schemes, protection of vessels carrying hazardous cargoes, assistance to search and rescue and hence improve port efficiency. Information on number and location of radars with regard to VTMS is available with Gujarat Maritime Board (GMB).

Map showing shipping density in the area is presented as **Figure 4.10**. It is to be noted that this data only represent vessels with Automatic Identification System (AIS) and do not accurately represent the levels of fishing and recreational activities in this area.

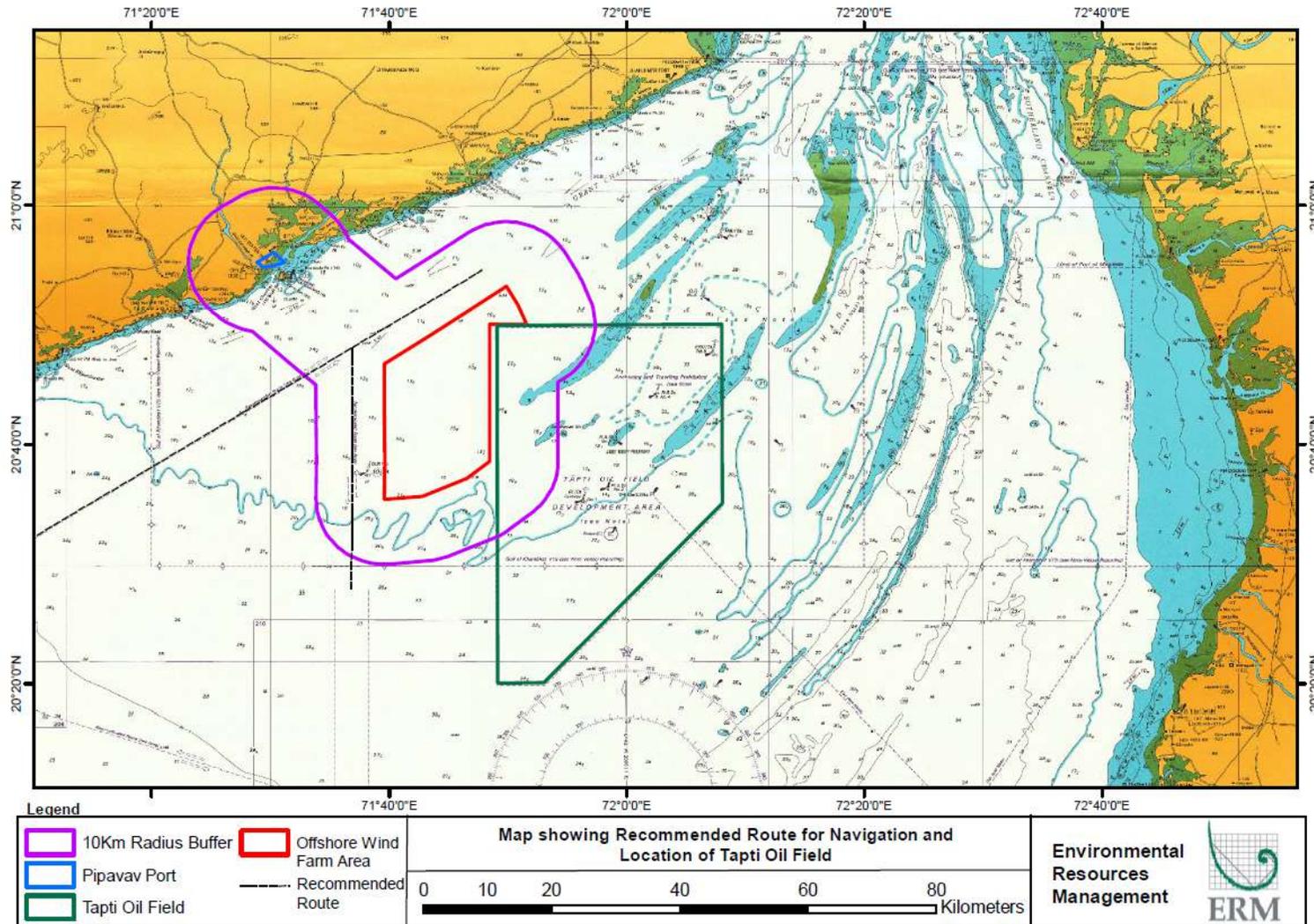
It can be inferred from the map that shipping in the project area i.e. project footprint is less, however shipping density in the study area of 10 km ranges from 1 to 118,000 route per 0.09 km²/year.

Discussions with GMB office at Jafrabad indicated that approx. 150-175 shipping vessels enter the three main jetties per month under Jafrabad jurisdiction. These are:

- Narmada Cements Jetty, Jafrabad- 15-25 vessels per month;
- Ultratech Cements Jetty, Kovaya- 35-40 vessels per month; and
- Pipavav Port- 100-120 vessels per month.

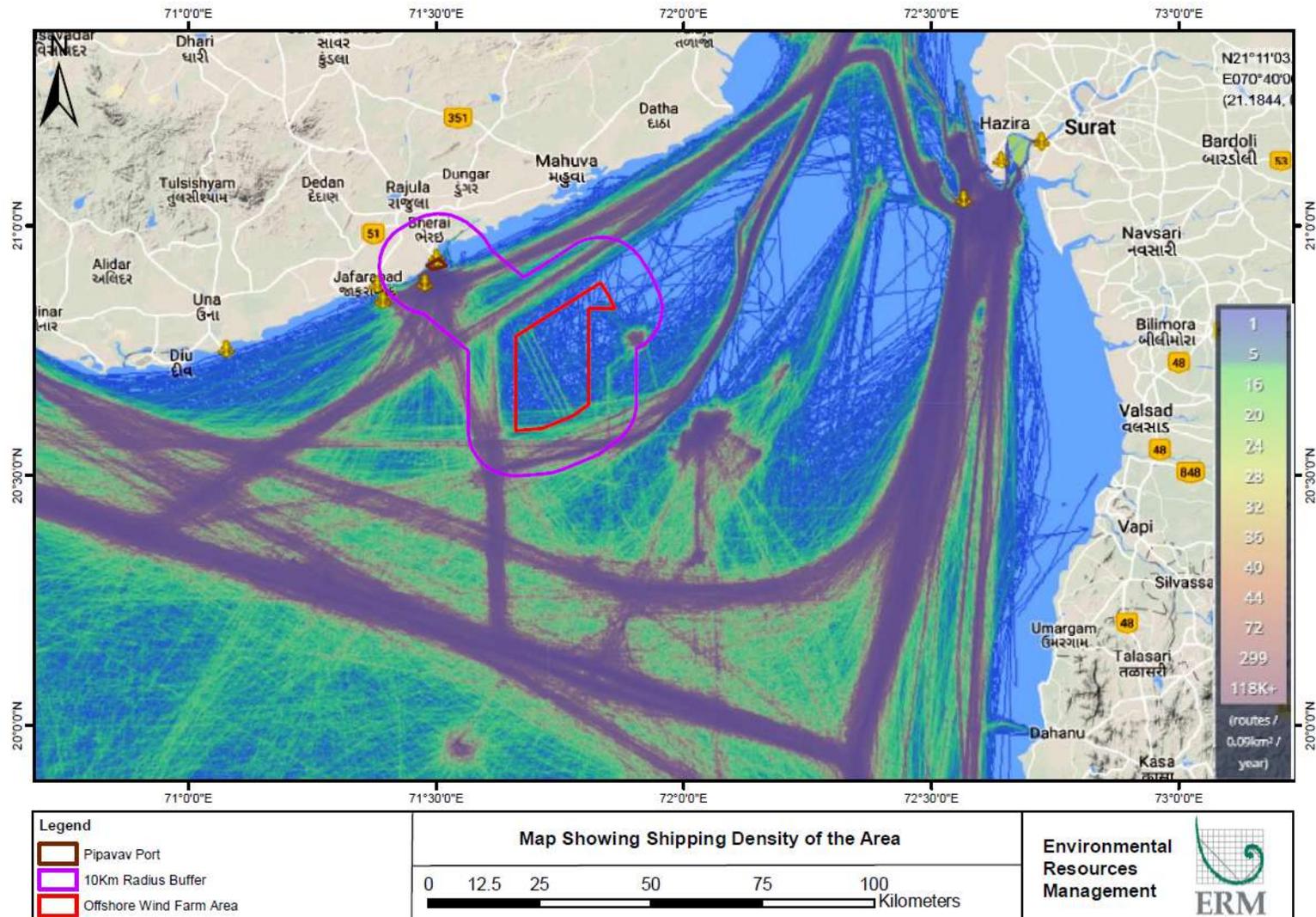
Discussions with the GMB and Department of Fisheries indicated that there are approx. 650 registered commercial fishing boats in the ports of Jafrabad, Shiyalbet, Chanchbunder and Mahuva. Majority of these boats (approx. 400) are registered in Jafrabad port.

Figure 4.9 Recommended route of navigation and location of Tapti Oil Field with respect to the proposed Wind Farm



Source: Marine Map of Gulf of Khambhat

Figure 4.10 Map showing shipping density in Gulf of Khambhat with respect to proposed wind farm



Source: <https://www.marinetraffic.com/en/ais/home/centerx:71.4/centery:20.8/zoom:9>

4.2.5 Offshore Oil and Gas Platform

Tapti oil field development area lies adjacent to the windfarm site boundary (refer **Figure 4.9**). It is a part of the Panna-Mukta-Tapti fields, commonly known as the PMT asset, owned by a consortium of three companies namely Oil & Natural Gas Corporation Limited (ONGC), Reliance Industries Limited (RIL) and British Oil & Gas Company (BG India). ONGC owns 40%, while RIL and BG India own 30% each.

Tapti field started production in 1997-98 and showed healthy output until 2008-2009 but have steadily declined since then. Decline for Tapti field was 35% in 2011. A nearly decline of 50% from the previous year in Financial year 2014 has resulted in BG, ONGC and RIL sending a proposal for early abandonment of the Tapti field to the Ministry of Petroleum and Natural Gas. It was anticipated that output from the Tapti field will taper off to zero by the end of 2015 (The Economics Times, 2011) (Business Standard, 2014) (The Economics Times, 2015).

4.2.5.1 Decommissioning of the Platform

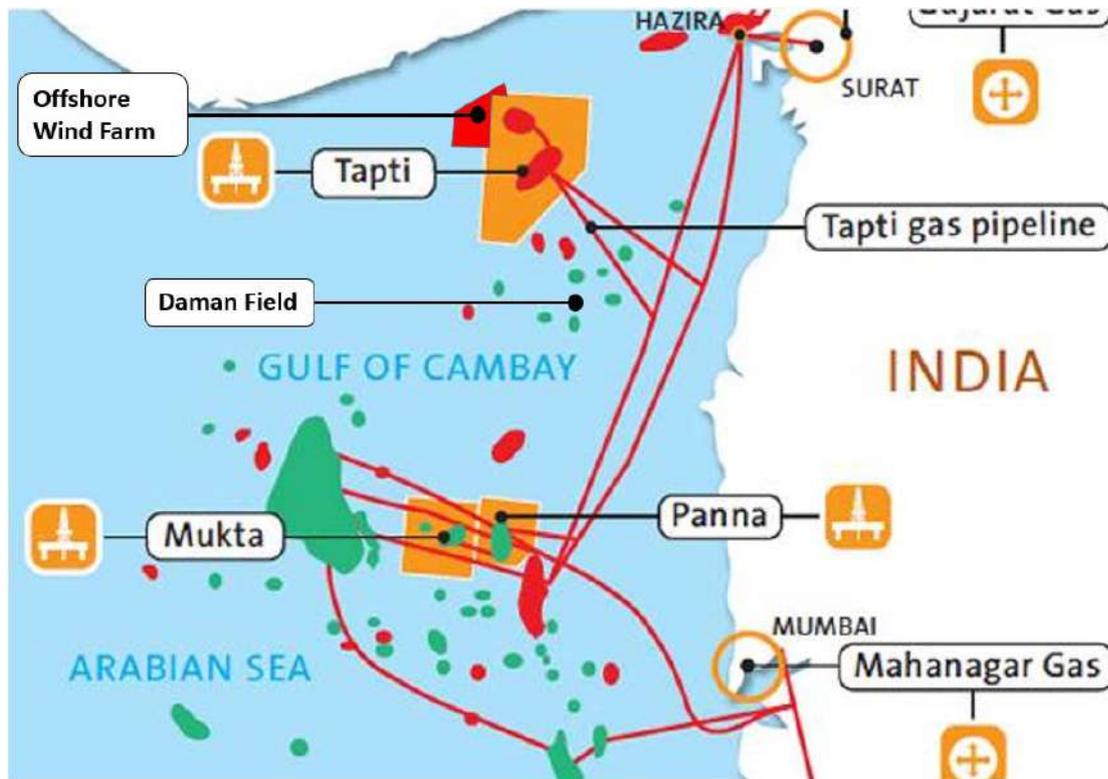
Approval of early abandonment of the Tapti field was announced in 2015 with sub-sea pipeline, and process platform to be transferred to ONGC's neighboring Daman Field (about 100 km from the Daman coast)¹ and the rest of the wellhead topsides, infield pipelines and wells to be dismantled (The Economics Times, 2015).

As per the prefeasibility report for Tapti Offshore Decommissioning, facility removal and onshore disposal for the proposed decommissioning is expected to start by 1st quarter of the year of 2019 (PMTJV, 2017). Map showing location of subsea Tapti gas pipeline and oil & gas infrastructure of PMT asset is presented in **Figure 4.11**.

Currently 68 wells are under production in Panna Mukta, however in Tapti field, the plugging and abandonment of wells and decommissioning of associated facilities are already under progress (Livemint, 2018).

¹ Daman field is located in the south and south-east direction of Tapti oil field. The Daman development project began production from its first well C24-P4#3 on August 20, 2016.

Figure 4.11 Map showing subsea pipeline and infrastructure of PMT and Daman Field



Source: <https://www.energy-pedia.com/news/india/panna-mukta-oil-and-gas-production-to-resume-mid-october>

4.2.6 Sub-sea Infrastructure

As indicated by representative from APM Terminal, there are no known sub-sea cables and pipelines across the proposed project area of offshore wind farm. However, an existing subsea electric line connects the island of Shiyal Bet with the coast, which is northwest of the proposed site for offshore windfarm. (Refer **Figure 2.9** for location of the cable). Pipelines associated with PMT asset lies to the east of the proposed site (**Figure 4.11**). There are no identified disposal or spoil sites that might contain contamination.

4.3 Coastal and Onshore Physical Environment

The offshore wind farm requires several onshore ancillary components including the Pooling Substation (refer to **Section 2.4**), Grid Substation, onshore cable (buried/ overhead) and Storage Yard. The locations of onshore pooling substation (if applicable) is not known however proposed tentative location is approximately 2.3 km southwest of the Pipavav Port. The project had identified five potential grid substations for power evacuation from the project. However owing to the large capacity currently targeted i.e. 1 GW, the 400/220kV substation proposed in village Pipavav and existing GETCO substation in Village Kovaya are the potential options. Route of the onshore cable from pooling substation to grid substation is yet to be finalised. In the absence of finalised route of onshore cable, straight-line path from the onshore pooling substation to proposed grid substation (as presented in **Figure 5.1**) has been considered for this scoping study. This section provides environmental sensitivities of the area where potential pooling substation and grid substation are located.

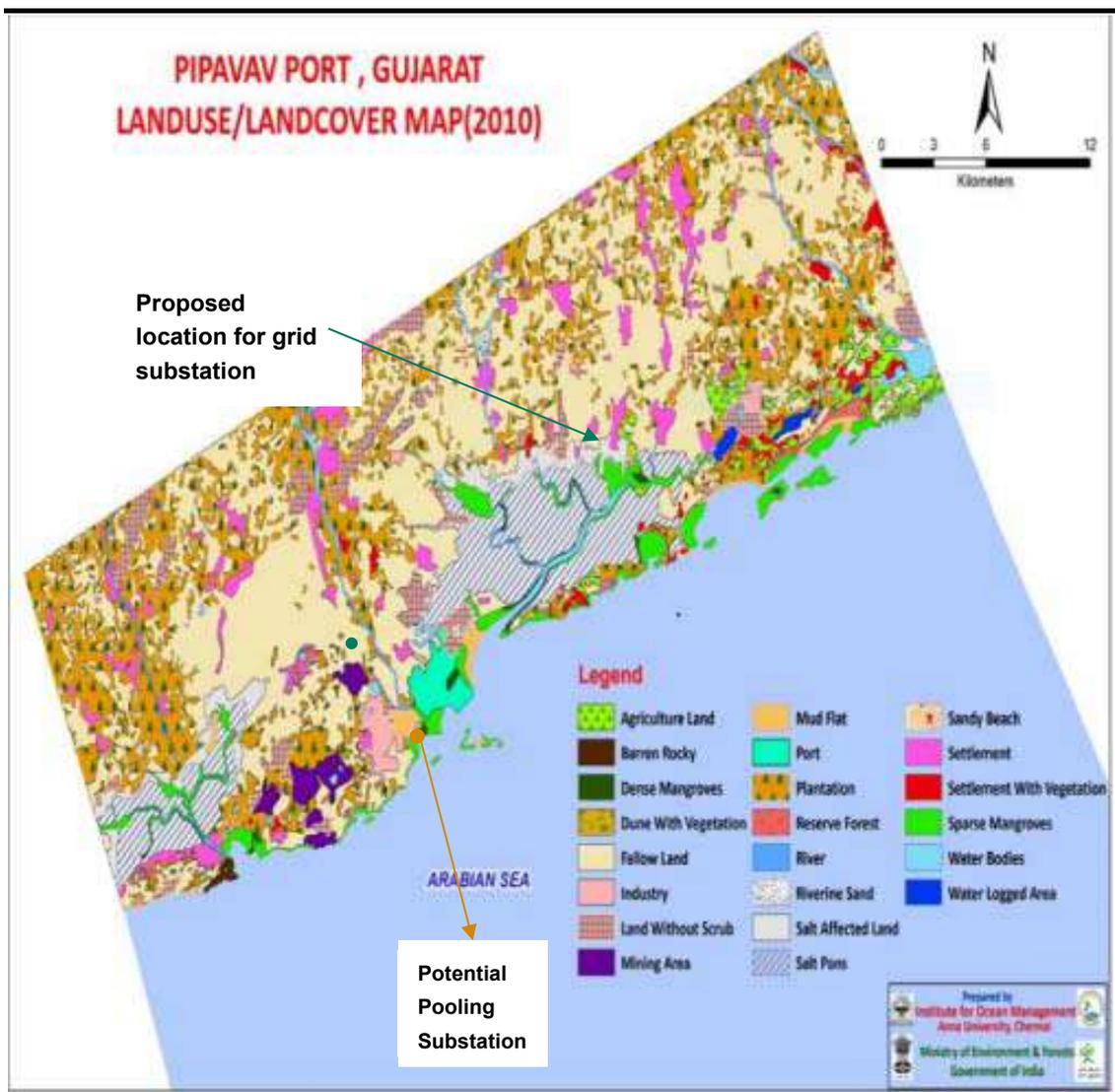
4.3.1 Land Use

The proposed wind farm is offshore at a distance approximately 9.0 to 23.5 nautical miles from Pipavav Port. However, activities pertaining to laying of onshore cables and setting up of tentative

pooling sub-station for power evacuation from non-conventional energy sources will be carried out onshore. The power generated from the offshore wind turbines will be evacuated through subsea export cables to a Pooling Substation (PSS) located approximately 2.3 km southwest of the Pipavav Port.

Land use of the proposed location of pooling substation is mudflat with mangroves towards northeast direction and industry towards west as shown in **Figure 4.12**. It is to be noted that that this location is tentative and likely to change depending on the preferred configuration for power evacuation and recommended location for landfall point.

Figure 4.12 Land use of the Potential Pooling Substation



Source: EIA Report for Pipavav port (Aquatech Enviro Engineers, 2011)

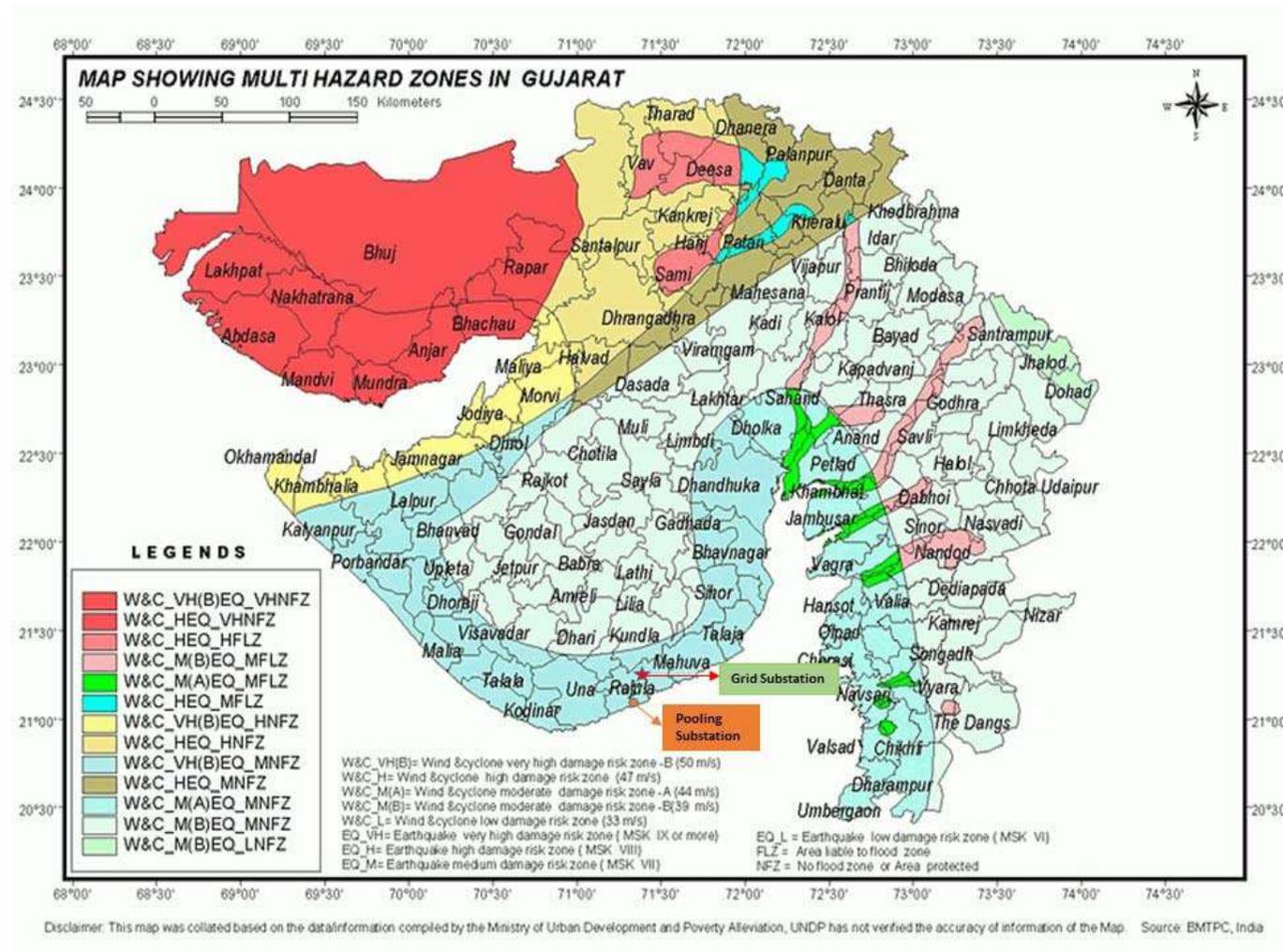
The project has also identified five potential grid substations. Out of the five, the one proposed in village Pipavav and Village Kovaya are under consideration. Site for the proposed Pipavav substation (400/220kV) is a fallow land as presented in **Figure 4.12**. Based on site visit it was noted that the proposed land is surrounded by agricultural land and village houses.

4.3.2 Hazard Zone

Multi hazard zone map of Gujarat (presented in **Figure 4.13**, showing vulnerability of area with respect to hazards like wind & cyclone, earthquake and flood, shows that the site for the pooling

substation (tentative), route of onshore cable (assumed to be straight) and potential grid substation lies in very high risk damage risk zone with respect to wind and cyclone, medium risk zone with respect to earthquake and no flood zone with respect to flood.

Figure 4.13 Multi hazard Zone Map showing location of proposed pooling substation, route of onshore cable and potential grid substation



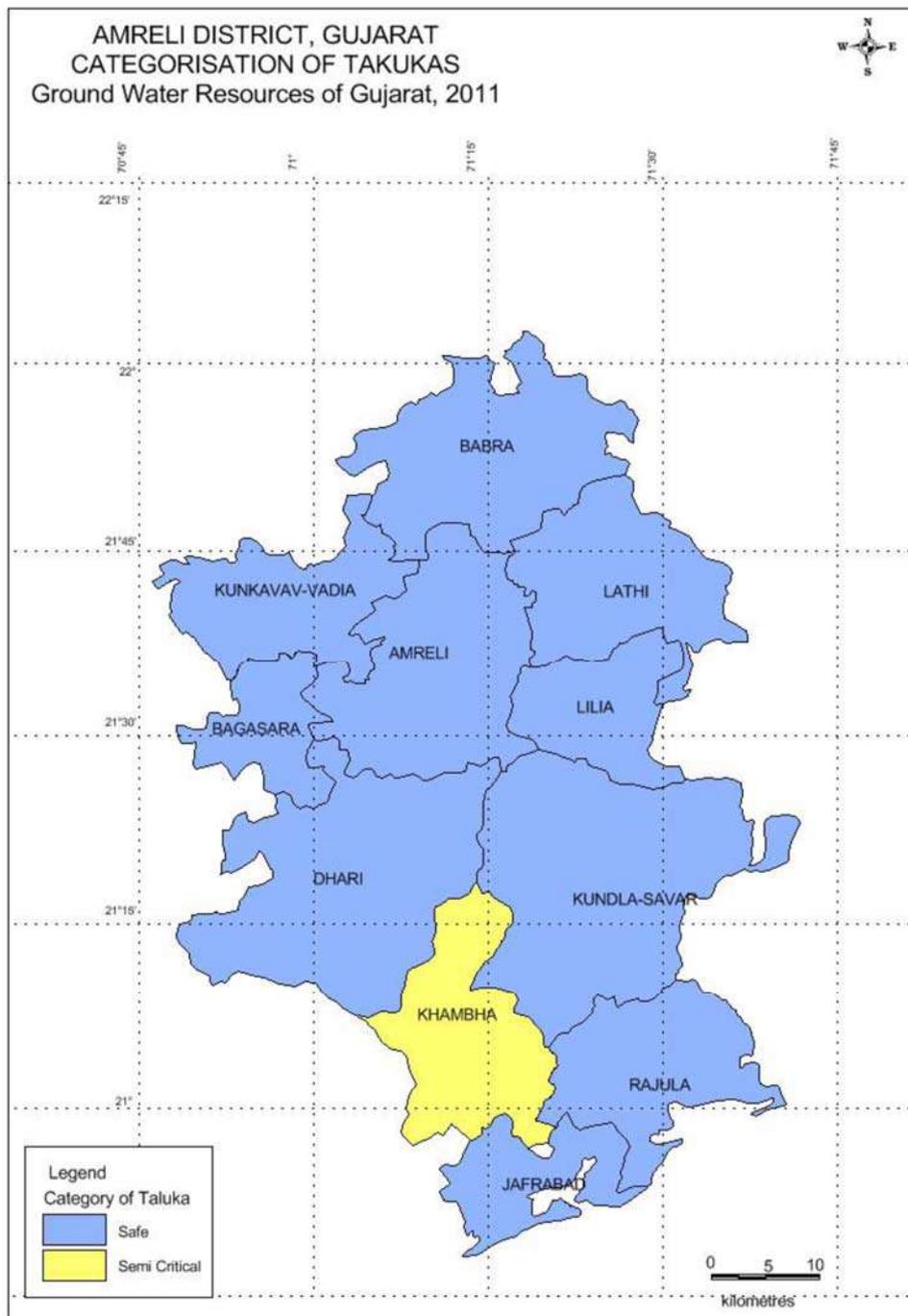
Source: Gujarat State Disaster Management Authority

4.3.3 Groundwater Resources

As per the groundwater information booklet of Taluka Rajula in District Amreli (where proposed onshore pooling substation and proposed grid substations are located), falls in safe category (i.e. area which have ground water potential for development) where % of ground water development is 54.99%. Ground water resource map of Amreli District showing category of taluka with respect to ground water development is presented in **Figure 4.14**.

It was observed that all the taluks of district Amreli falls under safe category except one i.e. Khamba which falls under Semi Critical Category where cautious ground water development is recommended.

Figure 4.14 Ground Water Resource Map of Amreli District



Source: (CGWB, 2011)

4.3.4 Geomorphology & Soil Type

Geomorphologically, the Amreli District can be divided into two major units: (i) those formed by Quaternary/Tertiary formation (includes alluvial plain, salt flat, valley fill, coastal plain, coastal ridge, coastal depression and pedimount zone; and (ii) those formed by Deccan Trap (includes pediment, dissected hilly terrain, moderately dissected pediplain and denundation hill).

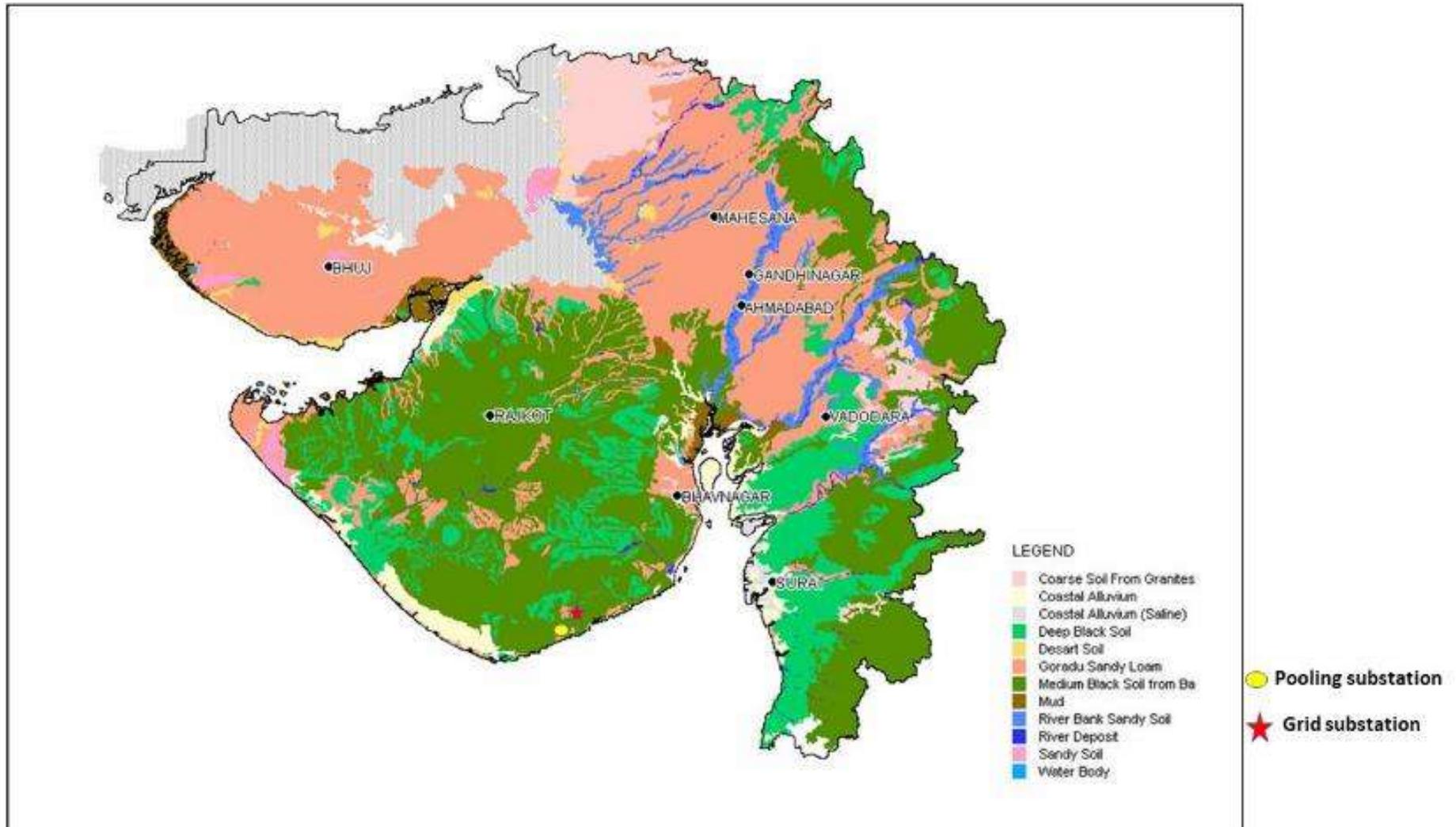
Soil map of Gujarat district showing locations of the pooling substation (tentative) and proposed grid substation is presented as **Figure 4.15**. Soil type of the area ranges from medium to deep black soil.

4.3.5 Noise and Vibration

The existing noise environment at the proposed site is not known. However, ambient noise levels in coastal environments are generally thought to be higher than in offshore environments.

The existing background noise levels at terrestrial noise sensitive receptors are not known. There are industrial and commercial developments on the closest shorelines to the proposed Wind Farm site. Project activities at coastal and onshore environments will result increase in noise levels near to the activity areas particularly during the construction phase.

Figure 4.15 Soil Map of Gujarat showing tentative locations of pooling substation and grid substation



4.3.6 Aviation (Civilian and Ministry of Defence)

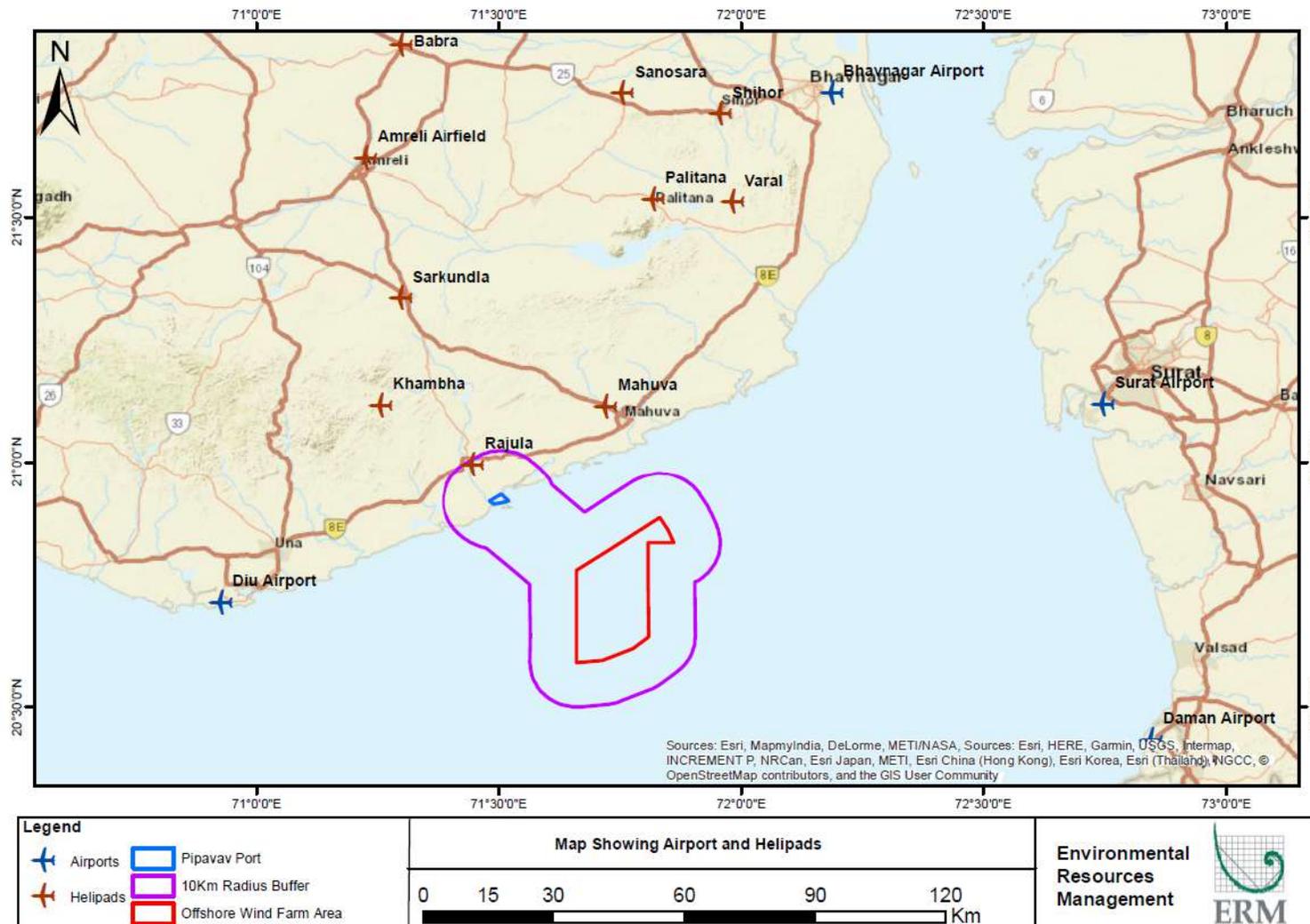
There are four airports near to the project site. These are:

- Diu- 77 km towards west
- Daman – 111 km towards southeast
- Surat -96 km towards east
- Bhavnagar – 103 km towards north east

As per the consultation with port representatives, it was noted that there are no aviation radars in the area. They also confirmed of absence of military aviation base activity in the area. It was noted that Pipavav Shipyard Limited (PSL) at a distance of ~ 23 km has a designated helipad. Helipads present in Amreli district include Aamerli Airfield, Savarkudla, Babra, Khambha and Chhatadiya, Rajula.

Map showing location of airports and helipads with respect to project site is as presented in **Figure 4.16**.

Figure 4.16 Map showing locations of nearby airports and Helipads



Source: (GIDB, n.d.) and (GSAIL, n.d.)

4.3.7 Traffic and Transportation

Wind farm area for the proposed project is located at a distance of 9 to 23.5 nautical miles from the Pipavav Port and can be accessed via the port at the time of construction as well as operation phases. The port is well connected via road, railway and coastal route. The port has developed 11 km long four lane expressway which connects the port to National Highway 8E which is 455 km in length. NH 8E connects Bhavnagar to Dwarka via Somnath and Porbandar. Highway currently is 2 lane however expansion work of highway from 2 lane to 4 lane is being undertaken.

The Pipavav port is well connected to its hinterland via Surendranagar by the broad gauge Indian Railways rail network. Surendranagar is further connected to the national grid.

The port is also well connected to the coastal feeders including Cochin, Tuticorin, Goa, Mangalore, Kandla and Mundra.

The main challenge with respect to wind energy facilities lies with the transportation of oversized or heavy wind turbine components (blades, turbine tower sections, nacelle, and transformers) and cranes to the site. Transportation route of the turbines is yet to be finalized. Other ports present near to proposed landing point include Jafrabad Port and Mahuva Port as shown in **Figure 2.5**.

4.4 Offshore Ecological Environment

4.4.1 Eco-sensitive Areas ⁽¹⁾ in Offshore Environment

The Gulf of Khambhat is considered an important ecosystem because of the interplay between fresh water from rivers draining in the gulf and the saline water coming in from the Arabian Sea. Several wetland habitats along the entire Gulf of Khambhat coast are promoted through this interplay including mudflats, mangroves, salt flats and swampy land. The area however, is not designated an ecologically sensitive area within state and national level notifications.

4.4.2 Ecological Sensitivities in the Offshore Environment

The offshore environment consists largely of rocky seabed nearshore and sandy bottom further offshore. Geophysical survey across FOWPI site area also found mostly sandy sediments on top seabed layer. No habitats of conservation importance such as coral reefs, cold seeps or seagrasses have been identified in the area. The Gulf of Khambhat also acts as a large estuary with varying degrees of salinity from the tip to the mouth and strong variation in salinity levels depending on the season. The Project site is in largely saline environment as it is closer to the mouth of the Gulf but will receive significant freshwater input into the monsoon and post-monsoon season that can affect the species composition.

Two other factors can affect species composition in an open water environment, namely plankton diversity and benthic systems. Strong plankton diversity provides the base for the food chain and can promote fish and larger consumer species in open water (i.e. pelagic environment). In contrast, a strong benthic diversity indicates a strong fish and larger consumer species diversity closer to the seabed. Both plankton and benthic diversity has been described in subsequent sections.

4.4.2.1 Plankton

The Gulf of Khambhat receives a lot of fresh water runoff from the various rivers of Gujarat and therefore there is a high concentration of nutrients available. High nutrient availability promotes primary productivity and therefore there are pockets of higher phytoplankton diversity near river mouths. No major rivers have their outfall near the Project site.

(1) Eco-sensitive areas in the offshore environment refers to declared Marine National Parks.

Studies were undertaken along the Gulf of Khambhat to measure plankton diversity. Near the Mahuva Port, which is 30 km north of the Project site, 13 genera of phytoplankton with a density of up to 50 nos./l was determined in 1999 (Vaccharajani, 2007). The plankton species were dominated by diatom and cyanobacteria, both of which are dominant in high nutrient conditions. Zooplankton density was also measured in the same study and a density of 390,000 nos./m³ was found near Mahuva Port.

4.4.2.2 Benthic Ecosystems

Benthic or marine sediment ecosystems were determined to have low diversity (ICMAM, 2002) due to the high currents and rocky seabeds that exposes benthic fauna to the full effects of physical variations of the ocean. The FOWPI site area, which has mostly sandy sediments on top seabed layer, receives strong currents and undertow that acts as a deterrent to benthic growth.

4.4.2.3 Commercial Fisheries

Commercial fisheries is largely dependent on Bombay Duck (*Harpadon nehereus*). Other species that are caught in the Jafrabad and Mahuva ports include Medium Prawns (*Penaeus* spp.), White Pomfret (*Pampus argenteus*), Catfish (*Arius* spp.), Sole (Family: *Soleidae*), Ribbonfish (Family: *Trichiuridae*), Indian Salmon (*Eleutheronema tetradactylum*), Eel (Family: *Congridae*), Mackerel (*Rastrelliger* spp.), Crab (Family: *Portunidae*) and Mudskipper (*Periophthalmus* spp.).

4.4.3 Species of Conservation Importance in the Offshore Environment

Species identified in the 10 km radius

Species of conservation importance that have been reported or observed within the 10 km radius of the wind farm area and as provided by the Rajula Forest Department and online journal articles is provided in the table below.

Table 4.2 Identified species of conservation importance in the offshore environment

S.N.	Common Name	Scientific Name	Conservation Significance
1.	Olive Ridley	<i>Lepidocheyls olivacea</i>	IUCN Status: Vulnerable IWP Status: Schedule I Turtle nesting occurs along the Amrelii Coast and further north of the Project site. Nesting has also been identified by the Rajula Forest Department in Chanch Bandar, located approximately 3 km north of the Pipavav Port. Three nesting females regularly use Chanch Bandar for nesting
2.	Humpback Whale	<i>Megaptera novaeangliae</i>	IUCN Status: Endangered (Arabian Sea variant) IWP Status: Not Evaluated The Arabian Sea variant of the Humpback Whale has been found occasionally beached along the Gulf of Khambhat coast. The Rajula Forest department confirmed a beaching near Jafrabad port in the last year that could only be a humpback whale based on coloration and size description.
3.	Beaked Whale	Unknown species	IUCN Status: Data Deficient (most beaked whales found in India except the Cuvier's beaked whale is data deficient) IWP Status: Not Evaluated

S.N.	Common Name	Scientific Name	Conservation Significance
			An unidentified species of beaked whale was described as having beached near Jafrabad in the last two years. Based on the colouration (tan yellow) and size (~6m), the species could not be determined. The individual is likely one of four species – Cuvier's Beaked Whale (<i>Ziphius cavirostris</i>), Southern Bottlenose Whale (<i>Hyperodon planifrons</i>), Blainville's Beaked Whale (<i>Mesoplodon densirostris</i>) or Deraniyagala's beaked whale (<i>Mesoplodon hotaula</i>).
4.	Whale Shark	<i>Rhincodon typus</i>	IUCN Status: Endangered IWP Status: Schedule I The Whale Shark is commonly found in and around Diu and is known to travel as far north as Jafrabad as part of its regular foraging. A study tracking the movement of whale shark movement in the area has been provided in Figure 4.19

Species identified in the Gulf of Khambhat (outside 10 km radius)

In addition to the aforementioned Whale Shark, Humpback Whale, Beaked Whales and Olive Ridley turtles, there are other large fishes, mammals and reptiles found in the Gulf of Khambhat. Some of the species found in the area are described below ⁽¹⁾:

- Sea turtles including the Endangered Green Sea Turtle (*Chelonia mydas*), Vulnerable Leatherback Sea Turtle (*Dermochelys coriacea*) and Critically Endangered Hawksbill Sea Turtle (*Eretmochelys imbricata*) are commonly found foraging along the Gujarat coast and have been identified swimming around the Gulf of Khambhat (ICMAM, 2002).
- Fisherman consultations undertaken for the study indicate presence of the Vulnerable Finless Porpoise (*Neophocaena phocaenoides*) and Vulnerable Indo-Pacific Humpback Dolphin (*Sousa chinensis*) in the Gulf of Khambhat with occasional sightings close to the coast confirmed by the Rajula Forest Department;
- Some seabird species including Near Threatened Flesh-footed Shearwater (*Ardenna carneipes*) and Near Threatened Swinhoe's Storm Petrel (*Hydrobates monorhis*) have been reported (2) from the area
- Some threatened shark species such as the Endangered Broadfin Shark (*Manopsis temminckii*), Vulnerable Sandbar Shark (*Carcharhinus plumbeus*), Critically Endangered Sawtooth Shark (*Pristis pristis*) and Endangered Scalloped Hammerhead Shark (*Sphyrna lewini*) have also been identified along the Gulf of Khambhat. (Jabado)

4.5 Coastal and Onshore Ecological Environment

4.5.1 Proximity of Project Site to Eco-sensitive Areas

The proximity to Eco-sensitive Areas (ESAs) ⁽³⁾ has been determined for the onshore and offshore components separately. As shown in **Figure 4.17**, the nearest ESA is Gir National Park that is located approximately 35 km in the northwest direction from Pipavav Port. There is no habitat contiguity from

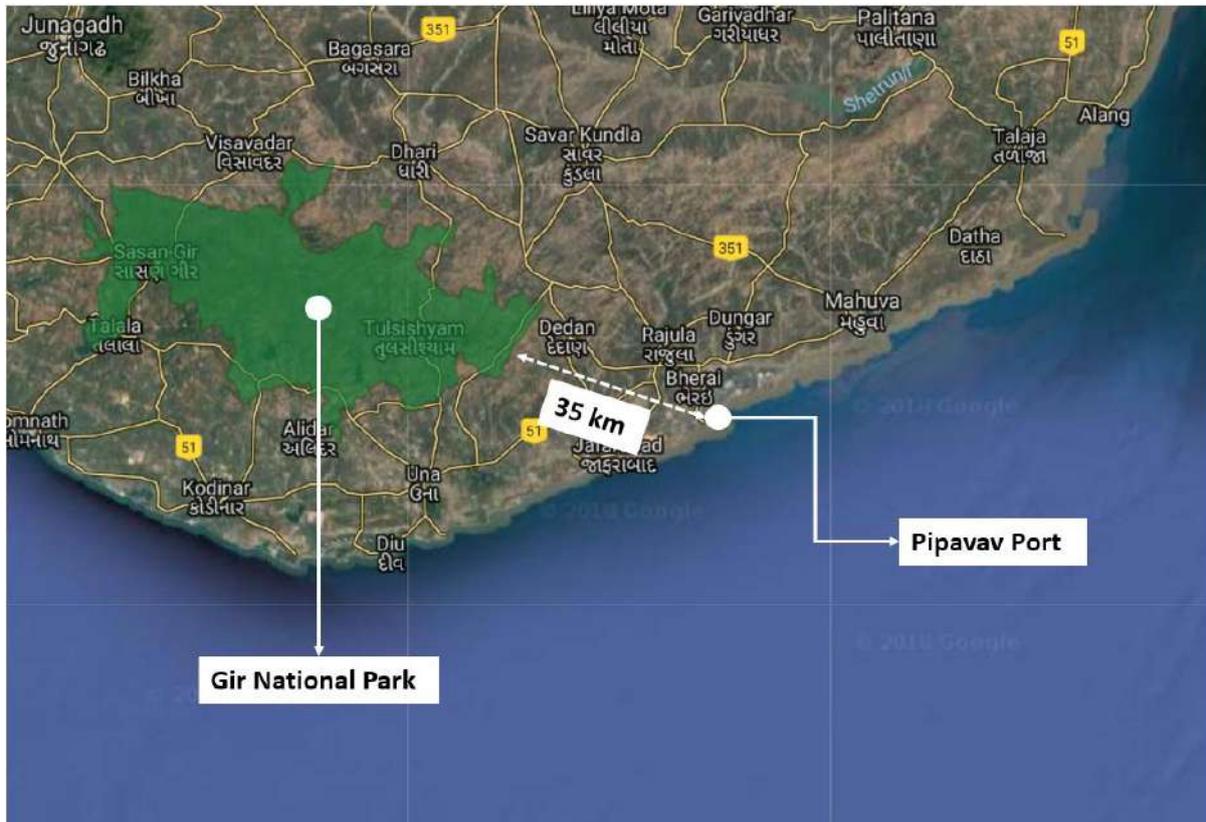
⁽¹⁾ The species listed in the Table 4.2 are found in the 10 km radius study area whereas other listed species are found in the Gulf of Khambhat at large. These species are only listed because they could potentially be found in the study area but there are no records in the public domain indicating that they have already been observed in these areas.

(2) BirdLife International Data Zone - datazone.birdlife.org

(3) ESA has been defined for the purpose of this study to include National Parks (NP), Wildlife Sanctuaries (WLS), Conservation Reserves, Community Reserves, Important Bird and Biodiversity Areas (IBAs), Alliance for Zero Extinction Sites (AZE), Ramsar Sites, Eco-sensitive Zones (ESZ) and UNESCO World Heritage sites.

Gir to the Project site. The Gir National Park is also an Important Bird and Biodiversity Area (IBA) for the protection of several Critically Endangered, Endangered and Vulnerable species including vultures (*Gyps* spp.), pelican (*Pelecanus* spp.) and eagles (Family: *Accipitridae*).

Figure 4.17 Nearest Eco-sensitive Area (ESA) to the Project site



Source: (Birdlife International, n.d.)

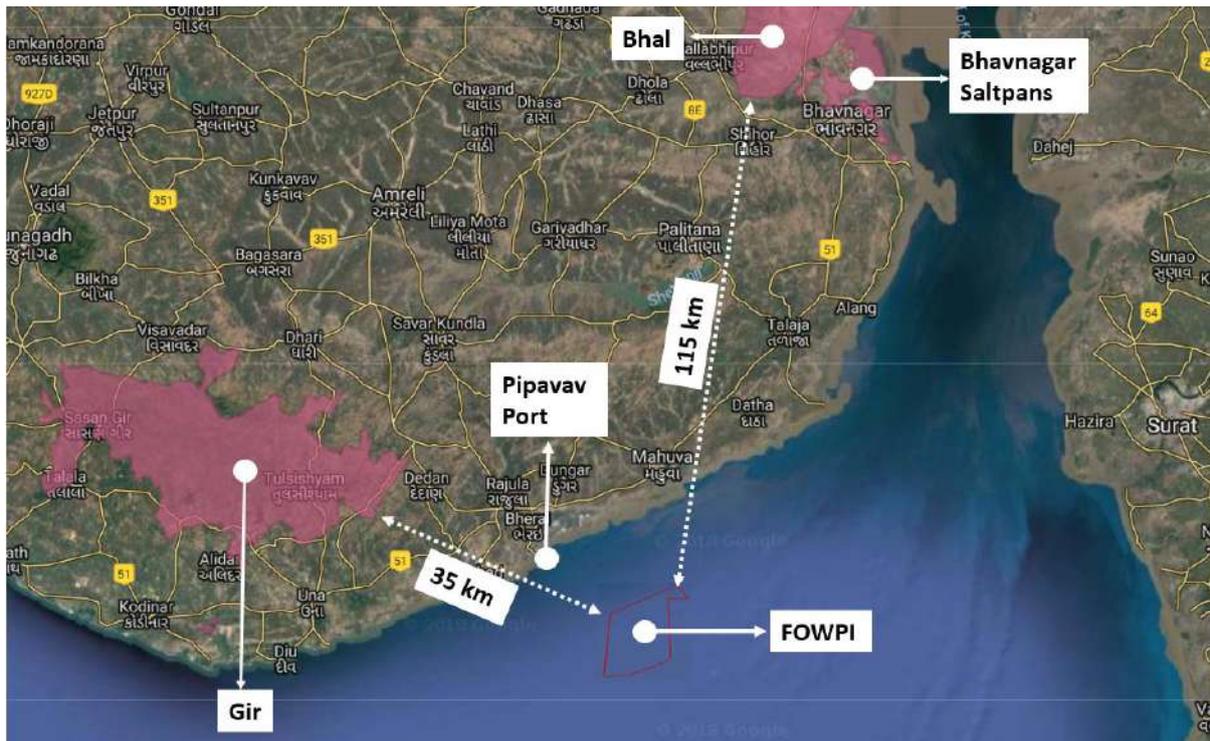
Box 4.1 Gir National Park

Gir National Park was declared in 1975 and covers an area of 258.71 km². The National Park (NP) is connected with the surrounding Gir Protected Areas including Gir Wildlife Sanctuary (1153.42 km²), Paniya Wildlife Sanctuary (39.64 km²) and Mitiyala Wildlife Sanctuary (18.22 km²). The NP consists of Dry Deciduous Teak Forest, Dry Deciduous Scrub Forests and Dry Savannah Forests. The NP is significant for the protection of Asiatic Lions (*Panthera leo*) and Leopards (*Panthera pardus*). Gir is also a significant bird conservation site and has been declared as an Important Bird and Biodiversity Area (IBA) for the protection of Critically Endangered Baer's Pochard (*Aythya baeri*), Vulnerable Sarus Crane (*Antigone antigone*), Endangered Lesser Frigate (*Sypheotides indicus*), Near Threatened Dalmatian Pelican (*Pelecanus crispus*), Near Threatened Spot-billed Pelican (*Pelecanus philippensis*), Vulnerable Indian Skimmer (*Rhynchops albicollis*), Critically Endangered White-rumped Vulture (*Gyps bengalensis*), Critically Endangered Indian Vulture (*Gyps indicus*), Vulnerable Greater Spotted Eagle (*Clanga clanga*) and Eastern Imperial Eagle (*Aquila heliaca*).

4.5.1.1 Key Biodiversity Areas

The biggest ecological concerns for operational wind farms is collision of flying fauna with the rotating wind turbine blades. The proximity of an Important Bird and Biodiversity Areas (IBAs) is therefore a bigger indicator of ecological sensitivity than Protected Areas. The proximity of the Project to IBAs has been presented in **Figure 4.18**.

Figure 4.18 Nearest IBAs to the Project site



Source: (Birdlife International, n.d.)

As seen in **Figure 4.18**, the Bhavnagar Salt pans ⁽¹⁾ and Bhal ⁽²⁾ IBAs are located at least 100 km from the Project site. However, the coastline and a few km inland along the Amreli and Bhavnagar coast have similar habitats consisting of mudflats, flooded areas and scattered salt pans. The entire Gulf of Khambhat western coast can therefore be considered potentially significant for migratory birds and the likelihood of migratory bird congregations being found around the offshore turbine locations is high. It should also be noted that there are similar species found in Gir and Bhavnagar Salt pan IBAs including the migratory Dalmatian Pelican (*Pelecanus crispus*) that are likely moving between the IBAs during the course of the migratory season (October to March).

Several migratory bird species were identified during the site visit including Kentish Plover (*Charadrius alexandrinus*), Common Snipes (*Gallinago gallinago*), Black-tailed Godwits (*Limosa limosa*), Spotted Redshank (*Tringa erythropus*), Little Stint (*Calidris minuta*) and Greater Flamingo (*Phoenicopterus roseus*). Photo-documentation of some of the species observed during the site assessment has been provided in **Appendix A**.

4.5.2 Ecological Sensitivities of Coastal and Onshore Study Area

The key habitats found along the study area were identified and mapped in **Figure 4.19**.

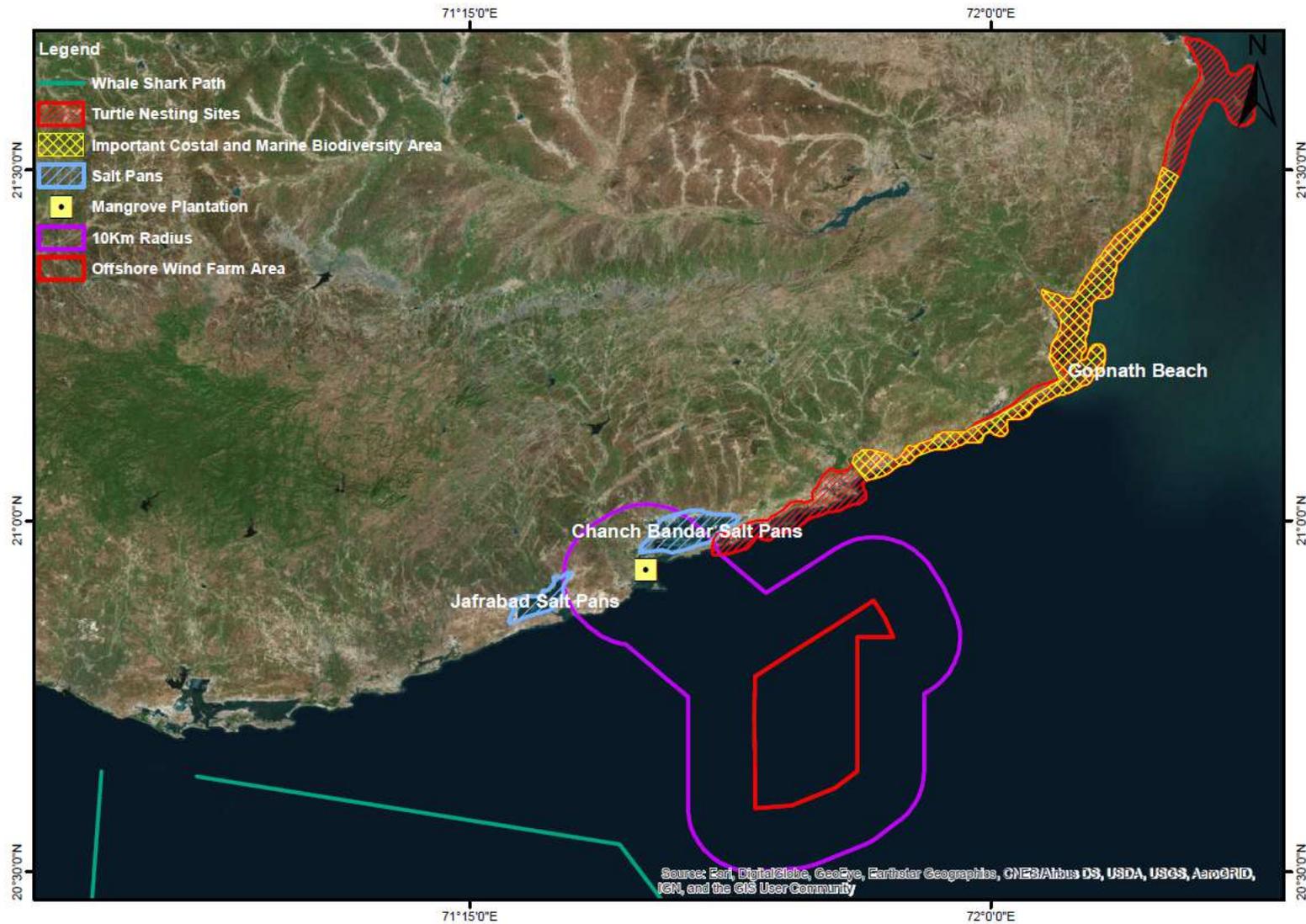
As seen in **Figure 4.19**, there are several ecological sensitivities along the western coast of Gulf of Khambhat. The coast is dominated by mudflats, salt pans, mangroves and rocky beaches, all of which can attract a wide variety of migratory birds. The area around Gopnath Beach has been declared an Important Coastal and Marine Biodiversity Area (ICMBA) that is locally significant for migratory bird activity and turtle nesting (Saravanan, 2013). The entire coast can therefore be considered a single

(1) Bhavnagar Salt pans has been declared an IBBA for the conservation of Dalmatian Pelican (*Pelecanus crispus*) and congregation of waterbirds exceeding 20,000 individuals.

(2) Bhal has been declared as an IBBA for the conservation of Sarus Crane (*Antigone antigone*), Lesser Florican (*Syphoetides indicus*), Greater Spotted Eagle (*Clanga clanga*), Eastern Imperial Eagle (*Aquila heliaca*), Lesser Kestrel (*Falco naumanni*) and White-browed Bushchat (*Saxicola machorhynchus*).

migratory pathway with movement of species from Bhavnagar coast in the southwest direction and towards the proposed wind farm site.

Figure 4.19 Indicative Ecological sensitivity map of the study area of the Project



4.5.3 Species of Conservation Importance in study area

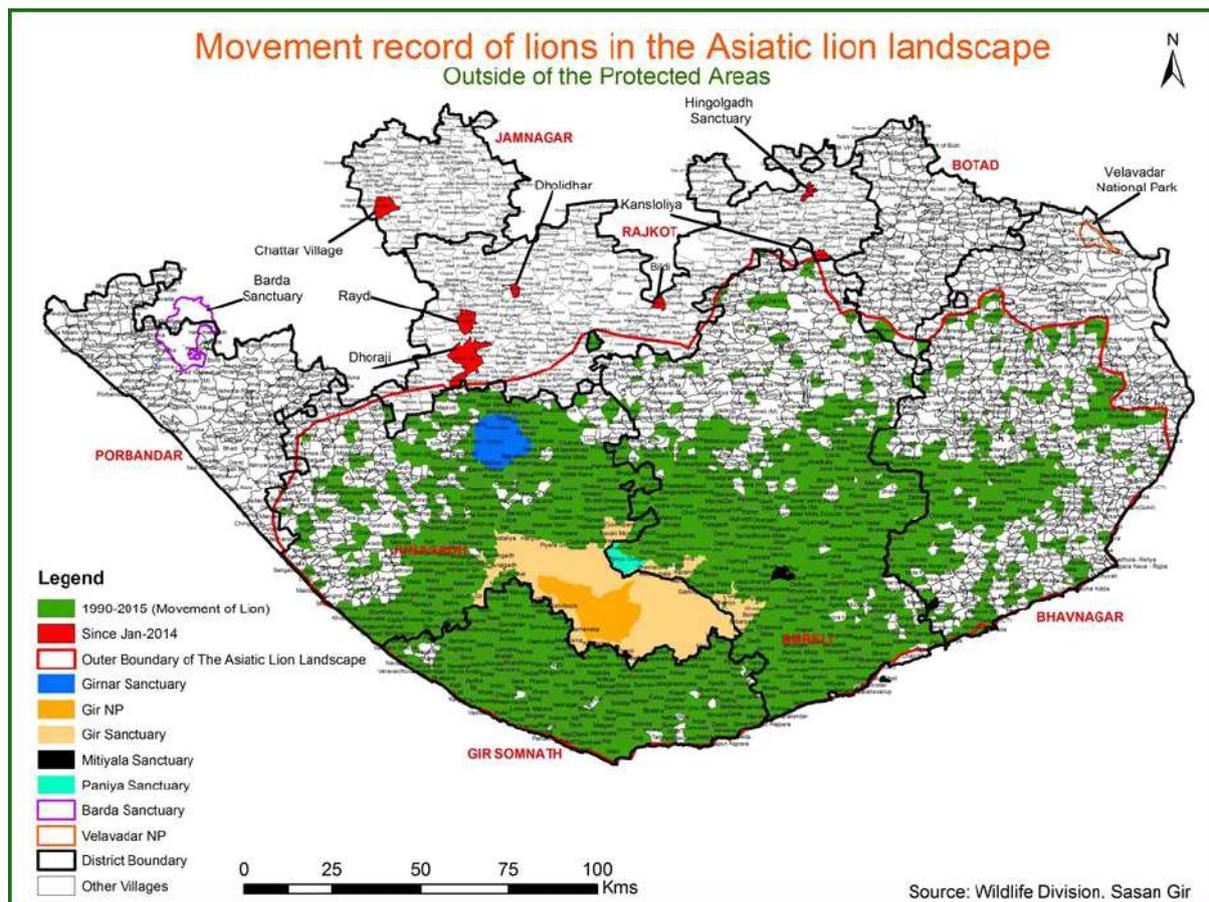
Several species of conservation importance have been reported or observed within the 10 km radius of the Pipavav Port and proposed offshore wind farm area. The list of species reported have been provided by the Rajula Forest Department and online journal articles. The list of species and their conservation significance has been provided in **Table 4.3**.

Table 4.3 Identified Species of conservation importance

S.N.	Common Name	Scientific Name	Conservation Significance
1.	Asiatic Lion	<i>Panthera leo persica</i>	<p>IUCN Status: Endangered IWP Status: Schedule I</p> <p>A total of 80 individuals are identified in the Rajula region, out of which 22 are frequently identified in and around Pipavav Port ⁽¹⁾. The species has also been frequently identified in the mangrove and water bodies within the Pipavav Port. Lion movement is shown in Figure 4.20.</p> <p>The area around Pipavav Port is also dominated by lion prey species including Chital (<i>Axis axis</i>), Nilgai (<i>Boselaphus tragocamelus</i>) and Chinkara (<i>Gazella benettii</i>)</p>
2.	i. Indian Vulture; ii. Griffon Vulture; and iii. Egyptian Vulture	i. <i>Gyps indicus</i> ii. <i>Gyps fulvus</i> iii. <i>Neophron percnopterus</i>	<p>IUCN Status: Critically Endangered (Indian Vulture), Endangered (Egyptian Vulture) and Least Concern (Griffon Vulture). IWP Status: Schedule I</p> <p>Rajula is part of a larger belt along with Mahuva where vulture conservation occurs. Nesting sites of the Indian Vulture are especially crucial because of the steady population in the area.</p>
3.	Sambar	<i>Rusa unicolor</i>	<p>IUCN Status: Vulnerable IWP Status: Schedule III</p> <p>Sambar is commonly found in the region along with other species. Some individuals of the species were directly observed during the site visit on the road leading to Pipavav Port.</p>

(1) Discussions with Rajula Forest Department

Figure 4.20 Asiatic Lion movement in Gujarat (1990-2015)



Source: (Wildlife Division, Sasan Gir, 2015)

4.6 Offshore Social Environment

4.6.1 Fishing and Fishing Allied Activities

Fishing is the primary source of livelihood in the coastal areas of the study area and has been separated from the occupational profile section to provide a more detailed understanding of sensitivities.

4.6.1.1 Fishing Settlements

Fishing is reported in large scale in the coastal areas of Jafrabad, Mahuva, Chanch and Shiyal Bet. Fishing folks indicated that there are no designated fishing zones, as they go on fishing trips in the region between Alang Port in Gulf of Khambhat in east and open seas to the west and south of Kathiawar Peninsula. These areas are potentially frequented by fishers from ports located in the eastern and western segments of Saurashtra coast such as Madhwar, Seedhar, Ghadola etc. Therefore, fishing activities inside the offshore project area and/or transecting through the offshore project area to reach other fishing grounds is a certain possibility. However, due to restrictions on fishing in the Tapti Oil Field, and its close proximity to the proposed windfarm location, intensity of fishing in the proposed area may be relatively less as compared to other open sea locations. Jafrabad (located 12 km west of Pipavav port) is a major fishing town and port in Amreli District.

4.6.1.2 Type of fishing

Fishing is largely undertaken on a commercial basis. The main fishing technique is the usage of dolnets and gillnets. A typical fishing voyage duration ranges between 7-15 days. It is to be noted,

that deep sea trawling is not undertaken by fishing folk in this area. Discussions with the Gujarat Maritime Board and Department of Fisheries indicated that there approx. 650 registered commercial fishing boats (dolnets and gillnet boats) in the ports of Jafrabad, Shiyalbet, Chanchbunder and Mahuva. Majority of these boats (approx. 400) are registered in Jafrabad port.

Artisanal fishing is undertaken on a need basis in the near shore areas of Shiyal Bet, Mahuva and Chanch. However, due to a well-developed fishing industry in the Kathiawar peninsula, most of the fishing households scale up their fishing activities to accrue benefits from strong forward linkage. The main fishing. There are no recreational/tourist fishing spots in the area as reported by the local community and Department of Fisheries.

There are also several aquaculture ponds located in the inland, mostly near Jafrabad. These are involved in cultivation of shrimps, feed fish, and prawns.

The port of Veraval, located approx 150-200 km from Jafrabad (westward, along the coast) is a major export zone of fishing industry. Veraval also boasts of a strong presence of storage and fish processing facilities, enabling large scale fish trade (both domestic and international).

4.6.1.3 Fishing Season

The main fishing season stretches between October and February although fishing is undertaken all year around, with only exception being the government-enforced embargo on fishing in the months of June, July and August. The commonly used commercial fishing boats are dolnets and gill nets. Presence of deep-sea commercial trawlers was negated during discussions with local fishing community

4.6.1.4 Type of fish catch

The main catch in this zone is Bombay duck, i.e. Bumla or Bombil. Jafrabad is popular for dry fish (Bumla). Other fishes include, Pomfret, Jew Fish, Shrimp, Lobster, Squid, Cuttle fish, Silver bar, Hilsa, Shark, Catfish, Mulletts etc.

4.6.1.5 Fishing Communities

Consultations with local community in these settlements indicated that Kharwas and Kolis are the main fishing communities. It was reported that approx. 4000 Kharwa household and 3000 Koli households from the settlement mentioned above are engaged in fishing. These include boat owners and workers. Majority of these households reside in Jafrabad. Among Muslims, Bhagela and Turkis are also engaged in fishing. It was reported that none of afore mentioned communities fall in the category of Scheduled Tribes in the State of Gujarat.

4.6.1.6 Fish and Gender

Fishing as an activity is totally dominated by males. This is due to cultural taboos for women to engage in fishing. However, the fish drying activity and local sale of fish catch is mostly undertaken by women of fishing households. In Jafrabad and Mahuva, consultations with fishing community indicated that expect for the physical act of fishing and going on fishing trips, women are engaged in a various activities in the fishing value chain such as preparation and repair of fish nets, rites and rituals related to fishing, fish drying and processing, and sale.

4.6.1.7 Income from fishing

Discussions with fishing households in the study area indicated that income from fishing depends on the fish catch and demand-supply dynamics of the fish economy. Fishes such as *Ghol* fetch enormous profits (used for medicinal purposes) in the international market. But due to increase in fishing activity in the past 10 years, fisher folk reported a general decline in fish catch and hence, income from fish. Typically one fishing trip fetches amounts of INR 50,000 to 3 lakhs depending on

type of fishes. Fisherfolk from Jafrabad reported higher income from fishing as compared to settlements of Mahuva and Shiyal Bet.

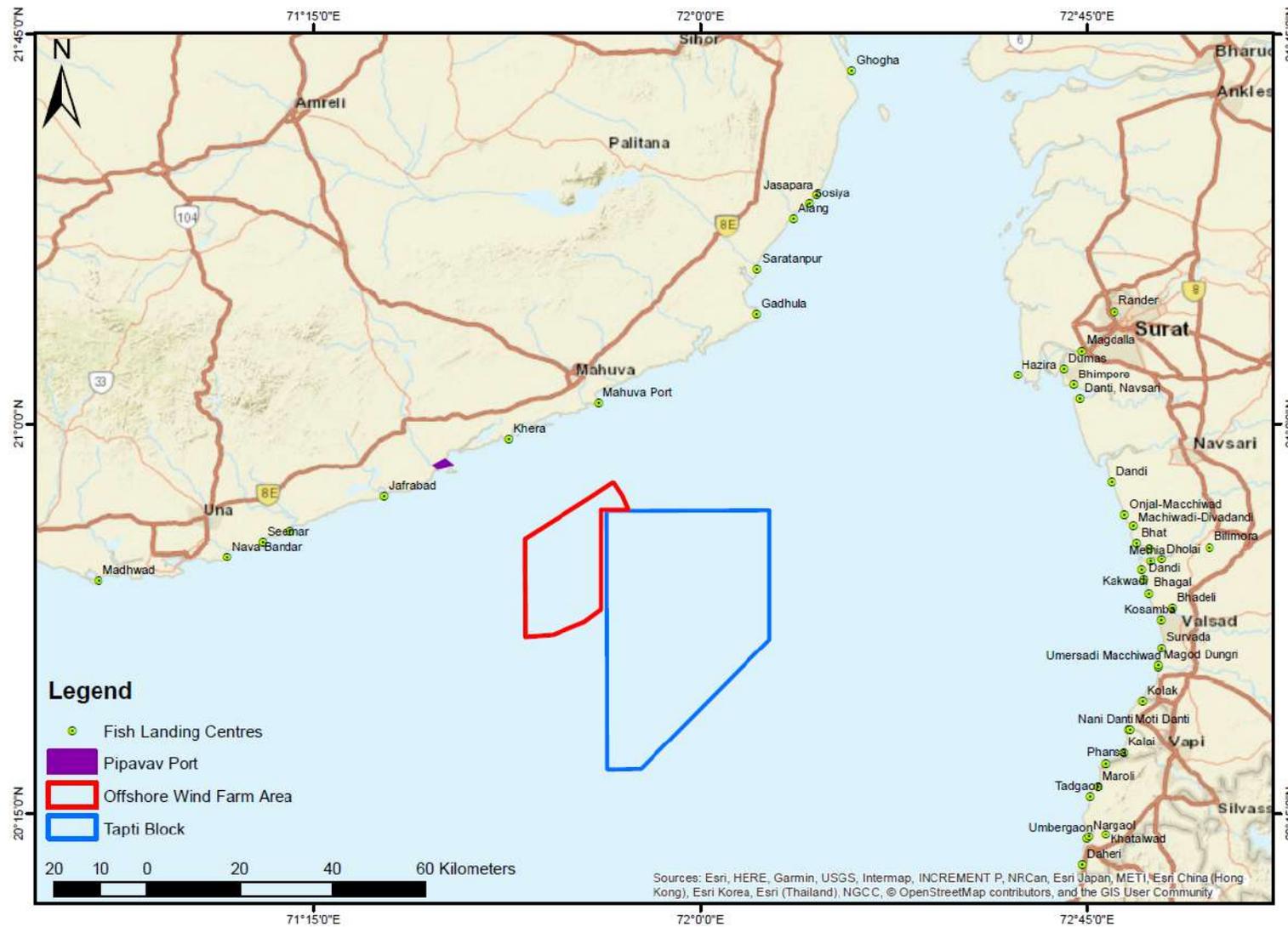
4.6.1.8 Infrastructure for fishing industry

Jafrabad port is the main fishing port of the area. It has a dedicated fishing jetty and landing site and space to dock approx. 400-500 fishing boats. All fishing boats are GPS tracked by the Gujarat Maritime Board. Jetties in Chanch and Mahuva are smaller in size. Therefore, most of the fisher folk use Jafrabad port for fish landing sites. As mentioned earlier, the port of Veraval, located approx 150-200 km from Jafrabad (westward, along the coast) is a major export zone of fishing industry. Veraval also boasts of a strong presence of storage and fish processing facilities, enabling large scale fish trade (both domestic and international).

4.6.1.9 Local Community Conflict- Fishing and Industries

Consultations with local community and fisher folk indicated that there are frequent cases of fishing gear damage by ships and vessels coming in and out of Pipavav Port. These complaints mostly emanate from the fishermen of Shiyal Bet. However, discussions with APM Terminals management revealed that these cases are addressed on a priority basis with the engagement with local community and Sarpanch (village head) of Shiyal Bet. There are reportedly two Fishing Boat Associations located in Jafrabad. These associations are active in the area and work in areas such as fishing access, internal conflict management among fishermen, port and dock access, and engagement with local industries and jetties such as Pipavav Port, Ultratech and Narmada Cements. There were reportedly no major active NGOs involved in fishing in the area. However, one NGOs, namely Gau Raxa Hitraxak Manch and Gauchar Paryavaran Bachav Trust approached the National Green Tribunal in 2013 and alleged adverse impact of expansion on the mangrove forest, migratory bird habitats and the wild fauna in the area after Environmental Clearance was provided to Pipavav Port expansion. The NGO had also alleged that the port expansion would affect land salinity and groundwater conditions and availability, in turn affecting crop production (The Economic times, 2013). Further details on the case were not available in secondary domain.

Figure 4.21 Fish Landing Centres or Major Fishing Settlement in Gulf of Khambhat and Saurashtra coast



Source: Google Earth Imagery 2018

4.7 Coastal and Onshore Social Environment

4.7.1 Demographic Profile

The offshore wind farm is located approximately 9.0 to 23.5 nautical miles in the southeast direction from Pipavav Port in Village Rampara, Taluk Rajula, District Amreli in Gujarat, India. The onshore project components will be located in Pipavav Port. For the purpose of scoping of social aspects, a study area of 10 km radius from Pipavav Port has been determined. The study area also includes the onshore cables right of way (RoW) to the onshore sub-stations.

The study area is located in Amreli District, spread across two talukas (sub-districts) of Rajula and Jafrabad. There are 15 villages in the study area (six in Jafrabad and nine in Rajula). There are two villages of Shiyalbet (Jafrabad taluka) and Rampara No-2 (Rajula taluka) located within 5 km radius.

As per Census of India 2011 data, the total population of the study area is 39,519 (in 7,048 households). The two villages i.e. Shiyalbet and Rampara No. 2 located in the 5 km radius have a total population of 8,655 people. The table below provides key demographic details of the study area.

Table 4.4 Key Demographic Details of Study Area

S. No	Taluka	Village	Household	Population	Sex Ratio	Literacy rate	% Scheduled Castes
1.	Rajula	Rampara No-2	625	3559	916.5	62.8	7.5
2.		Vad	183	1025	923.1	60.8	3.1
3.		Ningala No-1	142	1000	897.5	58.6	7.4
4.		Pipavav	330	1858	991.4	68.7	0.1
5.		Chanch	984	5830	945.3	57.3	0.0
6.		Bherai	730	4185	929.5	59.1	3.0
7.		Dharano Nes	74	363	861.5	63.7	0.0
8.		Uchaiya	194	914	961.4	64.5	30.5
9.		Victor	360	2040	967.2	66.5	1.3
10.		Kovaya	959	4061	908.4	82.1	5.2
11.	Jafrabad	Shiyalbet	832	5096	910.8	31.0	0.0
12.		Lothpur	502	2878	959.2	62.1	9.6
13.		Lunsapur	316	1888	920.7	55.1	6.6
14.		Vandh	363	2046	984.5	63.6	14.8
15.		Varahsvarup	193	1193	914.9	51.9	0.0
16.		Bhankodar	261	1583	971.4	56.4	0.0
		Total	7048	39519	935.5	59.1	4.4

Source: (Census Organisation, Ministry of Home Affairs, 2011)

Sex Ratio- Number of females per thousand males

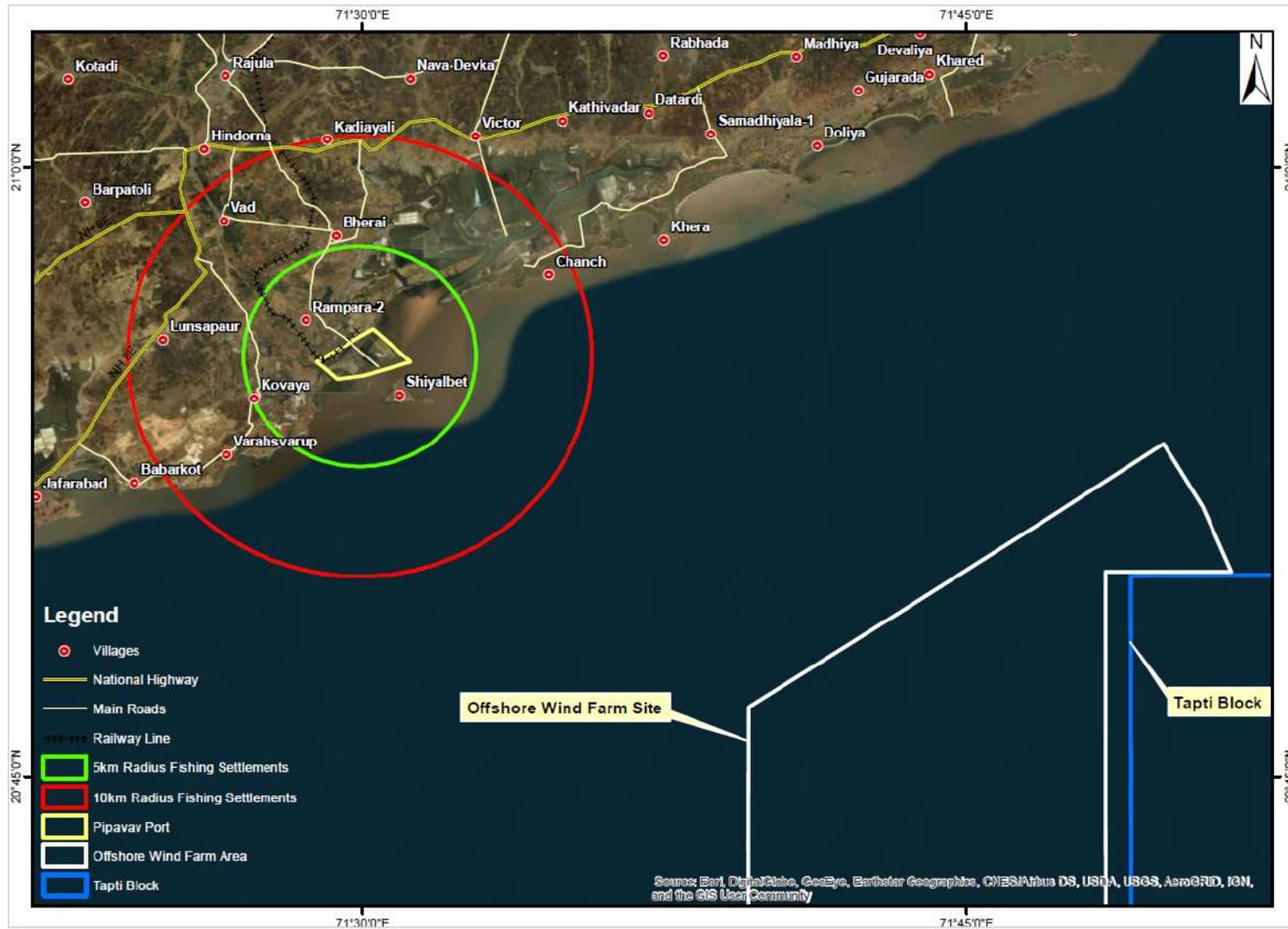
Scheduled Castes and Scheduled Tribes are various officially designated groups of historically disadvantaged people in India. The terms are recognised in the Constitution of India and the various groups are designated in one or other of the categories (Wikipedia, n.d.)

Fence line communities of Pipavav Port

The sex ratio in the study area is slightly lower than the Amreli District Sex Ratio of 947.8. However, the literacy rate in the study is considerable lower than the district literacy rate of 81.4%.

There are two predominant religious groups within the study area, Hindus and Muslims. The main castes groups in the study area include Rajputs, Kharwas, Kolis, Bhagelas, Turkis etc. Population of Scheduled Tribes in the study area is 25 only. Review of government data (Tribal Research and Training Institute, n.d.) on Scheduled Tribe communities, indicates that none of the aforementioned communities fall in the category of Scheduled Tribes or Indigenous Peoples.

Figure 4.22 Main settlements in the Study Area



Source: Google Earth

4.7.2 Land and Natural Resources

The study area is denoted land holdings of varied sizes. Consultations with local community indicated that the coastal soil is high in salinity, making it not very suitable for cultivation. At a district level (Amreli District). The soil quality in the northern part of the district including Babra and parts of Kunkavav Vadia and Dhari talukas are shallow and rocky. Certain areas in Amreli taluka known as *Kharapat* are poor in cultivation; but this taluka possesses the best land along the north and the south banks of the Shetrunji River (Census Organisation, 2015). Regardless of the soil quality in the study area, more than 50 percent of working population is engaged in agriculture (See **Section 4.7.3**).

4.7.2.1 Land Ownership and patterns of land tenure

The study area, as indicated during community consultations in Pipavav and Rampara No 2, has small land holdings, interspersed with large commercial farms. It was further revealed that the Patidar community hold more than 50 per cent own of the agricultural land in the area. Typical land holding size ranges from 2 acres to 20 acres.

Land tenure systems typically include privately owned lands, land under tenancy (and released by the government in favour of tiller as per Bombay Tenancy and Agricultural Land Act, 1948 and amendment dated 01/08/1956). There are forms of sharecropping, rented and contractual based land tenure systems as reported by local community.

4.7.2.2 Common Property Resources

Common Property Resources in the study area include village forest areas, designated forest areas under mangroves near villages of Rampara No 2 and Kovaya. Grazing is undertaken in open land areas near roads and designated grazing areas and wastelands.

4.7.3 Occupational Profile

As per Census of India 2011 data, the study area has a Work Participation Rate (percentage of total workers to total population) of 42.3% (15,980 workers). This is indicative of the trade and industrial activities in the study area. This constitutes 12528 main workers (workers employed for more than 180 days in a year) and 4,398 marginal workers (workers employed for less than 180 days in a years). Among main workers, 53% are engaged agricultural and allied activities as cultivators, agricultural labourers or fishing. Remaining 47% are engaged in non-agricultural activities, which include industries, and services and self-employment in businesses and trade. Fishing is reported in large scale in the coastal areas of Jafrabad, Mahuva, Chanch and Shiyal Bet, The villages of Kovaya, Pipavav, Victor, Nigala, and Rampara No 2 also reported intensive industrial labour and hence, agriculture in these villages is expected to relatively lower than other areas. Remaining villages in the study area are pre-dominantly agricultural in nature.

Table 4.5 Occupational Profile

S. No	Village	Main Workers					Marginal Workers					Grand Total
		CL	AL	HH	OW	Total	CL	AL	HH	OW	Total	
1.	Rampara No-2	348	132	8	462	950	6	28	0	29	63	1013
2.	Vad	186	11	0	2	199	395	30	0	3	428	627
3.	Ningala No-1	64	120	3	215	402	1	32	1	1	36	438
4.	Pipavav	21	499	0	374	894	1	17	0	14	32	926
5.	Chanch	17	416	7	1267	1707	2	21	0	211	234	1941
6.	Bherai	405	345	4	657	1411	59	467	1	79	606	2017
7.	Dharano Nes	49	30	0	5	84	3	105	0	13	121	205
8.	Uchaiya	103	122	0	41	266	0	273	0	0	273	539
9.	Victor	3	520	34	383	940	0	81	0	15	96	1036

S. No	Village	Main Workers					Marginal Workers					Grand Total
		CL	AL	HH	OW	Total	CL	AL	HH	OW	Total	
10.	Kovaya	179	23	6	980	1188	3	2	1	21	27	1215
11.	Shiyalbet	24	4	44	1027	1099	13	4	0	555	572	1671
12.	Lothpur	211	588	1	51	851	169	566	0	10	745	1596
13.	Lunsapur	148	454	0	77	679	2	151	0	6	159	838
14.	Vandh	191	151	8	142	492	16	762	1	47	826	1318
15.	Varahsvarup	27	412	1	48	488	0	164	0	4	168	656
16.	Bhankodar	120	749	0	9	878	1	10	0	1	12	890
	Total	2096	4576	116	5740	12528	671	2713	4	1009	4398	16926

Source: (Census Organisation, Ministry of Home Affairs, 2011)

CL- Cultivator

AL- Agricultural Labourer

HH- Household Industry

OT- Others

Definitions provided below

Cultivators

For purposes of the census a person is classified as cultivator if he or she is engaged in cultivation of land owned or held from Government or held from private persons or institutions for payment in money, kind or share. Cultivation includes effective supervision or direction in cultivation. A person who has given out her/his land to another person or persons or institution(s) for cultivation for money, kind or share of crop and who does not even supervise or direct cultivation of land, is not treated as cultivator. Similarly, a person working on another person's land for wages in cash or kind or a combination of both (agricultural labourer) is not treated as cultivator.

Agricultural Labourers

A person who works on another person's land for wages in money or kind or share is regarded as an agricultural labourer. She or he has no risk in the cultivation, but merely works on another person's land for wages. An agricultural labourer has no right of lease or contract on land on which she/he works.

Household Industry

Household Industry is defined as an industry conducted by one or more members of the household at home or within the village in rural areas and only within the precincts of the house where the household lives in urban areas. The larger proportion of workers in the household industry consists of members of the household. The industry is not run on the scale of a registered factory which would qualify or has to be registered under the Indian Factories Act.

Other Workers

All workers, i.e., those who have been engaged in some economic activity during the last one year, but are not cultivators or agricultural labourers or in Household Industry, are 'Other Workers(OW)'. The type of workers that come under this category of 'OW' include all government servants, municipal employees, teachers, factory workers, plantation workers, those engaged in trade, commerce, business, transport banking, mining, construction, political or social work, priests, entertainment artists, etc. In effect, all those workers other than cultivators or agricultural labourers or household industry workers are 'Other Workers'.

Source: Concepts and Definitions (Census Organisation, Ministry of Home Affairs, 2011)

4.7.3.1 Agriculture

As per the EIA report for the Pipavav Port (GPPL Limited) agriculture is the major economic activity, especially in villages located away from coastlines. In Amreli as in other districts of Gujarat, agriculture happens to be the main source of subsistence for the majority of people. According to the 2011 Census, 67.27 percent of the total working population of the district was engaged in agriculture, as against 49.61 percent in the State as a whole. As per Census 2011 records, more than 53 percent of main workers and 76 per cent of marginal workers were engaged in agriculture as cultivators or agricultural labourers.

Major food crops grown in the district are wheat, jowar, groundnut, bajra and chilies whereas non-food crops grown are cotton and fodder crops. Agriculture is beset by limitations including low productivity (due to low uptake of new agricultural methods, and poor soil quality etc.), erratic rainfall other than monsoon, lack of irrigation facilities and, poor linkages with markets. Land parcels tend to be small and agricultural methods are largely traditional. Large-scale, commercial farming is absent in the area, mainly due to the small size of the land holdings.

4.7.3.2 Industries

The study area has witnessed industrialization in the past 20-25 years. Pipavav Port was established in 2002 and is currently operated by APM Terminals. In 1998, Gujarat Maritime Board awarded concession to Gujarat Pipavav Port Limited. In 2000, the port formed a Joint Venture with Indian Railways to start Pipavav Rail Corporation Limited. Commercial operations started in 2002. In 2005 APM Terminals acquired majority stake. Major projects were completed in 2009 and the company came out with an IPO and was listed on Bombay Stock Exchange in 2010 ⁽¹⁾. Other major industries in the study area include Reliance Shipbuilding Yard (1 km west of Pipavav Port); Reliance Special Economic Zone (located 3 km west of Pipavav Port), Narmada Cement, and Ultratech Cement factory (located in Kovaya village). The villages of Kovaya, Pipavav, Victor, Nigala, and Rampara No 2 are located in the nearby vicinity of these industries and hence, proportion of industrial labour and ancillary industries employment was reported to be higher than 50 percent of total working population.

The industries have led to in-migration of workforce in these villages which has increased density and growth rate of the villages, as reported during consultations in Pipavav and Rampara. In addition, with the rise in industrial activities, skill-level of the local workforce of these villages has also reportedly undergone a marked change with more and more workers diversifying their skill sets in non-agricultural activities. As reported during consultations, vocational skills like electrical, mechanics and automobile repair, construction and masonry, and specific industrial activities as required by surrounding industries have witnessed a rise in local population and also due to in-migration of skilled workforce.

4.7.3.3 Others

Others sources of livelihood include livestock, salt pans, wage labour (including out-migration). Salt pans are located north of Chanch bunder and north of Jafrabad port.

4.7.4 Cultural Heritage

As per the EIA report for Pipavav Port (Aquatech Enviro Engineers, 2011), the ancient temples of “Ransod Temple” spread over on 320 acres of land situated in village Pipavav (6 – 7 km) from the project site. A Muslim pilgrim site is located in the island of Shiyalbet in Savaibet. As reported by Pipavav Port management and local community in Mahuva and Jafrabad, there are no marine archaeological sites located in the project area for offshore wind turbines

4.7.5 Local Infrastructure Networks

4.7.5.1 Physical Infrastructure

Transport facilities include road connectivity to Pipavav port and major towns of Rajula and Jafrabad. APM Terminals Pipavav has developed an 11 km, a four-lane expressway which connects the port to the National Highway 8E. The highway was previously known as the Coastal Highway 6, and was upgraded significantly after its conversion to NH 8E. Port Pipavav is connected to its hinterland via Surendranagar by the broad gauge Indian Railways rail network. The rail connectivity project was undertaken by Pipavav Rail Corporation Limited (PRCL), promoted by Port Pipavav and the Ministry of Railways. Port Pipavav has an equity stake of 38.8% in PRCL. The port can handle incoming and

(1) https://en.wikipedia.org/wiki/Port_Pipavav

outgoing trains simultaneously, with six railway sidings to support loading and off-loading. The port now handles two container trains per day, on average. The island of Shiyal Bet is connected through a ferry route (500 meters) from the Shiyal Bet jetty located adjacent to Pipavav port (refer to **Appendix B**).

Different types of drinking water facilities viz. own piped water, public/ community schemes, well/ and others. As per the EIA report for Pipavav Port, people from Amreli district use un-treated well water for drinking purpose. Water supply is available in all villages through wells, overhead water tanks and hand pump.

All villages in the study area are electrified. The island of Shiyal Bet was recently electrified in 2017.

4.7.5.2 Social Infrastructure

Medical facilities in terms of community health workers and medical practitioner are available in most of the villages. The villages devoid of government medical facility have to depend upon private clinics or visit to Rajula and Jafrabad for treatment. As per EIA Report for Pipavav Port, different health problems are reported to be prevalent in the community including diseases like gastroenteritis and malaria which are highly prevalent in the study area besides common fever and tuberculosis. The primary health centre and Pipavav Port CSR activities conducts various health camps and vaccination camps, health awareness programmes such as family welfare camps to motivate people for family planning operations, and regular medical check-up camps are organized by PHC.

EIA Report mentions that educational level in the region is relatively low. The status of female literacy is reported to be very low (45%). Low educational status in the region has made the population deprived of employment, as they are not able to fulfil the bare requirements of the job in the nearby industries

5. ASSESSMENT OF ALTERNATIVES

As discussed in the Project Description (**Section 2**), the Project is still in the nascent stages with several of the components still under consideration. The early assessment of environmental and social issues for the Project provides an opportunity to implement E&S considerations into the Project design¹. The following Project components have been assessed with respect to environmental and social risks and the potential impacts for each of the design alternatives has been considered:

- Turbine foundation concept that is used;
- Choice of onshore or offshore pooling substation;
- Export cable route; and
- Onshore cable route.

5.1 Turbine Foundation

As discussed in **Section 2.4.2**, three foundation concepts have been considered for the study:

- Monopiles;
- Jacket; and
- Concrete gravity-based.

Based on a cost and time analysis of using the above technologies, the *Advisory Foundation Concept Design Report* that was undertaken simultaneously as the E&S Scoping has recommended the use of Monopiles. The E&S risks associated with each of the above foundation concepts has been provided in **Table 5.1** and final decision will be made following further geotechnical and environmental studies.

Table 5.1 E&S risks associated with turbine foundation concepts

S.N.	Turbine Foundation Concept	Potential Impacts
1.	Monopiles	<p><i>Negative Impacts</i></p> <ul style="list-style-type: none"> ■ Disturbance of sediment and release of suspended sediment particles into water layers; ■ If present, release of contaminants bound in sediments into water layer; ■ Direct impact on benthic species from pile driving of the foundation and loss of seabed habitat; ■ Use of grouting to connect foundation with turbine that could introduce chemicals into water and change the water quality; ■ Health and safety concerns associated with the movement of the foundation structure from the shore to the Project site; and ■ Noise and vibrational impacts from foundation establishment. <p><i>Positive Impacts</i></p>

¹ The project is currently in initial stage of planning and the developer will finalise the final design. Therefore, it is quite possible that final configuration may be different from what is proposed during the planning/feasibility stage – environmental constraints, technical constraints etc. may also be quite different from what is finally consented and built than what is assessed during the E&S scoping as well as in the ESIA. In the UK there is an approach that looks at a design envelope that considers a realistic worst case design for each topic so there is some assurance that whatever ends up being built has been adequately assessed. This is called the Rochdale envelope after the planning development where the approach was established. The assessment may conclude that a particular effect may fall within a fairly wide range. In assessing the 'likely' effects, it is entirely consistent with the objectives of European Council Directive for EIA studies to adopt a cautious 'worst case' approach: mitigation measures should be adequate to deal with the worst case so as to optimise the effects of the development on the environment.

S.N.	Turbine Foundation Concept	Potential Impacts
		<ul style="list-style-type: none"> ■ Potential colonization of the foundation structure, rocks/boulders placed for scour protection and long-term increase in benthic growth. ■ Smaller footprint compared to gravity bases and potentially less costly.
2.	Jackets	<p><i>Negative Impacts</i></p> <ul style="list-style-type: none"> ■ Disturbance of sediment and release of suspended sediment particles into water layers; ■ Direct impact on benthic species from establishment of the foundation and from loss of seabed habitat; ■ Health and safety concerns associated with the movement of the foundation structure from the shore to the Project site; and ■ Noise and vibrational impacts from foundation establishment (less than monopoles due to smaller piles, however would require more no. of piles). <p><i>Positive Impacts</i></p> <ul style="list-style-type: none"> ■ Potential colonization of the foundation structure and long-term increase in benthic growth; and ■ Provision of shelter for fish and crustacean species and potential increase in fish stock and fish catch in the long-term.
3.	Concrete gravity-based	<p><i>Negative Impacts</i></p> <ul style="list-style-type: none"> ■ Direct impact on benthic species from establishment of the foundation and loss of seabed habitat; ■ Health and safety concerns associated with movement of the completed foundation structure from the shore to the Project site; and ■ Noise and vibrational impacts from foundation establishment but lesser in comparison to monopiles and jackets. <p><i>Positive Impacts</i></p> <ul style="list-style-type: none"> ■ Potential colonization of the foundation structure and long-term increase in benthic growth.

5.2 Pooling Substation

Two pooling substation options have been considered for the Project:

- Onshore Pooling Substation; and
- Offshore Pooling Substation.

Some high level environmental and social issues to consider for both options have been described in the table below. The final decision for offshore or onshore pooling substation will be decided after completion of the ongoing technical feasibility studies and considering financial implications.

Table 5.2 Environmental and social considerations for pooling substations

S.N.	Pooling Substation	Environmental and Social Considerations
1.	Onshore	<ul style="list-style-type: none"> ■ Change in land use including potential loss/ disturbance of sensitive habitats, i.e. mudflat land; ■ Impact on soil and land environment and potential for compaction and erosion of soil layers; ■ Loss of coastal vegetation (if any); ■ Increased infrastructure (e.g. access road), anthropogenic movement and vehicular movement; and, ■ Potential electrocution risk along coastal areas that are commonly used by migratory species.
2.	Offshore	<ul style="list-style-type: none"> ■ Impact to sediment including release of sediment particles into water layer, loss of benthic species, loss of benthic habitat and potential release of contaminants (e.g. drilling fluid, oil products, grease, etc.); ■ Potential risk of electrocution for migratory and aquatic bird species that use the substation as roosting points; ■ Noise and vibrational impacts from establishment of the pooling substation; and ■ Increased construction requirement that can cause noise and water quality impacts and is a higher occupational health and safety risk.

5.2.1 Export Cable Route

The proposed and the recommended export cable route has been provided in **Figure 2.9**. The advantages of the recommended route have been provided below:

- The landing shoreline consists of rocky and sandy shores and therefore is generally not as ecologically sensitive as mangroves, salt pans and mudflat habitat that is found in other parts of Amreli District coastline;
- There are no marine archaeological sites, ecologically sensitive areas or existing offshore installations along the recommended export cable route;
- The above route will cross the existing subsea cable that connects the island of Shiyal Bet with the mainland and therefore no anticipated expansion or dredging activity is anticipated in the area in the near future;
- The export cable route does not conflict with current and proposed expansion plans of Pipavav Port and therefore additional NoCs will not need to be obtained from industries within the port premises; and
- However, export cable should be at a safe distance from busy shipping area of Pipavav Port to avoid any concerns around anchor drag impacting the cables.

5.2.2 Onshore Cable Route

The onshore cable route has not been determined at this stage of the scoping study and therefore the exact environmental and social sensitivities associated with its siting cannot be determined. This section has therefore focused on avoidance criteria that should be considered while determining the onshore cable route and in association, the grid substation location.

For the proposed 400/220 kV Pipavav Grid Substation and existing Kovaya Grid Substation, the straight-line path from the onshore pooling substation/Pipavav Port has been considered and environmental and social sensitivities have been provided in **Figure 5.1**.

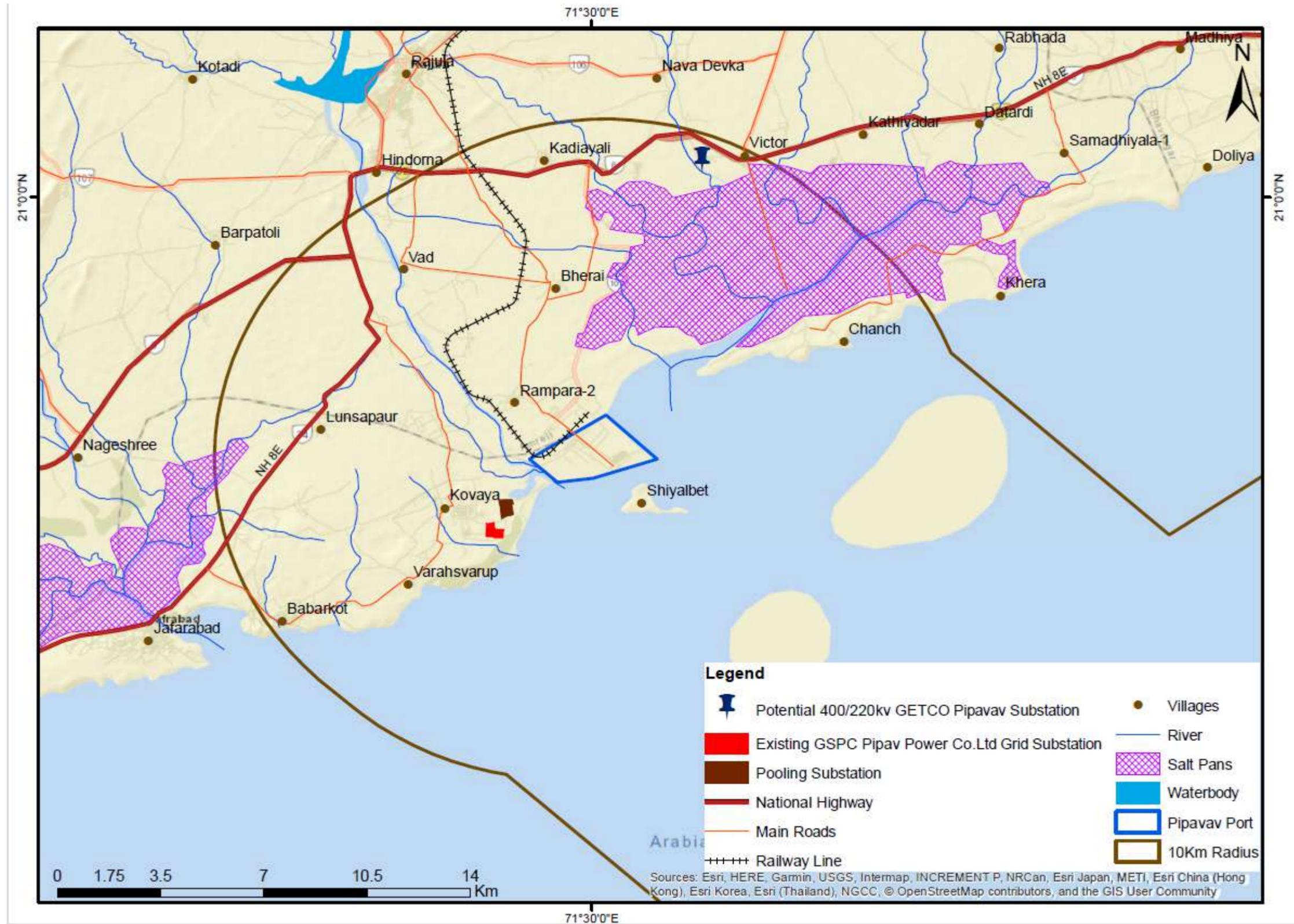
In addition to avoiding the environmental and social sensitivities in **Figure 5.1**, some factors that should be considered while identifying and finalizing the onshore cable route has been provided below:

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- Route to avoid/ have minimum number of habitations and agricultural land;
- No house or community structure to be located under/above the onshore cables or in setback zone of onshore cables;
- Areas requiring extensive clearing of vegetation/ tree felling to be avoided;
- Finalised route to avoid environmental sensitives (like river/ water bodies, forest area, eco-sensitive area) as identified subsequently; and
- Procurement of land parcels that may render land owner landless should be avoided.

The shortest possible route after considering the above factors should be selected for the onshore cables.

Figure 5.1 Avoidance criteria for onshore cabling route



6. IDENTIFICATION OF POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

Scoping has been undertaken to identify the potential interactions between the project activities and resources/receptors in the study area and the impacts that could result from these interactions, and to prioritize these impacts in terms of their likely significance. This is to ensure that the impact assessment focuses on these key issues that are most important for decision-making and stakeholder interest.

6.1 Scoping Methodology

The establishment of environmental, social and ecological sensitivities around the Project Site (**Section 4**) has identified several receptors and resources that may be affected by the Project activities (defined in **Section 2**). The potential interactions between the project activities and resources/receptors and the impacts that could result from these interactions have been highlighted in this section. This section will also prioritize these impacts in terms of their likely significance and provide key focus areas for the Environmental and Social Impact Assessment (ESIA) that will be carried out at a later stage.

The interaction between the E&S sensitivities and the Project activities has been captured in an activity-receptor interaction matrix that considers all phases of the Project i.e.

- Pre-construction;
- Construction;
- Operation and Maintenance; and
- Decommissioning.

The matrix is based on interpretations of the data available on the Project, discussions with the Project team and ERM's prior understanding of wind power projects. Potential impacts have been identified through a systematic process whereby the features and activities (both planned and unplanned) associated with the various phases of the project have been considered with respect to their potential to interact with resources/ receptors. Potential interactions have each been classified in one of three categories:

- No interaction: where the project is unlikely to interact with the resource/ receptor (e.g., wholly terrestrial projects may have no interaction with the marine environment);
- Interaction likely, but not likely to be significant: where there is likely to be an interaction, but the resultant impact is unlikely to change baseline conditions in an appreciable/detectable way; and
- Significant interaction: where there is likely to be an interaction, and the resultant impact has a reasonable potential to cause a significant effect on the resource/receptor.

As a tool for scoping, various project features and activities that could reasonably act as a source of impact were identified, and these have been listed down the vertical axis of a Potential Interactions Matrix. The resources/receptors relevant to the baseline environment have been listed across the horizontal axis of the matrix. Each resulting cell on the Potential Interactions Matrix thus represents a potential interaction between a project feature/activity and a resource/ receptor.

6.2 Scoping Matrix

The activity-receptor interaction matrix has been provided in **Table 6.1**.

Table 6.1 Activity-Receptor Interaction Matrix

Environmental and Social Resources/ Receptors	Physical Environment									Ecological Environment								Social Environment											
	Seabed	Underwater Noise & Vibration	Marine Water Quality	Marine Sediment	Land use	Topography and Drainage	Soil/Land Environment	Ambient Air Quality	Ambient Noise & Vibration	Surface Water Quality	Benthic Ecology	Fish & Shell Fish	Marine turtles	Sea birds	Marine Mammals	Intertidal Flats	Mangroves	Terrestrial Avifauna	Turtle Nesting Sites	Terrestrial Habitats	Sea Scape	Commercial Fisheries	Shipping and Navigation	Archaeology and Cultural Heritage	Tourism and Recreation	Socio-economics	Saltpans and other coastal enterprises	Road and Rail Traffic	
Project Activity/ Hazards																													
Pre-Construction Phase																													
Offshore																													
Technical Studies like tidal survey, bathymetry studies, seabed geology, visual and seascape assessment, etc.																													
Obtaining permits and approvals required for wind farm establishment																													
Coastal and Onshore																													
Land procurement and lease for required ancillary components including pooling substation, storage yard, labour camp and batching plant																													
Right-of-Way access for the export cables and onshore cables																													
Strengthening of Port deck for loading/unloading of wind turbine modules.																													
Construction Phase																													
Offshore																													
Movement of marine vessel(s) for offshore construction activity																													
Dredging and pile driving for establishment of turbine foundations and offshore pooling substation																													
Loading/unloading and transportation of turbine components to the offshore wind farm and pooling substation area, disposal of dredged material																													
Fixing the turbine to the established foundation and erection of wind turbine.																													
Dredging to create a trench for subsea cables																													
Laying of subsea cables																													
Restriction of fishing near construction areas																													

Environmental and Social Resources/ Receptors	Physical Environment									Ecological Environment									Social Environment									
	Seabed	Underwater Noise & Vibration	Marine Water Quality	Marine Sediment	Land use	Topography and Drainage	Soil/Land Environment	Ambient Air Quality	Ambient Noise & Vibration	Surface Water Quality	Benthic Ecology	Fish & Shell Fish	Marine turtles	Sea birds	Marine Mammals	Intertidal Flats	Mangroves	Terrestrial Avifauna	Turtle Nesting Sites	Terrestrial Habitats	Sea Scape	Commercial Fisheries	Shipping and Navigation	Archaeology and Cultural Heritage	Tourism and Recreation	Socio-economics	Saltpans and other coastal enterprises	Road and Rail Traffic
Project Activity/ Hazards																												
Coastal and Onshore																												
Construction/strengthening of access road to ancillary facilities such as the pooling substation																												
Mobilization of contractors, labourers, equipment and turbine components to the Project site																												
Establishment of Storage/ Stock yard																												
Establishment of temporary labour camp																												
Establishment and operation of batching plant																												
Operation of Diesel Generator Set																												
Construction of Pooling substation																												
Laying of export and onshore cables																												
Operation Phase																												
Offshore																												
Operation of the wind turbines and offshore pooling substation																												
Periodic maintenance of the wind turbines, pooling substation and subsea cable																												
Replace or upgrade of turbine components and other offshore infrastructure																												
Coastal and Onshore																												
Operation of onshore pooling substation and onshore cables																												
Ad-hoc maintenance of the access roads, onshore cables and pooling substation																												
Decommissioning Phase¹																												
Offshore																												
Removal of turbine components from the foundation																												

¹ At present, there is no specific plan for decommissioning of the project and lifespan of the project is about 25 years. Project activities/ hazards interaction with offshore and onshore components has been developed based on an assumption that all the infrastructure need to be removed to restore the project footprint into its baseline condition.

Environmental and Social Resources/ Receptors	Physical Environment									Ecological Environment								Social Environment										
	Seabed	Underwater Noise & Vibration	Marine Water Quality	Marine Sediment	Land use	Topography and Drainage	Soil/Land Environment	Ambient Air Quality	Ambient Noise & Vibration	Surface Water Quality	Benthic Ecology	Fish & Shell Fish	Marine turtles	Sea birds	Marine Mammals	Intertidal Flats	Mangroves	Terrestrial Avifauna	Turtle Nesting Sites	Terrestrial Habitats	Sea Scape	Commercial Fisheries	Shipping and Navigation	Archaeology and Cultural Heritage	Tourism and Recreation	Socio-economics	Saltpans and other coastal enterprises	Road and Rail Traffic
Project Activity/ Hazards																												
Removal of turbine foundation and restoration to pre-project level																												
Dredging and removal of subsea cables																												
Transportation of turbine components to the shore																												
Coastal and Onshore																												
Demolition of the onshore pooling substation																												
Removal of export and onshore cables																												
Rehabilitation of location to pre-project levels																												

- = Represents "no" interactions is reasonably expected
- = Represents interactions reasonably possible but none of the outcome will lead to significant impacts
- = Represents interactions reasonably possible with one of the outcomes leading to potential significant impacts

6.3 Emerging Themes for Detailed Assessment

Based on the scoping matrix in **Table 6.1**, several significant interactions between project activities and receptors/resources have been identified. The summary of the environmental, social and ecological sensitivities has been presented from **Table 6.2** to **Table 6.7**. Each of the table presents potential impacts during construction, operation and decommissioning phases of the project along further detailed assessment that will need to be undertaken as a part of Environmental and Social Impact Assessment (ESIA) study. The key emerging themes identified in the E&S Scoping Study are described below. The themes below are cross-cutting themes that may have an impact on environmental, social and ecological receptors and could result in several indirect or induced impacts across the Project life cycle.

- Disturbance of seabed including benthic habitats from piling, excavation for turbine foundation, trenching, scour protection and dredging;
- Underwater noise and vibrations from construction activities and vessel movement;
- Impacts to avifauna (including seabirds) in the operation phase of the Project due to the risk of collision with the rotating turbine blades and/or displacement;
- Loss of turtle nesting sites around the Pipavav Port and primarily in the Chanch Bandar area, which is anticipated to be the landfall point of the Project; and
- Loss or damage to fishing grounds or reduced access to fishing grounds being utilized by fisher folk due to establishment of the wind turbines, offshore substation(s), cabling and/or implementation of fishing restrictions in the area.

Table 6.2 Emerging Themes – Offshore Physical Environment

Focus Area	Emerging themes for assessment		Mode of Assessment
	Construction and Decommissioning	Operation	
Seabed and Hydrography	<p>The seabed may be impacted during construction phase due to:</p> <ul style="list-style-type: none"> ■ Seabed compaction in the footprint of WTG foundations (monopiles) due to piling works as well as leading to mortality of sensitive marine life (benthic) in these areas; ■ Disturbance of seabed due to trenching works for array and export cables; and ■ Disposal of dredged material in deep sea. <p>The seabed may be impacted during decommissioning phase due to:</p> <ul style="list-style-type: none"> ■ Removal of WTG foundations as well as array and export cables. 	<p>The seabed may be impacted during the operation phase due to:</p> <ul style="list-style-type: none"> ■ Scour impacts around base of the turbines (monopiles); and ■ Scour impacts in vicinity of array and export cables. <p>The hydrography may be impacted during the operation phase due to:</p> <ul style="list-style-type: none"> ■ Change in nearfield wave and tidal regime leading to changes in sediment transport processes 	<ul style="list-style-type: none"> ■ Site specific bathymetry to be assessed; ■ A low power seismic survey to be undertaken to provide information on the sub-seabed geology; and ■ Site specific measure of metocean data to be undertaken.
Underwater Noise	<p>Potential underwater noise impacts from marine activities during construction and decommissioning will include:</p> <ul style="list-style-type: none"> ■ Piling, trenching and vessel movement; ■ Removal of foundations, array and export cables. <p>The activities have potential to adversely affect marine mammals and fish species. These effects can result in behavioural responses, or at much higher sound levels, can result in temporary or permanent deafness.</p>	<p>Potential underwater noise impacts from marine activities during operational phase are considered to be significantly lower than construction/ decommissioning noise impacts and frequency of such activities will be limited.</p>	<ul style="list-style-type: none"> ■ Secondary information on underwater piling and construction activities for similar projects to be reviewed and compiled to understand the intensity and impact on marine mammals. ■ Underwater noise modelling to understand impacts from construction and maintenance activities; and ■ The underwater noise source levels and duration of use for the construction and operational equipment planned to be used to be obtained. This information should be used to assess the anticipated likely worst case underwater noise levels arising from the construction activities. These predictions can be referenced against the distribution and population of sensitive marine mammals and fish to determine impact levels.
Marine Water Quality and Marine Sediments	<p>Marine water quality may be impacted during the construction phase due to:</p> <ul style="list-style-type: none"> ■ Increase in suspended sediment concentration during piling, installation of foundations or cables. It will result in degrading water quality, 	<p>Marine water quality may be impacted during the operation phase due to:</p> <ul style="list-style-type: none"> ■ Accidental spillage from the vessels used for maintenance works. 	<ul style="list-style-type: none"> ■ Marine water quality monitoring covering temperature, pH value, turbidity, salinity, dissolved nitrogen, oil& grease, dissolved phosphate, iron, radioactive material, chlorophyll a, phytoplankton, zoo plankton, total petroleum hydrocarbon to be carried out.

Focus Area	Emerging themes for assessment		Mode of Assessment
	Construction and Decommissioning	Operation	
	<p>increasing turbidity and potentially adversely affect fishing activity in the area.</p> <ul style="list-style-type: none"> Accidental spillage from the vessels, cranes etc. used during construction. <p>Marine water quality may be impacted during the decommissioning phase due to:</p> <ul style="list-style-type: none"> Increase in suspended sediment concentration during removal of foundation or cables Accidental spillage from the vessels, cranes etc. used during construction. Contamination of water due to improper disposal debris and related wastes. 	<ul style="list-style-type: none"> Accidental discharges of lube oil/ transformer oil. 	<ul style="list-style-type: none"> Sea bed sediment sampling and analysis in conjunction with particle size analysis to be undertaken to understand seabed sediment composition and distribution prior to the project construction, considering that project site is located close to Tapti Oil Field. Sediment transport modelling to be undertaken to understand the existing sediment transport movement and changes due to construction for the offshore wind farm.
Raw materials	<p>Construction phase will include following activities:</p> <ul style="list-style-type: none"> Removal of sediments to prepare seabed for foundations and disposal of removed material; Shipping of new suitable raw materials to prepare seabed and to construction scour protection around foundations. <p>Likely impacts due to these activities may result:</p> <ul style="list-style-type: none"> Sediment dispersion on marine habitats. Dispersion of contaminants from sediments removal. Maritime activity related to raw materials transport and disposal. 	<p>Likely impacts during operation phase will include:</p> <ul style="list-style-type: none"> Reef effect from scour protection 	<ul style="list-style-type: none"> Sediment transport modelling to be undertaken to understand the existing sediment transport movement and changes due to construction for the offshore wind farm. Developer to ensure navigation risk assessment to be undertaken in order to determine the potential for impact to navigation safety.
Sub-sea Infrastructure	<p>Likely impacts during the construction and decommissioning phases include:</p> <ul style="list-style-type: none"> Crossing of sub-sea infrastructure (e.g. pipelines, cables, etc.) during array/ offshore cables laying/ removal. 	--	<p>Discussion to be undertaken with Gujarat Maritime Board (GMB), Department of Telecommunication (DoT), and other relevant departments on identify the presence of sub-sea infrastructure (pipelines, cables, etc.) in the area as well as existing pipeline/ cable operators prior to finalization of route and construction activities as well as any removal of cables during the decommissioning phase.</p>

Table 6.3 Emerging Themes – Coastal and Onshore Physical Environment

Focus Area	Emerging themes for assessment		Mode of Assessment
	Construction and Decommissioning	Operation	
Land Use	Land use may change during construction phase for the areas used for laydown areas, construction camps, batching plant etc. The duration of impact will depend on the construction schedule.	<p>Permanent change of land use will be mainly in case of onshore pooling substation and pillars of the onshore cables up to grid substation.</p> <p>Onshore cables will be either buried or above ground and right of way will be required, which will have some restrictions for development on land.</p>	<ul style="list-style-type: none"> Assessment of land use based on satellite data as well as land records
Topography & Drainage	<p>Topography and drainage pattern may be impacted during construction phase due to:</p> <ul style="list-style-type: none"> Construction of access roads to ancillary facilities and pooling substation; Development of site for pooling substation 	--	<ul style="list-style-type: none"> Topographic survey and drainage pattern should be studied for identified site/s.
Soil	<p>Land clearance and compaction activities are the main two activities of construction phase, which are likely to affect the soil structure and quality.</p> <ul style="list-style-type: none"> The most significant potential impacts will be due to change in soil structure and soil quality as a result of excavation or compaction. The magnitude and extent of the impacts are likely to vary according to the characteristics of the soil and the types of construction activity. Clearance of land would render soil vulnerable to erosion. Loose soils and construction material if placed unattended will lead to contamination of soil. The excavated soil if kept uncovered and unprotected will be rendered vulnerable to loss from erosion. 	--	<ul style="list-style-type: none"> Study of characteristic of soils at identified sites for laydown area/s, pooling substation to be undertaken.
Ambient Air Quality	Potential impacts on air quality resulting from the construction of the project may include:	--	<ul style="list-style-type: none"> Consultation with key stakeholders, including the local authorities, through whose areas the route will pass and baseline review of the local air quality condition to be undertaken

Focus Area	Emerging themes for assessment		Mode of Assessment
	Construction and Decommissioning	Operation	
	<ul style="list-style-type: none"> ■ Increased emissions into the air from vehicle movements associated with the construction activity, and ■ Increased dust emissions into air during construction. <p>Potential impacts on air quality resulting from the decommissioning of the project may include:</p> <ul style="list-style-type: none"> ■ Fugitive dust emission and a temporary increase in number of vehicular movement on the nearby roads, and would be similar to those of construction phase. 		
Ambient Noise Quality	The potential temporary effects of construction noise may arise from activities carried out on the surface along the proposed onshore cable route (mainly earth moving and excavation) and also construction activities at the substation. Heavy goods vehicles servicing the proposed onshore cable corridor and substation, delivering or removing materials (including spoil and fill) and batching plant will also lead to noise and vibration.	--	Noise sensitive receptors in the surrounding to be mapped and noise baseline monitoring to be undertaken
Surface Water Quality	Surface water quality may be impacted during the construction phase in case of discharge of untreated wastewater from the labour camp to the nearby waterbody or surface runoff from construction site/s.	--	<ul style="list-style-type: none"> ■ Identification of nearby waterbodies (river/ pond) around the construction sites for pooling substation, access roads, construction sites of onshore cables.
Traffic and Transportation	During the construction phase, construction traffic is likely to be generated by a range of activities including: <ul style="list-style-type: none"> ■ Construction workers arriving and leaving site ■ Supply of construction materials and machinery including cable and substation components 	--	Land based traffic and transportation study to assess impacts on existing offsite roadways, bridges, crossings over culverts, overpasses/underpasses, turning radii, and utilities, as well as whether surface replacements, upgrades, etc. to be undertaken.

Focus Area	Emerging themes for assessment		Mode of Assessment
	Construction and Decommissioning	Operation	
	<ul style="list-style-type: none"> ■ Movement of construction machinery ■ Removal of soil resources, spoil or waste, and ■ Movement of service vehicles and visitors. <p>The above will result into:</p> <ul style="list-style-type: none"> ■ Increase in traffic congestion on the route ■ Road safety issues introducing new risks with transportation of oversized turbine components and construction machinery, suitability of delivery route for abnormal loads 		
Aviation	The infrastructure required in the process of WTG commissioning/decommissioning, in particular large crane structures, may present a physical obstruction and effect operations of low flying aircraft, including SAR helicopters.	<p>Wind turbines have the potential to interfere with military and civil aviation operations, primarily through effects on radar systems but also in respect of their location and physical presence, relative to aerodromes and also within military low flying areas.</p> <p><i>Operation Phase</i></p> <ul style="list-style-type: none"> ■ The physical presence of wind turbines may have an impact on the aviation radar installations. ■ WTGs can be difficult to see from the air, particularly in poor meteorological conditions, and can increase the collision risk to aircraft operations at low altitudes. 	Consultation to be undertaken with the civilian and military authorities to ensure any possible issues are resolved at an early stage. Recommendation from the authorities, if any, will be complied with.

Table 6.4 Emerging Themes – Offshore Biological Environment

Focus Area	Emerging themes for assessment		Mode of Assessment
	Construction and Decommissioning	Operation	
Benthic Ecology	<ul style="list-style-type: none"> ■ Change in water quality from the increased construction activity, grouting for monopile foundation establishment, sediment release, contaminant release and accidental spills/leaks 	<ul style="list-style-type: none"> ■ Loss of benthic habitat due to turbine foundation and cable laying; ■ Potential colonization of turbine foundation by benthic species; 	<ul style="list-style-type: none"> ■ Benthic samples should be undertaken as part of the ESIA study to determine the benthic diversity in the wind farm area and along the export cable route. ■ Microhabitats with higher benthic diversity as identified during the bathymetry study and technical surveys

Focus Area	Emerging themes for assessment		Mode of Assessment
	Construction and Decommissioning	Operation	
	<p>of oil, lubricant or diesel carried by Project vessels;</p> <ul style="list-style-type: none"> ■ Direct loss of benthic ecology during turbine foundation establishment (e.g. pile driving of monopile foundation and clearing of seabed for jacket foundation); and ■ Introduction of or local dispersal of invasive species due to vehicular movement that can result in a loss of resident species. 	<ul style="list-style-type: none"> ■ Scour around foundations and scour protection measures that can cause loss of seabed habitat; and ■ Increase in sediment temperatures due to heat from subsea cables and subsequent degradation of organic content that can impact benthic fauna. 	<p>should be avoided and specifically as part of the mitigation strategy.</p> <ul style="list-style-type: none"> ■ An analysis of alternatives should be undertaken to identify specific locations for turbine foundation siting and cable routing.
Fish and Shellfish Species	<ul style="list-style-type: none"> ■ Displacement of fish and shellfish species due to noise from the vessel movement, piling and construction of foundation structure; ■ Vibration impacts from vessel movement, piling and construction can lead to a net displacement of species from the area; ■ Change in water quality from construction activity, grouting, sediment release, contaminant release and accidental spills/leaks; ■ Dispersal of fish species from increase vessel movement and disturbance; and ■ Decreased spawning due to loss of seabed habitat from wind farm establishment. 	<ul style="list-style-type: none"> ■ Loss of spawning habitat due to turbine foundation and cable laying; ■ Increased shelter options if jacket foundation is established; ■ Artificial reef effect from foundation establishment that increases resources and prey species; ■ Avoidance of electrical structures due to electromagnetic disturbance; and ■ Increased fish stock, if area around the wind farm area is notified as a no fishing zone (to be confirmed during stakeholder consultations). 	<ul style="list-style-type: none"> ■ Key fishing grounds, spawning habitat and fish movement should be identified through consultations with local communities and discussions with the local fisheries department. These areas can then be avoided during the project siting. ■ Handling of hazardous materials and movement of the same in marine vessels should be reviewed and managed as part of the ESIA process. ■ An analysis of alternatives should be undertaken for the siting of project components to reduce the impact to fishing grounds or spawning habitats. ■ Discussion with local fisherman about whale shark (<i>Rhincodon typus</i>) movement in the region.
Marine Turtles	<p>The Project site has some marine turtle activity that is found in the region close to the nesting period in the start of the calendar year. These turtles will be affected by vessel movement that may interrupt the mating cycle and dissuade individual females from approaching the shore for nesting.</p> <ul style="list-style-type: none"> ■ Decrease in water quality from the increased construction activity, grouting for monopile foundation establishment, sediment release, contaminant release and accidental spills/leaks of oil, lubricant or diesel carried by Project vessels; 	<ul style="list-style-type: none"> ■ Potential increase in vessel strikes due to maintenance related boat movement. 	<ul style="list-style-type: none"> ■ Study of movement pattern of turtles around the wind farm site.

Focus Area	Emerging themes for assessment		Mode of Assessment
	Construction and Decommissioning	Operation	
	<ul style="list-style-type: none"> ■ Noise and vibrational impacts; and ■ Vessel strikes. 		
Birds	<p>The Project site has limited seabird activity that is not specific to the Project site but found across the Gulf of Khambhat. These species will be affected by:</p> <ul style="list-style-type: none"> ■ Change in fish/shellfish composition in the surrounding waters due to the aforementioned impacts; and ■ Increased disturbance will dissuade foraging in the surrounding waters. 	<p>In the operational phase, impact could be due to:</p> <ul style="list-style-type: none"> ■ Wind farm as a barrier to migratory bird movement; ■ Loss of foraging areas from the presence of the wind turbines; ■ Collision risk with the turbine rotor blades due to foraging around the operational wind farm; ■ Attraction of birds to artificial or navigational lights on the turbines and increased risk of collision; ■ Displacement of resident and migratory bird species from the wind farm area as an avoidance behaviour; ■ Increased energy expenditure for bird species that want to avoid the wind turbines during migration, foraging and breeding; ■ Change in fish species composition from the wind turbine that may affect the availability of prey species for piscivorous ⁽¹⁾ avifauna; 	<ul style="list-style-type: none"> ■ An ecology baseline survey should be undertaken in the winter migratory season (October to March) and breeding season (April to June) to identify seasonal sensitivities of avifaunal species
Marine Mammals	<p>Marine mammals may pass through the wind farm area as part of regular foraging and daily movement. Some impacts identified:</p> <ul style="list-style-type: none"> ■ Increased vessel movement can disturb the species and increase noise and vibrational impacts; ■ Dredging, pile driving and decommissioning of the wind farm components can cause further 	<p>In the operational phase, the impacts could be:</p> <ul style="list-style-type: none"> ■ Behavioural changes in individuals due to low-frequency noise and vibrations from the turbine operation; ■ Barrier movement due to establishment of the turbine foundation over a 400 km² area; and 	<ul style="list-style-type: none"> ■ Consultations with communities, fisheries department and local researchers/marine mammal specialists (if identified) should be undertaken to determine seasonal sensitivities associated with marine mammal sightings. ■ Baseline surveys for cetacean species in the area. ■ An assessment with respect to noise and vibrational impacts based on the cetacean species identified in the area should be undertaken to understand impacts.

(1) fish-eating species

Focus Area	Emerging themes for assessment		Mode of Assessment
	Construction and Decommissioning	Operation	
	noise and vibrational impacts to marine mammals; <ul style="list-style-type: none"> ■ Significant noise and vibrational impacts (including pile driving) can affect navigation and communication across large distances and may injure individuals; ■ Boat strikes may be a concern for marine mammals breaching the water surface for breaths; and ■ Indirect impacts from displacement of fish and shellfish species from the region. 	<ul style="list-style-type: none"> ■ Disturbance to orientation due to the electromagnetic field around export cables. 	

Table 6.5 Emerging Themes – Coastal and Onshore Biological Environment

Focus Area	Emerging themes for assessment		Mode of Assessment
	Construction and Decommissioning	Operation	
Intertidal Flats	Intertidal flats will be impacted by: <ul style="list-style-type: none"> ■ Modification of habitat due to export cable laying, dredging for vessel movement, trench creation and scouring; and ■ Loss of coastal habitat that may affect the nutrient cycling processes in intertidal flats and fish/shellfish composition. 	--	<ul style="list-style-type: none"> ■ Assessment of intertidal fauna around the proposed export cable route.
Mangroves	Mangroves should be avoided as part of the Project siting. Some causes of concern, if avoidance cannot be undertaken: <ul style="list-style-type: none"> ■ Clearance of mangrove vegetation for export cable, landfall point and onshore cabling; ■ Loss of nutrient cycling and storm protection ecosystem services that are attributed to mangrove habitat; and ■ Loss of spawning and nursing sites for fish, shellfish and larger aquatic species. 	--	<ul style="list-style-type: none"> ■ Mapping of mangroves along the export and onshore cable routes.
Avifauna	Habitat modification and/or loss due to establishment of pooling substation (if required),	Electrocution risk due to overhead onshore cables (if overhead option is chosen).	<ul style="list-style-type: none"> ■ Baseline survey as part of ESIA study around the pooling substation, grid substation and onshore cable route (in case of above ground).

Focus Area	Emerging themes for assessment		Mode of Assessment
	Construction and Decommissioning	Operation	
	construction of grid substation, onshore cabling and access road construction (if required).		
Turtle Nesting Sites	<p>Occasional turtle nesting sites have been identified near the Chanch Bandar Salt Pans that are 2 km north of the proposed landfall point. Other turtle nesting sites are largely found closer to the tip of the Gulf of Khambhat. These sites could be affected by:</p> <ul style="list-style-type: none"> ■ Laying, maintenance and removal of the onshore cables at the landfall. ■ If the proposed pooling substation location or landfall point is changed then it may lead to loss of nesting site habitat for turtle species; ■ Increased development along the coast may result in higher number of artificial lights and that could disorient turtle hatchlings during their movement to the ocean; and ■ Increase labour and demographic influx could potentially increase waste debris along the coast and result in accidental ingestion or entangling around individuals. 	<ul style="list-style-type: none"> ■ Artificial lights and marine debris from coastal Project components (e.g. pooling substation) that may affect turtle hatchlings; and ■ Buried cable may affect burial of turtle eggs. 	<p>Turtle nesting sites should be mapped as part of the ecological assessments to identify avoidance areas for project components. Surveys should be undertaken in potential nesting sites to determine presence/absence. Impacts to hatchlings including artificial lights, waste, etc. around these sites should be considered during the establishment of project components.</p>
Terrestrial Habitat	<p>The loss of terrestrial habitat including vegetation patches, coastal vegetation, agricultural land, wetlands and swamp land will have a direct impact on terrestrial fauna. These habitats will be affected by the establishment of the pooling substation, onshore cabling and any ancillary facilities that are identified for the project.</p> <ul style="list-style-type: none"> ■ Habitat loss and modification from establishment of onshore components including pooling substation and onshore cables; ■ Increased anthropogenic movement and vehicular movement in the region; and 	--	<ul style="list-style-type: none"> ■ Habitat mapping and ecological survey for terrestrial flora and fauna around project activity areas. ■ Impacts to terrestrial fauna including human-wildlife conflict and habitat loss/modification should be considered as part of the ecological assessment. ■ Asiatic Lions (<i>Panthera leo</i>) movement should be determined through baseline studies, consultations with the Forest Department, local communities and researchers/experts in the area to understand any impacts to the species from the onshore components of the project.

Focus Area	Emerging themes for assessment		Mode of Assessment
	Construction and Decommissioning	Operation	
	<ul style="list-style-type: none"> ■ Influx of labour that may increase human-wildlife conflict including hunting, poaching, trapping, road kills, etc. 		

Table 6.6 Emerging Themes – Offshore Social Environment

Focus Area	Emerging themes for assessment		Mode of Assessment
	Construction and Decommissioning	Operation	
Seascape	--	Considering that distances between the Wind Farm site (9 to 23 nautical miles) from coast line visual impact of the turbines upon seascape and visual impact of lighting during night will not be significant.	--
Commercial Fisheries	<p>Fishing activities inside the offshore project area and/or transecting through the offshore project area to reach other fishing grounds is a certain possibility and needs to be investigated in detail during ESIA. The project is likely to have impacts on fishing communities because of:</p> <ul style="list-style-type: none"> ■ Potential change in depth of channels and estuaries ■ Potential impact on fish population due to increased turbidity and siltation and subsequently on the livelihoods of the fishermen ■ Restriction in access and boat movement <p>The impact on boat movement and vessels is expected to largely pertain to the restrictions on access to the channel, which is used, for accessing the port and marine waters and for parking boats in the channels close to Shiyalbet.</p>	<p>Potential impact on commercial fishing during operations phase is expected due to following reasons:</p> <ul style="list-style-type: none"> ■ Loss of part of existing fishing grounds. ■ Any fishing activity inside the proposed offshore project area may cease to exist; ■ Access/transecting through the offshore project area to reach other fishing grounds may get affected. Fishing boats may need to use alternate access routes 	<ul style="list-style-type: none"> ■ Socio-economic survey of fishing households (sample); ■ Consultations with fishing households, key community representatives, Department of Fisheries, Gujarat Maritime Board etc.

Focus Area	Emerging themes for assessment		Mode of Assessment
	Construction and Decommissioning	Operation	
	In terms of impacts due to restriction of access and boat movement, this will be resultant from the channel which is maintained by Pipavav and any new channel to be maintained for transportation of Wind farm components. Navigational buoys, demarcating channel for navigation of larger barges and ships, will mark this channel. In general, the navigation is a priority use of the channel, which precedes other uses. Hence, fishing boats using the channel are expected to give way to approaching ships and vessels and avoid collision.		
Shipping and Navigation	<p>There is potential for the safe navigation of all vessel types to be affected. Impacts may include but not limited to the following:</p> <ul style="list-style-type: none"> ■ Vessels operating on-site are expected to include, but are not limited to, heavy lift construction vessels, crew transfer vessels, barges, jack-up vessels, cable installation vessels and tugs. When they are restricted in their ability to maneuver or undertaking sensitive operations they would have advisory safety zones around them. ■ Route of fishing vessel likely to be displaced ■ Collision with other vessels due to increased activities during construction and decommissioning 	<p>Likely impacts during the operation phase include:</p> <ul style="list-style-type: none"> ■ Interference of turbines with radar resulting in higher navigational risks. ■ Potential effect on navigation routes or anchoring areas. 	<p>To determine the potential for impact to shipping access and area use, the following studies and survey to be undertaken</p> <ul style="list-style-type: none"> ■ Vessel routing survey ■ Vessel density survey <p>Developer to ensure navigation risk assessment to be undertaken in order to determine the potential for impact to navigation safety.</p>
Archaeology and Cultural Heritage	Information on presence of any offshore cultural/archaeological site in the study area is not available. However, as reported by Pipavav Port Marine team and local communities in Mahuva and Jaffrabad, there are no off shore cultural sites located in the area.	--	Consultations with local community and government authorities to confirm presence/absence of any offshore/marine cultural sites.

Focus Area	Emerging themes for assessment		Mode of Assessment
	Construction and Decommissioning	Operation	
Tourism	The windfarm site is more than 9 nautical miles from the coast and as per consultation with local communities, no offshore cultural site are located in that area.	--	Consultations with local community and government authorities to confirm presence/absence of any offshore/marine cultural sites.

Table 6.7 Emerging Themes – Coastal and Onshore Social Environment

Focus Area	Emerging themes for assessment		Mode of Assessment
	Construction and Decommissioning	Operation	
Socio-economics	<p>Construction and decommissioning activities will lead to following impacts:</p> <ul style="list-style-type: none"> ■ Influx of labour, setting up of labour camps and interactions with local communities leading to temporary demographic changes. Currently, location of labour camp and estimates on overall number of construction labour required for construction phase have not been finalised; ■ Direct impact on livelihood may be generated due to land procurement for sub-stations and right-of-way for onshore cables; ■ Potential direct beneficial impact via employment of local workers during construction of wind farm; ■ Potential indirect beneficial impact via employment in suppliers and other sub-contractors further down the supply chain that may be initiated by the Project; ■ Potential induced impacts i.e. second tier employment supported by spending of wages in the local economy; ■ The project has a potential to generate beneficial impacts through improvement in infrastructure through roads and community development measures. 	<p>Potential direct beneficial impact via employment of local workers during operation of wind farm.</p>	<p>As part of the Social Impact Assessment, following activities will need to be undertaken:</p> <ul style="list-style-type: none"> ■ Elements such as location of labour camps, migrant workforce, number of labour required etc. will be assessed and potential impacts will be identified. This will involve discussions with project proponents, local communities and EPC contractors. ■ Consultations and survey of impacted households due to land procurement; ■ Discussions with project proponent and EPC contractors on potential workforce mobilisation (as per skill) from the local area in construction and operations phase; ■ Discussion with project proponent on plans for local community and infrastructure development.

Focus Area	Emerging themes for assessment		Mode of Assessment
	Construction and Decommissioning	Operation	
Saltpans and other coastal enterprises	Saltpans are located in the north-eastern sector of the study area (i.e. north of Chanch Bunder settlement). Potential impacts are expected on saltpans during the construction phase due to laying of cables.	--	Consultations with saltpan owners and assessment of impacts due to land requirement for onshore cable towers and right-of-way.
Road and rail traffic	<p>Road and rail traffic may be impacted during the construction phase due to potential minor disruption to road or rail traffic where the cable route crosses road or rail tracks, due to brief closures to allow workers in safe conditions for the road and rail users. As the onshore cable route has not been finalised, these crossings points have not yet been identified.</p> <p>There is potential of increase in road traffic during construction phase which may lead to health and safety risks to the local community by increased chances of accidents.</p>	--	<p>Identification of all road and railway crossing points for onshore cables.</p> <p>Mapping of expected traffic movement in construction phase and preparation of Traffic Management Plan.</p>
Archaeology and Cultural Heritage	<p>The project is not expected to directly impact the cultural site of Rasodan temple in Pipavav. Mosque in Savai Bet Island may get impacted during dredging, noise/vibration related impacts.</p> <p>There is also possibility of potential removal of archaeological remains found during excavation for cable i.e. chance finds.</p>	--	<p>Assessment of Savai Bet mosque in terms of structural stability and potential impacts through dredging/ noise or vibration related impacts.</p> <p>Chance-find procedure to be prepared as part of the ESIA.</p>
Community Health and Safety	<ul style="list-style-type: none"> ■ Community health and safety impacts, in terms of risk of collision of fishing boats and ships/vessels; ■ Risks associated with labour camps and outbreak of diseases 	--	Discussions with fishing communities, fence line communities, and project proponent

Focus Area	Emerging themes for assessment		Mode of Assessment
	Construction and Decommissioning	Operation	
	<ul style="list-style-type: none"> ■ Risks associated with construction activities, especially during laying of sea cables, movement of marine vessels and overhead onshore cables. 		

6.4 Cumulative Impacts

As identified in **Section 4.2.4** and **Section 4.2.5**, the following projects will be occurring simultaneously as the establishment of the offshore wind farm:

- Expansion of the Pipavav Port;
- Decommissioning of the Tapti Oil and Gas Platforms; and
- Offshore wind power projects development in Zone B.

The key implications of both projects have been described in the subsequent sections.

6.4.1 Expansion of the Pipavav Port

The ongoing Pipavav Port expansion will occur simultaneously to the construction of the offshore wind farm and therefore there is a potential for cumulative impacts from both projects on the affected resources and receptors. Some examples of cumulative impacts are identified below:

- Increased dredging activities along the shipping channel and extension of shipping channel to accommodate the increased quay length could have an overall negative impact on coastal and benthic ecology in the area;
- Limited seine based fishing does occur along the coast near Mahuva. Some of these fisherman may perceive a loss of potential fishing ground from the combined expansion of the port and loss of fishing ground in the wind farm area;
- The increased construction activities could lead to higher dust levels and run-off that will cause sedimentation of the water body and increase the total dissolved substances (TDS) levels; and
- The higher capacity of the Pipavav Port indicates an increased boat traffic, which combined with the wind farm boat movement can lead to an overall increase in boat traffic. The increased boat traffic increases chance of pollution discharge, strikes to marine mammals, perceived loss of fishing grounds for local fisherman and noise impacts to local ecology and communities.

The port expansion will also have some perceived impacts on the wind farm establishment:

- The export cables connecting the wind farm to the proposed onshore pooling substation will need to approach from east of Shiyal Bet (**Figure 2.9**). The route will have to move further east to accommodate the current expansion plans; and
- The increase in deck space can be beneficial to COWI should dedicated vessels be needed during the operation phase. The deck can also be strengthened during the expansion to ensure that the minimum requirement of 20 tons/m² is met.

6.4.2 Decommissioning of the Tapti Field

The decommissioning of the Tapti field could occur simultaneously near the Project site and therefore there will be some potential cumulative impacts on resources and receptors in the area:

- The decommissioning could increase the boat traffic in the region due to the Tapti field adjacent to the site. The combined boat traffic would have perceived impacts on the fisherman and may result in a net displacement of ecology (including commercial fish species) from the area; and
- The decommissioning will include removal of topside and jacket, cutting of jacket and plugging and abandonment of well. The activities may be undertaken simultaneously to pile driving and dredging for the wind farm establishment. Each of these activities will have noise and vibrational impacts that could result in a net displacement of ecology from the area.

6.4.3 Offshore Wind Power Development in Zone B

The FOWPI project is a pilot project in Zone B and has high potential for offshore wind project development in the future. As part of the NIWE Expression of Interest for the 1 GW wind power development, several technical studies including wind resource assessments are being undertaken in Zone B to identify the potential for offshore wind power projects. The establishment of future wind power projects in the area may have cumulative impacts with respect to the following:

- Increased vessel movement across the Gulf of Khambhat that would affect fish species, fishing activities and marine mammal movement. The increased boat movement could also increase the risk of an accident/incident that will affect the water quality;
- Net displacement of fish, shellfish, marine mammal and seabird species from the area due to increase anthropogenic movement and development in the region;
- Cumulative underwater noise impacts if multiple projects are constructed at the same time or sequentially;
- Risk of cumulative bird collision (offshore turbines) and electrocution (onshore overhead cables) due to the increased wind farm development and larger footprint; and
- Habitat modification and loss (offshore and onshore) due to decreased space and resources for sustaining multiple wind power projects.

7. STAKEHOLDER SCREENING AND MAPPING

7.1 Stakeholder Engagement during Scoping Study

A preliminary stakeholder engagement process was undertaken to identify primary stakeholders that can influence the project and may be key decision makers in the establishment of the offshore wind farm. The stakeholder identification and their inclusion in the scoping process to identify concerns at an early stage.

7.2 Stakeholder Mapping

The details of the preliminary stakeholder engagement process has been provided in **Table 7.1**. These stakeholders were selected on the basis of preliminary mapping of stakeholders who may have direct influence or interest on the project. The table includes the following items:

- Categorization of the stakeholder based on the overall grouping i.e. community, institution, project, government or other; and
- Key expectations and outcomes of the stakeholder consultation.

Table 7.1 Preliminary Stakeholder Engagement

S.N.	Stakeholder Name	Stakeholder Category	Stakeholder Interests	Key discussion points and outcomes
1.	Pipavav Port: Environmental Team Date: 26 th February 2018 Location: Pipavav Port Office	Project	Project Operations, sharing of resources	<p>The ERM team discussed the Pipavav Port environmental and social management systems and key requirements for establishment of the offshore wind farm. Some of the key points that were discussed have been highlighted below:</p> <ul style="list-style-type: none"> ■ The Pipavav Port has obtained an Environmental Clearance from the Ministry of Environment, Forests and Climate Change (MoEFCC) in 2012 for expansion of the port in the northeast direction. The first phase of the expansion has been completed and the second phase of the expansion will coincide with the establishment of the offshore wind farm; ■ The port staff is unaware of the Project components including the export cables route, storage area facility and connection to the grid. A concern was raised for the export cables stating that the route should ideally be further northeast of the proposed phase II expansion; ■ The seascape between the Pipavav Port and proposed offshore wind farm area has no significant fishing grounds and there are no marine archaeological sites or installations; ■ The social impact including impact to fishing communities, loss of resources and loss of livelihood was determined to be minimal during the EIA undertaken for the port expansion; ■ The harbour sees approximately 100 ships/month of vessel traffic along the Western Channel leading into Pipavav Port from the mouth of Gulf of Khambhat; ■ Fishing activity including seine fishing along the coast and coastal aquaculture is non-existent across the Western and Eastern Channel of the Port; and ■ Fishing vessels are rarely seen entering the harbour area, with the exception of Shiyal Bet vessels.
2.	Pipavav Port: Marine Team Date: 26 th and 27 th February 2018 Location: Pipavav Marine Office	Project	Vessel movement	<p>The ERM team discussed the Pipavav Port marine team to better understand the metocean characteristics and physical characteristics of the harbour. The key points have been highlighted below:</p> <ul style="list-style-type: none"> ■ The average depth of the water is 13.5-14.5 m but there are areas of extremely shallow water located along the Eastern Channel; ■ Metocean characteristics including tidal current, wind conditions, water current, wave height and flow characteristics was discussed with the marine team; and ■ The marine team confirmed that there are no marine archaeological sites or installations in the area but showed the approximate route of the Shiyal Bet undersea cables that are used to provide electricity to the community residing on the island.
3.	Gujarat Maritime Board (GMB) Date: 27 th February 2018	Government	Permits and licenses, vessel movement, navigation routes	<p>The ERM team had a discussion with the assistant port officer in the Gujarat Maritime Board to get a better understanding of GMB's role in the decision making process and to understand vessel movement around the study area. The key points have been highlighted below:</p>

S.N.	Stakeholder Name	Stakeholder Category	Stakeholder Interests	Key discussion points and outcomes
	Location: GMB Office, Jaffrabad			<ul style="list-style-type: none"> ■ The team was made aware of the multiple jetties/ports in the area including Ultratech Cement, Narmada Cement, Pipavav Port and Jafrabad Port. The total number of vessels entering and existing these ports was approximated as 700 boats; ■ The team was informed about the commercial fishing operations in the area especially with respect to Shiyal Bet, Jafrabad and Mahuva; and ■ Vessel movement in deeper water between the port and wind farm area was discussed and it was recommended that Vessel Traffic Management and Information Systems (VTMS) should be consulted as they have radars across the Gulf that track vessel movement in the region.
4.	Rajula Forest Department Date: 28 th February 2018 Location: Rajula Range Forest Office, Amreli District	Government	Marine and terrestrial ecology	<p>The ERM team consulted the Rajula Forest Department to understand ecological concerns associated with the wind farm establishment in the region. The key points have been highlighted below:</p> <ul style="list-style-type: none"> ■ The Forest Department described cetacean strandings that had occurred in the last 5 years including a beaked whale and humpback whale; ■ The department has confirmed that they are tracking nesting of Olive Ridley Turtles in Chanch Bandar; ■ The movement of Asiatic Lions in Taluka Rajula was described including the presence of approximately 80 nomadic individuals in the region and 22 that regularly enter the Pipavav Port boundaries; ■ The presence of migratory bird species including pelican, stork and flamingo was indicated; and ■ The presence of several other species including the leopard, whale shark, vulture, hyaena, fox, wolf, jungle cat and cobras was highlighted.
5.	Shiyal Bet Fishing Community Date: 28 th February 2018 Location: Pipavav Port Jetty	Community	Fishing, passenger ferry movement	<p>The ERM team discussed fishing and allied activities with fisherman in the Pipavav Port. The focus of the discussion was on preferred fishing grounds, fishing gear, fishing vessels, fish landing centres and religious/cultural places.</p>
6.	Commercial Fisherman in Jafrabad Date: 27 th February 2018 Location: Jaffrabad town	Community	Fishing	<p>The ERM team had a detailed discussion with the Jafrabad Fishing Community including a qualified marine biologist to discuss the fishing and allied activities in the region. The key points have been highlighted below:</p> <ul style="list-style-type: none"> ■ The two primarily used fishing gear is dol netters and gill netters that is used for top water, middle water and bottom water fishing; ■ Bombay Duck is the preferred commercially fished species but other species including medium prawns, pomfret and catfish are regularly caught; ■ Approximately 14,000 people are involved in Seine fishing;

S.N.	Stakeholder Name	Stakeholder Category	Stakeholder Interests	Key discussion points and outcomes
				<ul style="list-style-type: none"> ■ Prawn aquaculture does occur in Chanh Bandar with approximately 1000 operational farms; ■ The seasonal shutdown of fishing is 10 June to 15 August; ■ Fish catch has decreased significantly and the catch per unit effort has decreased from 4 hours to 12 hours; and ■ Fishing grounds can vary from Surat Coast to Mahuva, Rajpara and Mumbai/Daman.
7.	Commercial Fisherman in Mahuva Port Date: 28 th February 2018 Location: Mahuva Village	Community	Fishing	<p>The ERM team had discussions with Mahuva Fishing Community to discuss how fishing behaviour at Mahuva varies from Jafrabad port. The key points have been highlighted below:</p> <ul style="list-style-type: none"> ■ Key fishing grounds can vary from Diu to Surat depending on where the fish stock is identified; ■ The larger commercial vessels from Jafrabad has created a paucity of space in key fishing areas; ■ Fish catch has reduced considerably with several fisherman having returned with minimal to no fish catch despite being out in the water for several hours; and ■ Seine fishing is practiced by locals to capture fish in the incoming tide.
8.	Villagers of Rampara No. 2 Date: 27 th February 2018 Location: Rampara No-2	Community	Employment	<p>ERM team had discussion with the villagers of Rampara No.2 located in north east of Pipavav Port. Key points have been highlighted below:</p> <ul style="list-style-type: none"> ■ Land procurement for Pipavav Port has led to reduction in land available for construction. But agriculture is still practised in the village, especially during the months of July-October; ■ On the other hand, local community has benefitted from the port activities through employment during construction stage and operations phase, petty contracts and growth of ancillary industries such as transportation, maintenance, small businesses in hospitality etc. ; ■ Dependence on fishing as a source of livelihood is minimal. There is occasional fishing undertaken in the mangrove area. However, it was not termed as commercial by local villagers.

7.2.1 Summary of key concerns as reported by stakeholders during Scoping

- Fishing communities were concerned about any potential impacts on access to their fishing grounds or direct impact on fishing grounds due to increased vessel movement, dredging etc.
- Non-fishing villages such as Rampara No.2 reported expectations revolving around increased employment and business opportunities;
- Regulatory authorities expect the project to undertake all associated assessments for obtaining permits, licenses and clearances.
- Pipavav Port: the main expectations of the port authority was optimum utilisation and sharing of resources such as energy, water, workforce etc. Concerns revolved around increase in number of vessels, additional ship docking requirements; storage areas including storage of hazardous materials (example oil, diesel etc.). Land lease arrangement for any potential siting of project components during construction or operations phase within Pipavav Port land.

7.2.2 Stakeholder Mapping for Project

Stakeholder mapping refers to the process of identifying individuals or groups that may have an influence over the wind farm establishment and operation. The mapping also identifies key decision makers who would need to be consulted as part of the consent and approval process during the planning stage. Stakeholder identification and their inclusion in the decision making process is critical in prioritizing, analysing and addressing issues and in developing management systems and mechanisms to address their respective concerns.

The indicative list of stakeholders that should be consulted as part of the decision making process has been provided in **Table 7.2**.

Table 7.2 Stakeholder Identification and Mapping- for ESIA study

S.N.	Stakeholder Name	Stakeholder Category	Purpose of Stakeholder Engagement
1.	Pipavav Port Staff	Project	The Pipavav Port staff would need to be consulted as part of the feasibility analysis to finalize the location of the storage yard, onshore pooling substation, export and onshore cables and temporary structures like the batching plant and labour camp. The Port Staff will also play a direct role in providing a No Objection Certificate for the export cable route along the Port property and harbour.
2.	Gujarat Maritime Board (GMB)	Government	The Gujarat Maritime Board will need to be consulted prior to creating any infrastructure within the port limits or port approaches. The GMB will also be important in establishing GMB can provide input on the vessel traffic and boat movement for construction and maintenance activities.
3.	Gujarat Pollution Control Board (GPCB)	Government	The Gujarat Pollution Control Board will need to be consulted for obtaining the necessary approvals related to obtaining consent (for project related activities that results in the discharge of effluents, solid wastes, sewage falling within CRZ limits defined (within 12 nautical miles) and waste authorizations (for generation and disposal of hazardous waste on site). The GPCB will also enforce standards and laws related to pollution prevention that needs to be determined for the offshore wind farm project.

S.N.	Stakeholder Name	Stakeholder Category	Purpose of Stakeholder Engagement
4.	Gujarat Energy Transmission Corporation (GETCO)	Government	The offshore wind farm will require connection to the national grid through a GETCO substation. The consultations with GETCO will therefore provide clarity on the grid connection process.
5.	Gujarat Department of Forest and Environment (DoFE)	Government	The Gujarat Forest Department should be consulted about ecological sensitivities within a 10 km radius of the project footprint covering windfarm as well as export cables and onshore cables. The consultations should highlight species of conservation importance, proximity to ecologically sensitive areas and impact on conservation efforts being carried out in the region.
6.	Ministry of Environment, Forest and Climate Change (MoEFCC)	Government	EC consenting process specifically for offshore wind energy projects have not been established in the Indian context. MoEFCC should be consulted for obtaining EC for the project.
7.	Gujarat Coastal Zone Management Authority (GSCZMA)	Government	The GSCZMA is responsible for the application of the Coastal Regulation Zone Notification 2011 and therefore any laying of cables or activities within 500m of the High Tide Line will require specific requirements from the authority.
8.	Shiyal Bet Residents	Community	The Shiyal Bet fishing communities undertake some limited fishing in the seascape between the Pipavav Port and offshore area. The communities also undertake deeper water fishing in the Gulf of Khambhat.
9.	Jafrabad Commercial Fisherman	Community	The Jafrabad commercial fisherman are the largest fishing community that operates in the area and therefore the impact to fisheries from establishment of the wind farm will need to be determined through consultations. The community can also provide feedback with respect to key fishing grounds and areas of high diversity that should be avoided when siting the export cables route.
10.	Rampara No. 2 Residents and other settlements	Community	The Rampara No. 2 community have sold the land that currently belongs to the Pipavav Port. The project landing site and onshore pooling station (in case planned) may also locate on the Rampara Village land and therefore consultations with community members would be required to understand the perceived impacts from the Project. Furthermore, consultations will be requirement with residents of other settlements from where land will be leased/ procured/ RoW taken for onshore components including onshore cables and towers.
11.	Fishing settlements of Madhwad, Nava-Bandar, Khera, Mahuva, Gadhula etc.	Community	The project area may be frequented by fishers not only from the aforementioned settlements but also from settlements located further away from study area. Therefore, consultations with fishers in these locations can also provide feedback with respect to key fishing grounds.

S.N.	Stakeholder Name	Stakeholder Category	Purpose of Stakeholder Engagement
12.	Other Important Local Community Stakeholders	Community	Salt pan owners, aquaculture owners, Mahuva fishing community, workers engaged in Pipavav Port activities and nearby industries, community representatives and private boat owners will need to be consulted to understand the perceived impact of the wind farm development to their livelihood.
13. Inf	Health Department/Local PHC	Govt. Infrastructure	Local health department and PHCs will be consulted to understand local health profile of the study area, prevalent diseases, adequacy of local health infrastructure, disaster management etc.
14.	District Disaster Management Authority	Government	The District Disaster Management Department will be engaged to gain an understanding of disaster preparedness, early warning systems and disaster response.
15.	VTMS Authority	Government/Vessel Tracking	VTMS, Surat will have to engaged to gain an understanding of systems of vessel tracking, protocols to be followed to track unknown vessels, or lost boats, historical data etc.
16.	Panna Mukti and Tapti Joint Venture	Community	Panna Mukti and Tapti Joint Venture will be consulted to understand plans for decommissioning of Tapti field.
17.	ESSO – Indian National Centre for Ocean Information Services (INCOIS)	Government	ESSO – INCOIS provides advisory services on ocean observations for industry, government and research purposes. The agency has a database on potential fishing zones across Gulf of Khambhat and undertake ground-truthing of these fishing zones. The information can be used to identify trends in fishing and key fishing grounds.
18.	Project developer(s)	Project	The wind farm developer(s) will be consulted to determine the proposed project activities, timelines and understand the project design being implemented in the 1 GW offshore wind farm.
19.	Project contractors	Project	The contractors for the project including transmission line contractor, pooling substation contractor and operation and maintenance contractor to determine indicative project activities, timelines and company's EHS systems.

8. WAY FORWARD

The environmental and social scoping study that has been undertaken has identified several site sensitivities associated with FOWPI (**Section 4**). These sensitive resources and receptors have been mapped with the proposed Project activities to identify significant interactions that would result in a risk or impact (**Table 6.1**).

The scoping study has highlighted key interactions that require further study to understand the significance of impacts. These significant interactions and any sensitivities that require further assessment has been determined and recommended for the Environmental and Social Impact Assessment (ESIA) as emerging themes in **Table 6.2** to **Table 6.7**. The above tables also include a 'mode of assessment' that highlights key surveys and studies that need to be undertaken as part of the ESIA to identify the type and magnitude of the impact to environmental, social and ecological receptors. The list of recommended surveys has been summarized in the table below.

Table 8.1 Recommended surveys

S.N.	Technical Studies	Associated Emerging Themes
Offshore Environment		
1.	Site-specific Bathymetry Study	<ul style="list-style-type: none"> ■ Impact to seabed and hydrography ■ Impact to marine sediment ■ Impact to subsea infrastructure
2.	Seismic Surveys and Sediment Quality Study	<ul style="list-style-type: none"> ■ Impact to seabed and hydrography ■ Impact to marine sediment ■ Impact to subsea infrastructure ■ Impact to benthic ecology
3.	Metocean Study	<ul style="list-style-type: none"> ■ Impact to seabed and hydrography ■ Impact to marine sediment
4.	Sediment Transport Modelling	<ul style="list-style-type: none"> ■ Impact to marine sediment ■ Impact from raw material transport
5.	Noise and Vibration Modelling	<ul style="list-style-type: none"> ■ Impact from underwater noise ■ Cumulative Impacts
6.	Shipping Traffic Modelling	<ul style="list-style-type: none"> ■ Impact from raw material transport ■ Impact from underwater noise ■ Impact on shipping and navigation ■ Impact on community health and safety ■ Cumulative Impacts
7.	Turtle Nesting Site Assessment	<ul style="list-style-type: none"> ■ Impact on marine turtles ■ Impact on turtle nesting sites
8.	Fishing Livelihood Analysis	<ul style="list-style-type: none"> ■ Impact on fish and shellfish species ■ Impact on commercial fisheries
Onshore Environment		
9.	Ambient Air Quality Study	<ul style="list-style-type: none"> ■ Impact to ambient air quality ■ Cumulative Impacts
10.	Soil Quality Study	<ul style="list-style-type: none"> ■ Impact to soil environment ■ Cumulative Impacts
11.	Ambient Noise Monitoring	<ul style="list-style-type: none"> ■ Impact to ambient noise quality ■ Cumulative Impacts
12.	Surface Water Quality Monitoring	<ul style="list-style-type: none"> ■ Impact to surface water quality ■ Cumulative Impacts
13.	Ground Water Quality Monitoring	<ul style="list-style-type: none"> ■ Cumulative Impacts
14.	Land Use Assessment	<ul style="list-style-type: none"> ■ Impact to land use ■ Impact on mangrove habitats
15.	Topographic Surveys	<ul style="list-style-type: none"> ■ Impact to topography and drainage
16.	Traffic Studies	<ul style="list-style-type: none"> ■ Impact to traffic and transportation ■ Impact on road and rail traffic ■ Impact on community health and safety ■ Cumulative Impacts

S.N.	Technical Studies	Associated Emerging Themes
Studies applicable for both offshore and onshore		
17.	Socio-economic Surveys	<ul style="list-style-type: none"> ■ Impact on commercial fisheries ■ Impact on local tourism ■ Impact on socio-economics ■ Impact on saltpans and other coastal enterprises ■ Impact on community health and safety ■ Cumulative Impacts
18.	Cultural Heritage Impact Analysis	<ul style="list-style-type: none"> ■ Impact on archaeology and cultural heritage
19.	Year-long Avifaunal Survey	<ul style="list-style-type: none"> ■ Impact on avifauna
20.	Ecological Baseline Surveys	<ul style="list-style-type: none"> ■ Impact on benthic ecology ■ Impact on fish and shellfish species ■ Impact on marine turtles ■ Impact on avifauna ■ Impact on marine mammals ■ Impact on intertidal flats ■ Impact on mangrove habitats ■ Impact on terrestrial habitat

A list of the above technical studies and justification for the ESIA has been provided in the Terms of Reference (ToR) attached in **Appendix E** of this report.

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APPENDIX A PHOTO-DOCUMENTATION

Photo-documentation



Photo 1: Mangrove standing within the Pipavav Port



Photo 2: Water body within the Pipavav Port

Project: Environmental and Social Scoping of First Offshore Wind Power Project in India (FOWPI)

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Photo-documentation



Photo 3: Migratory bird activity around the wind farm including Redshanks, Godwits and Shovelers.



Photo 4: Resident species including painted stork, flamingo (resident population), black kite, Eurasian spoonbill, grey heron and glossy ibis found in the wind farm area.

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Photo-documentation



Photo 5: Bird flocking behavior identified near the wind farm



Photo 6: View of NH 8E connecting Bhavnagar to Dwarka, currently 2 lane and is under expansion

Project: Environmental and Social Scoping of First Offshore Wind Power Project in India (FOWPI)

Client: GMS# 0443131

ERM India Private Limited

Building 10, 4th Floor,
Tower A, DLF Cyber City
Gurgaon - 122 002, India
Board: +91- 0124 4170300
Fax: + 91-0124 - 4170301



Photo-documentation



Photo 7: View of the tentative location of the proposed grid substation at Pipavav



Photo 8: View of 220KV grid substation existing at Pipavav port

Project: Environmental and Social Scoping of First Offshore Wind Power Project in India (FOWPI)

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Photo-documentation



Photo 9: View of 220 kV Grid Substation at Village Otha



Photo 10: View of 220 kV Substation in Village Dhokadva

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Photo-documentation



Photo 11: View of Pipavav Port Jetty



Photo 12: View of access to Shiyalbet passenger ferry jetty

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Fax: + 91-0124 - 4170301



Photo-documentation



Photo 13: View of Jafrabad Port



Photo 14: View dried Bombay duck fishes in Jafrabad

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Photo-documentation



Photo 15: View of Mahuva Port



Photo 16: View of Coal Handling Unit in Pipavav Port

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Photo-documentation



Photo 17: Fishing community consultations in Mahuva



Photo 18: View of Cargo Handling, Gantries and Cranes in Pipavav Port

Project: Environmental and Social Scoping of First Offshore Wind Power Project in India (FOWPI)

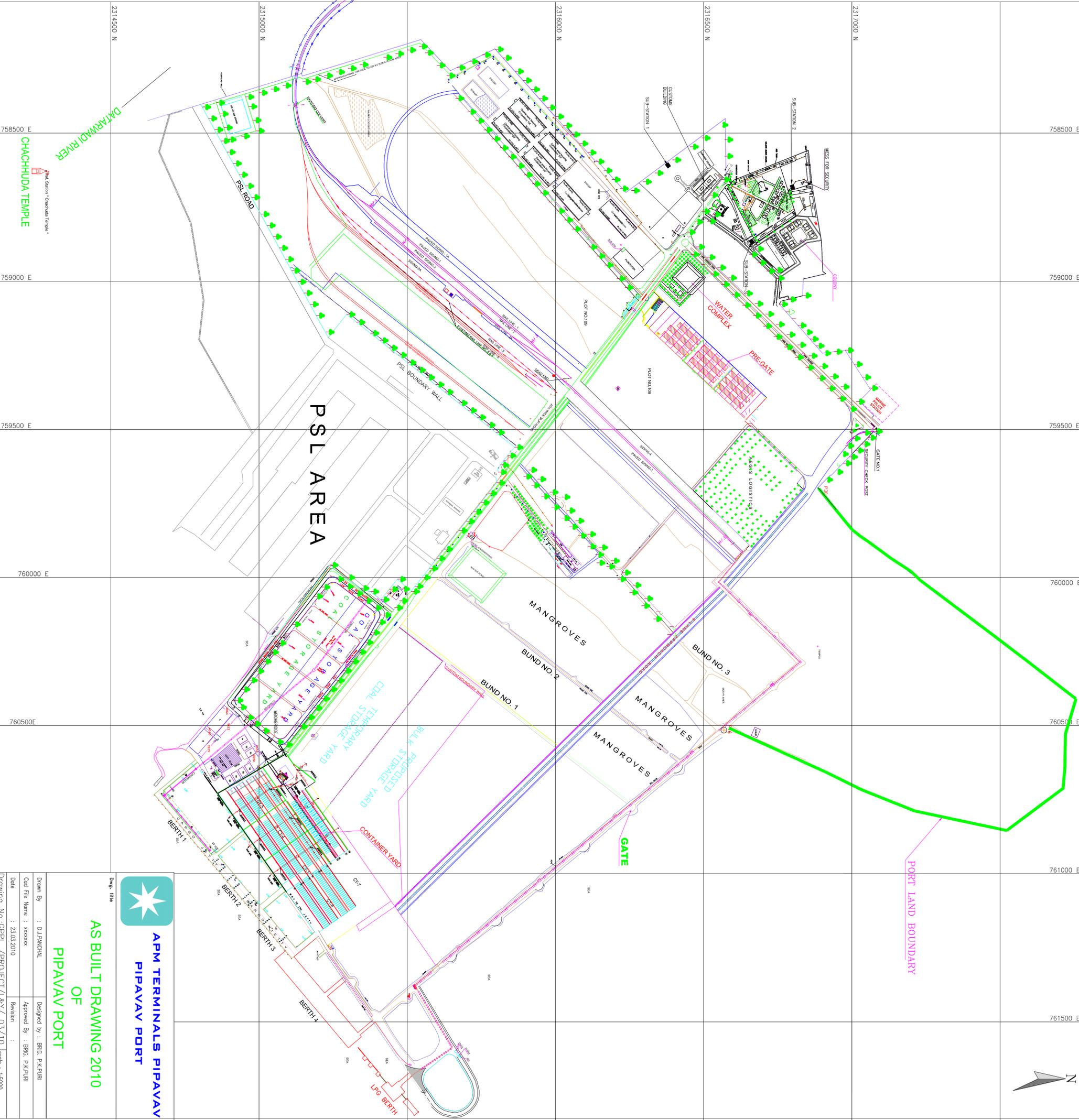
Client: GMS# 0443131

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APPENDIX B DETAILS OF PIPAVAV PORT EXPANSION



APM TERMINALS PIPAVAV
PIPAVAV PORT

AS BUILT DRAWING 2010
OF
PIPAVAV PORT

Dwg. Title	
Drawn By :	01/JRANICAL
Designed By :	BRG, P.K.PURI
Code File Name :	xxxxxx
Approved By :	BRG, P.K.PURI
Date :	23/03/2010
Revision :	
Drawing No.:PPL /PROJECT/L&Y/ 03/10 scale : 1:5000	

KEY PLAN



- NOTES:**
1. ALL DIMENSIONS ARE IN METRES UNLESS STATED OTHERWISE.
 2. NO DIMENSION SHALL BE SCALED FROM THIS DRAWING.
 3. ALL LEVELS ARE IN METRES RELATIVE TO CHART DATUM

LEGEND:

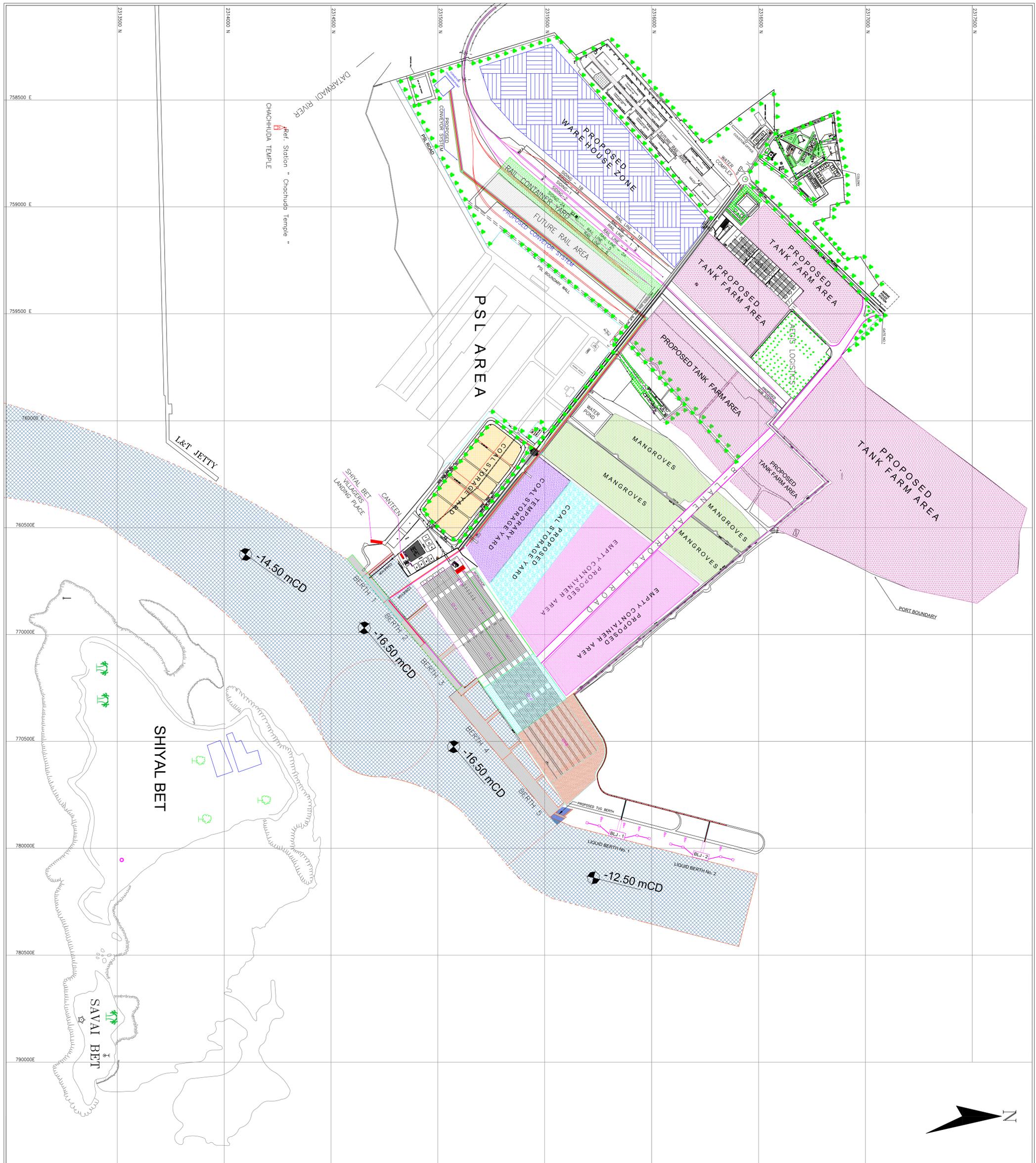
	HARBOR AREA
	PROPOSED RECLAMATION AREA
	CONTAINER YARD NO. 9
	RAIL CONTAINER YARD
	PROPOSED EMPTY CONTAINERS AREA
	EXISTING CONTAINER YARD NO. 1 TO 6
	TEMPORARY COAL STORAGE YARD
	EXISTING COAL STORAGE YARD
	PROPOSED COAL STACK YARD
	MANGROVES
	PROPOSED CONVEYOR ROUTE
	PROPOSED TANK FARM AREA
	PROPOSED WAREHOUSE ZONE
	FUTURE RAIL AREA
	CONTAINER YARD NO. 7
	CONTAINER YARD NO. 8



**PIPAVAY PORT
MASTER PLAN REVIEW
PHASE - I**

DRAWING

Drawn by	Date :
Checked by	Date :
Approved by	Date :
Drawing No.	scale : 1:5000



APPENDIX C DETAILS OF PROPOSED GRID SUBSTATION LOCATIONS

1. DETAILS OF THE PROPOSED GRID SUBSTATION LOCATIONS

1.1 BACKGROUND

ERM was commissioned by COWI India Pvt. Ltd. to undertake an Environmental and Social Scoping of their 200 MW offshore wind farm in Gulf of Khambhat, Gujarat. ERM undertook the site assessment from 26th to 28th February, 2018 that included as part of the scope – an assessment of five potential locations for connection to the state grid. The five locations are Grid Substations that are planned/operated by Gujarat Energy Transmission Corporation Limited (GETCO) and are listed below:

- 220 kV Substation in Village Otha, Tehsil Mahuva, District Bhavnagar in Gujarat, India: located approximately 45 km in the northeast direction of Pipavav Port;
- 220 kV Substation in Village Dhokadva, Tehsil Una, District Junagadh in Gujarat India: located approximately 45 km in the western direction of Pipavav Port;
- 220 kV Substation in Village Timbdi, Tehsil Sutrapada, District Junagadh in Gujarat, India: located approximately 90 km in the western direction of Pipavav Port;
- 220 kV proposed substation in Village Pipavav, Tehsil Rajula, District Amreli in Gujarat, India: located approximately 10 km northeast of the Pipavav Port; and
- 220 kV Substation in Pipavav Port.

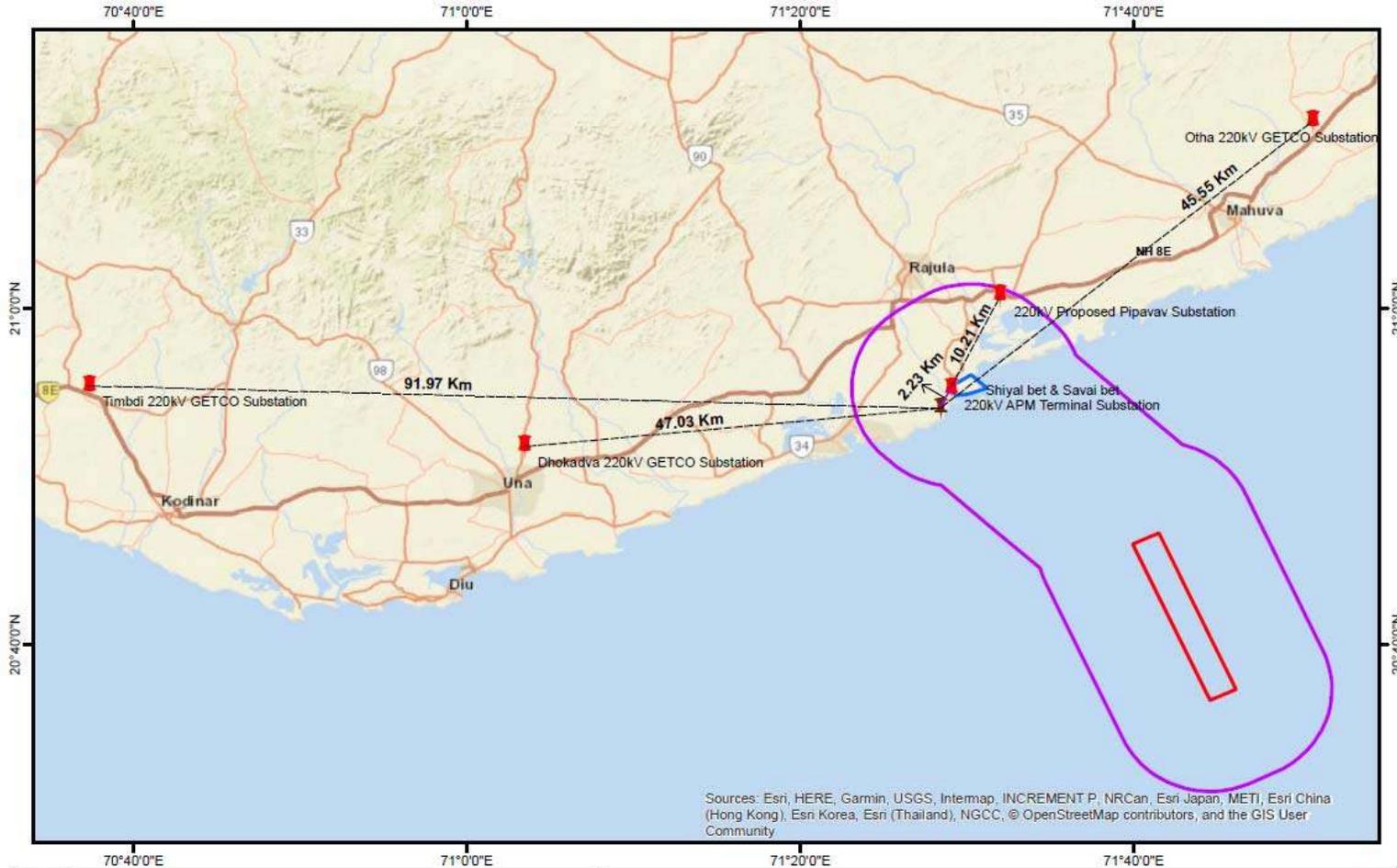
The five substations has been mapped in **Figure 1.1**.

The details of the substations have been provided in the table below.

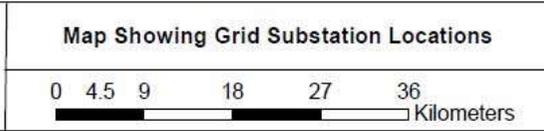
Table 1.1 Details of the Grid Substations

Grid Substation	Criteria to consider prior to selection
Otha Substation	Otha 220 KV GETCO sub station is at a distance of ~ 45 km in the northeast direction of Pipavav Port. Towards the north of the substation is residential colony followed by village Otha and towards west is road. Substation is surrounded towards east and south by agricultural fields.
Dhokadva Substation	Dhokadava 220 KV substation is located at an aerial distance of ~ 45 km in the western direction of Pipavav Port. The same is accessible by Kodinar – Amreli Highway and is located around more than 1 km from the Village Kansari and is surrounded by agricultural land.
Timbdi Substation	220KV Timbdi Substation is located at a distance of ~ 90 km in the western direction of Pipavav Port. It is accessible by Somnath Una Highway and is surrounded by agricultural fields on all side expect one i.e. towards west, is a road.
Proposed Pipavav Substation	This is a proposed substation located within village Pipavav. Tentative location of the proposed substation was visited at the time of site visit, is accessible by single lane village road. It is at a distance of ~ 14 km form the proposed pooling substation site. Site is likely to be surrounded by agricultural land and village houses.
APM Terminals Pipavav	220 KV APM terminal is located within the Pipavav port. The substation is located adjacent to a pond that is part of a mangrove patch and therefore cannot be affected by any proposed expansion.

Figure 1.1 Grid Substation Locations



Legend	
	Proposed Grid Substations
	Pipavav Port
	Pooling Substation
	Offshore Wind Farm Area
	10Km Radius
	Onshore Cable



Environmental Resources Management

1.2 GRID SUBSTATION ANALYSIS

As part of the site assessment, each of the Grid Substations (GSS) was visited and the following activities were undertaken:

- Consultations with the GSS staff (where possible) to understand capacity and land requirement for expansion; and
- Identification of environmental and social sensitivities along the straight line route between the GSS location and Pipavav Port.

Some specific outcomes of the site assessment has been provided below:

- The 220 kV GETCO substation within Pipavav Port is limited by space because of the presence of the jetty to the west and mangrove patch to the east. There is therefore no land availability of expansion of the substation.
- The proposed 220 kV GETCO substation in Pipavav Village has not been determined. Based on the geographical coordinates provided by the client, the location is surrounded by agricultural land and villages and there is no sufficient land requirement for establishment of a substation. The village however, has several open areas at its peripheries where a substation can be established on barren agricultural land.

1.3 CONCLUSION

The offshore wind farm capacity has been increased from 200 MW to 1000 MW in November 2018 and therefore the proposed 400/220 kV GETCO substation in Pipavav Village has been selected for connection to the state grid. The substation is currently in the pre-planning stages and will be constructed with the capacity to evacuate the 1 GW offshore wind farm.

APPENDIX D CONSENT REGISTER

Table D1: Consent Register for the First Offshore Wind Farm in India

S. No.	Activity	Phase	Onshore/Offshore	Permit/Approval	Regulation/Convention/Policy	Requirement	Nodal Authority	Remarks
A	Environment, Health & Safety							
1	Carrying out Non-exclusive Offshore Surveys/studies in waters/ Exclusive Economic Zone of India using vessels	Pre-construction	Offshore	Registration of Offshore Wind Energy Project Developers.	National Offshore Wind Energy Policy-2015 issued in Gazette notification dated 07 October 2015 Circular No: NIWE/OW&IB/Offshore/2017/01 as issued by National Institute of Wind Energy (NIWE): Detailed Draft Guidelines for Offshore Studies and Surveys by Private sector	Private developers/players, who are desirous for collecting wind data together with oceanographic and bathymetric data at specific locations should inform the details of the site to National Institute of Wind Energy (NIWE), Chennai (Head, OW&IB Unit). Such information will be registered by NIWE on a nominal payment of Rs.10000/- per site (Non-Refundable). In case, the companies want to outsource the activity through any other agency/body, they have to furnish necessary documents to establish the credentials of such agency/body, experience, expertise etc.	NIWE	
2		Pre-construction	Offshore	Agreement with NIWE for non-suppression of survey data collected by Offshore Wind Energy Project Developers/Surveyors.	Same as above	The private developer/ surveyor will submit an undertaking to NIWE (Ref: Annexure 2) to the effect that any data/ information collected through surveys and studies under permission granted by NIWE will not be concealed or suppressed from NIWE.	NIWE	
3		Pre-construction	Offshore	Clearance for Research, Survey, Exploration and Exploitation (RSEE) of Resources in Maritime Zones in India (MZI)	Same as above	At least two or more months clear advance notice on commencement of exploration/survey work is required to be given to the Ministry of Defence (MoD) through NIWE so that the work does not clash with any defence exercise in the area. Applications to be submitted to NIWE at least 2.5 months before for processing by MoD. Please refer to Annexure 1(B) of the NIWE guidelines to this regard.	MoD & NIWE	
4		Pre-construction	Offshore	Naval Security Clearance for Vessels to Operate in Maritime Zone of India (MZI)	Same as above	All vessels deployed in the area by contracted companies of the developer shall undergo naval security inspection under the aegis of the FOC-in-C of the concerned Naval Command, Flag Officer, Offshore Defence Advisory Group (FODAG) prior to their deployment. As per norm, one month's notice is to be given to facilitate clearance/ inspection. Please refer to Annexure 1(E) of the NIWE guidelines to this regard.	FODAG	
5		Pre-construction	Offshore	Clearance regarding deployment of foreign nationals in offshore wind energy blocks.	Same as above	Necessary clearance will be required to be obtained by the developer for deployment of any foreign nationals on vessels involved in the research, survey, exploitation	Ministry of External Affairs	

S. No.	Activity	Phase	Onshore/Offshore	Permit/Approval	Regulation/Convention/Policy	Requirement	Nodal Authority	Remarks
						and exploration of resources within MZI.		
6		Pre-construction	Offshore	Security Clearance for Company & Director(s)	Same as above	Necessary security clearance will be required to be obtained for the Company and the Directors to be involved in the development of the proposed project. Please refer to Annexure 1(M) & 1(N) of the NIWE guidelines to this regard.	Ministry of Home Affairs	
7		Pre-construction	Offshore	Oil Pollution Prevention Certificate	Merchant Shipping (Prevention of Pollution by Oil from Ships) Rules, 2010	With respect to the proposed project, all vessels operating within coastal or territorial waters in India is required to obtain an Oil Pollution Prevention Certificate from the Certifying Authority.	Directorate General of Shipping (DG Shipping)	
8		Pre-construction	Offshore	Load Line Certificate	Merchant Shipping (Load Line) Rules, 1979	With respect to the proposed project, all vessels weighing 150 tonnes or more and operating within coastal or territorial waters in India is required to obtain a Load Line Certificate from the Certifying Authority.	Directorate General of Shipping (DG Shipping)	
9		Pre-construction	Offshore	Sewage Pollution Prevention Certificate	The Merchant Shipping (Prevention of Pollution by Sewage from Ships) Rules, 2010	In accordance to the provision of this Rule, an Indian Sewage Pollution Prevention Certificate is to be obtained for vessels involved in marine surveys for the proposed project including those conducting voyages to the offshore wind energy installations falling within Indian waters.	Directorate General of Shipping (DG Shipping)	
10		Pre-construction	Offshore	Safety Management Certificate	SOLAS 1974, regulation IX/4; ISM Code, paragraph 13	A Safety Management Certificate shall be issued to every vessel deployed for the project by the Administration or an organization recognized by the Administration. The Administration or an organization recognized by it shall, before issuing the Safety Management Certificate, verify that the company and its shipboard management operate in accordance with the approved safety management system.	Directorate General of Shipping (DG Shipping)	
11		Pre-construction	Offshore	International Ship Security Certificate (ISSC) or valid Interim International Ship Security Certificate	SOLAS 1974 (2002 amendments) regulation XI-2/9.1.1*; ISPS Code part A, sections 19 and appendices	An ISSC shall be issued to every vessel to be deployed for the project by the Administration or an organization recognized by it to verify that the ship complies with the maritime security provisions of SOLAS chapter XI-2 and part A of the ISPS Code.	Directorate General of Shipping (DG Shipping)	
12		Pre-construction	Offshore	Registration of Indian vessels	Merchant Shipping Act, 1958 and Registration of ships rules, 1960	For all sea going vessels to be deployed for the proposed project fitted with mechanical means of propulsion of 15 tons net and above, are required to be registered to a port in India.	Directorate General of Shipping (DG Shipping)	

S. No.	Activity	Phase	Onshore/Offshore	Permit/Approval	Regulation/Convention/Policy	Requirement	Nodal Authority	Remarks
13		Pre-construction	Offshore	Registration of Foreign Flag Vessels	Part XIV - of the Merchant Shipping Act, 1958 and Shipping Development Circular No. 2 of 2002	In case of foreign flag vessels to be engaged in offshore support operation, a chartering permission will be required by making an application in prescribed format to the Indian National Ship-owners' Association (INSA) and to the D.G. Shipping.	Directorate General of Shipping (DG Shipping) & Indian National Ship-owners' Association (INSA)	
14		Pre-construction	Offshore	License of sea-going vessels	Merchant Shipping Act, 1958 and Merchant Shipping (Forms of Licences) Rules, 1960	For all Indian vessels to be deployed for the proposed project is required to obtain a licence as granted by the Director-General under this section to operate within any ports within or outside India.	Directorate General of Shipping (DG Shipping)	
15		Pre-construction	Offshore		Merchant Shipping (Management for the Safe Operation of Ships) Rules, 2000	Per SOLAS requirements the vessel under Rule 4 of Merchant Shipping (Management for the Safe Operation of Ships) Rules, 2000 need to develop and implement a Safety Management System which conforms to the requirements of International Safety management Code.	Directorate General of Shipping (DG Shipping)	
16		Pre-construction	Offshore		MARPOL 73/78, Annex V, Regulation 9	With respect to the proposed project every vessel of 400 gross tonnage and above and every vessel which is certified to carry 15 persons or more shall carry a garbage management plan which the crew shall follow.	Directorate General of Shipping (DG Shipping)	
17		Pre-construction	Offshore		Convention on the International Regulations for Preventing Collisions at Sea, 1972 The Merchant Shipping (Prevention of Collisions at Sea) Regulations, 1976	The operator of the vessel need to comply with the following specific rules as outlined in this Convention/Regulations to prevent collision with fishing and commercial vessel during marine surveys: <i>Rule 5 – Look Up</i> <i>Rule 6 – Safe Speed</i> <i>Rule 7 – Risk of Collision</i> <i>Rule 8 – Action to avoid Collision</i> <i>Rule 9 – Narrow Channels</i> <i>Rule 13 – Overtaking</i> <i>Rule 15 – Crossing Situation</i> <i>Rule 19 – Conduct of vessels in restricted visibility</i> <i>Rule 33 – Equipment of Sound Signals</i> <i>Rule 34 – Manoeuvring and Warning Signals</i> <i>Rule 35 – Sound Signals in restricted visibility</i>	Shipping Authority of Flag State including Directorate General (DG) of Shipping	
18	Construction/operation/decommissioning of offshore wind power installation	Operations	Offshore	Aviation Clearance	National Offshore Wind Energy Policy-2015 issued in Gazette notification dated 07 October 2015	For offshore wind projects located near aviation radars/aerodromes (distance not specified), clearance will be required from Ministry of Civil Aviation. No clearance/NOC required for all other locations.	Ministry of Civil Aviation	Based on the scoping exercise undertaken, the location of the radars have been identified and plotted with respect to the

S. No.	Activity	Phase	Onshore/Offshore	Permit/Approval	Regulation/Convention/Policy	Requirement	Nodal Authority	Remarks
								proposed project components. However requirement of any clearance resulting from the distance of the radars with respect to the wind farms; height of the wind-farm, aircraft funnel effect etc. need to be established in discussion with the Airport Authority of India (AAI).
19		Construction; Operations & Decommissioning	Offshore	Clearance for operating within existing oil and gas blocks	National Offshore Wind Energy Policy-2015 issued in Gazette notification dated 07 October 2015	<p>For offshore wind project proposed in Oil & Gas Blocks, necessary approval is required to be obtained from the Ministry of Petroleum & Natural Gas (MoPNG). NOC is not required for construction undertaken outside the offshore Oil & Gas Blocks.</p> <p>Review of the project design document does not indicate any conflict of the proposed offshore infrastructure with any oil and gas block, with the Tapti Oil Field Development Area located at a distance of 5 km from the project site boundaries. Subsea infrastructure however still remains to be assessed.</p>	Ministry of Petroleum & Natural Gas (MoPNG)	As mentioned, the location of the offshore wind farm area with respect to the Tapti oil field has been overlaid National Hydrographic Map of Gulf of Khambhat. The same has also been furnished in the scoping report as well.
20		Construction; Operations & Decommissioning	Offshore	Permission for operating within safety zone of any oil and gas facility	Petroleum and Natural Gas (Safety in Offshore Operations) Rules, 2008	<p>In accordance to the Petroleum and Natural Gas (Safety in Offshore Operations) Rules, 2008 a safety zone of five hundred metres from the extremities of the offshore oil and gas facility is required to be maintained. In case for any unauthorized vessel (including aircraft) to enter, pass, stay or operate in the safety zone, necessary permission is required to be obtained from the operator of the said facility. But it is to be noted that the same applies only for unauthorized vessels.</p>	Operator of oil and gas facility	Furthermore Consultations with the Gujarat Maritime Board (GMB) indicate that both "safety" and "no fishing zones" will be required to be established around the proposed wind farm. However no information is currently available to ascertain whether any permits will be required for vessel activities in such zones and details of the safety zonation. Additional

S. No.	Activity	Phase	Onshore/Offshore	Permit/Approval	Regulation/Convention/Policy	Requirement	Nodal Authority	Remarks
								information to this regard to be sought as part of the Phase III Stakeholder Consultations to be undertaken.
21		Construction & Operations	Offshore	Restriction of operating in close vicinity of offshore windfarm installation	The International Regulation of Offshore Wind Farms under the 1982 Law of the Sea Convention	<p>In accordance to the relevant provision of The International Regulation of Offshore Wind Farms under the 1982 Law of the Sea Convention, coastal States has the power to regulate innocent passage, including in the vicinity of a wind farm, which is not limited only to the operation of 'positive' routing systems', such as Traffic Separation Schemes (TSS) or sea lanes. This may include "safety zones" or "Areas to be Avoided" (ATBAs), established by the coastal State, which could lead to the result that any activity in fact is banned from these areas.</p> <p>Presently, for the coastal state of Gujarat the demarcation of safety zones or ATBAs around offshore windfarms are yet to be established.</p>	Operator of offshore windfarm installation	Consultations with the Gujarat Maritime Board (GMB) indicate that both "safety" and "no fishing zones" will be required to be established around the proposed wind farm. However no information is currently available to ascertain whether any permits will be required for vessel activities in such zones and details of the safety zonation. Additional information to this regard to be sought as part of the Phase III Stakeholder Consultations to be undertaken.
22		Operations	Offshore and Onshore	License for transmission of electricity (both onshore and offshore)	Electricity Act, 2003	The developer is required to obtain transmission licence for construction and maintenance of certain transmission lines and the facilities to be used for evacuation of power from proposed offshore wind energy installation and onshore sub-station.	Central Electricity Regulatory Commission/Gujarat Energy Transmission Corporation Limited (GETCO)	
23		Operations	Offshore and Onshore	Power Purchase Agreement & Power Generation License	Electricity Act, 2003	Per provision of Section 49 of the aforesaid Act, any consumer of electricity is required to enter into an agreement with any entity involved in supply of electricity on such terms and conditions (including tariff) as may be agreed upon. All independent power producers, is required to enter into a power purchase agreement (PPA) with the respective State Electricity Boards.	Central Electricity Regulatory Commission/Gujarat Energy Transmission Corporation Limited (GETCO)	In accordance to Section 7 of the Electricity Act, 2003, license may not be required for a power generating company if it complies with the technical standards specified for construction of electrical plants, electric

S. No.	Activity	Phase	Onshore/Offshore	Permit/Approval	Regulation/Convention/Policy	Requirement	Nodal Authority	Remarks
24		Construction & Operations	Offshore	Clearance for setting of offshore wind installation near any space station	National Offshore Wind Energy Policy-2015 issued in Gazette notification dated 07 October 2015 Circular No: NIWE/OW&IB/Offshore/2017/01 as issued by National Institute of Wind Energy (NIWE): Detailed Draft Guidelines for Offshore Studies and Surveys by Private sector	Clearance from security angle is required to be obtained with respect to maintenance of minimum safety distance from any nearby space installations.	Department of Space Installation	lines and connectivity to the grid.
25		Construction; Operations & Decommissioning	Offshore & Onshore	License for performing any operations within any notified ecologically sensitive area	Wild Life Protection Act, 1972 Coastal Regulation Zone (CRZ) Notification, 2011	In accordance to section 28 of the Wild Life Protection Act, 1972, a permit will be required from the Chief Wild Life Warden to enter into notified ecologically protected area viz. sanctuaries, national parks etc., for the purpose of investigation or study of wildlife and purposes ancillary or incidental thereto; photography; scientific research; tourism; and transaction of lawful business with any person residing in the sanctuary. Furthermore, in accordance to section 29 of the aforesaid Act, no person shall destroy or damage the habitat of any wild animal or deprive any wild animal or its habitat within any notified ecologically protected area except under and in accordance with a permit granted by the Chief Wildlife Warden and no such permit shall be granted unless the State Government authorises the issue of such permit. The Coastal Regulation Zone (CRZ) Notification 2011, restricts the activity within any CRZ-1 areas viz. ecologically sensitive and important such as national parks, Sanctuaries, reserve forests, wildlife habitats, mangroves, corals coral reef areas; areas close to breeding and spawning grounds of fish and other marine life, areas of outstanding beauty/areas rich in genetic diversity, areas likely to be inundated due to rising Sea level consequent upon global warming and such other areas, as may be declared by the Central and State Government at the State or Union territory level from time to time.	Chief Wild Life Warden	

S. No.	Activity	Phase	Onshore/Offshore	Permit/Approval	Regulation/Convention/Policy	Requirement	Nodal Authority	Remarks
26		Construction; Operations & Decommissioning	Offshore	Clearance regarding deployment of foreign nationals in offshore wind energy blocks.	Refer to SI.No. 5	Refer to SI.No. 5	Refer to SI.No. 5	
27		Construction; Operations & Decommissioning	Offshore	Oil Pollution Prevention Certificate	Refer to SI.No. 7	Refer to SI.No. 7	Refer to SI.No. 7	
28		Construction; Operations & Decommissioning	Offshore	Load Line Certificate	Refer to SI.No. 8	Refer to SI.No. 8	Refer to SI.No. 8	
29		Construction; Operations & Decommissioning	Offshore	Sewage Pollution Prevention Certificate	Refer to SI.No. 9	Refer to SI.No. 9	Refer to SI.No. 9	
30		Construction; Operations & Decommissioning	Offshore	Safety Management Certificate	Refer to SI.No. 10	Refer to SI.No. 10	Refer to SI.No. 10	
31		Construction; Operations & Decommissioning	Offshore	International Ship Security Certificate (ISSC) or valid Interim International Ship Security Certificate	Refer to SI.No. 11	Refer to SI.No. 11	Refer to SI.No. 11	
32		Construction; Operations & Decommissioning	Offshore	Registration of Indian vessels	Refer to SI.No. 12	Refer to SI.No. 12	Refer to SI.No. 12	
33		Construction; Operations & Decommissioning	Offshore	Registration of Foreign Flag Vessels	Refer to SI.No. 13	Refer to SI.No. 13	Refer to SI.No. 13	
34		Construction; Operations & Decommissioning	Offshore	License of sea-going vessels	Refer to SI.No. 14	Refer to SI.No. 14	Refer to SI.No. 14	
35		Operations	Offshore	Final Approval Certificate	National Offshore Wind Energy Policy-2015 issued in Gazette notification dated 07 October 2015.	Following completion of the project, a certificate for commencement of operation of the windfarm shall be issued by NIWE. This will enable verification of all statuary and regulatory guidelines by the NIWE before commissioning.	NIWE	
36		Construction & Operations	Offshore	Environmental Clearance (EC) and CRZ Clearance	EIA Notification, 2006 (as amended) and Coastal Regulation Zone Notification, 2011	Offshore windfarms are not covered under the Schedule I of EIA Notification, 2006 which requires an Environmental Clearance (EC) to be obtained. However the offshore windfarm installation based on their distance to the coast (<12nm) may require an CRZ clearance to be obtained from the MoEF &CC and GCZMA.	Gujarat Coastal Zone Management Authority/ Ministry of Environment Forests & Climate Change (MoEF&CC)	Among the permits identified, based on our experience the time required for obtaining CRZ clearance from the Gujarat Coastal Zone Management Authority (GCZMA) and Ministry of Environment Forest & Climate Change (MoEF&CC) may somewhere vary within 1- 1.5 years. Generally no activities with respect to the development of offshore

S. No.	Activity	Phase	Onshore/Offshore	Permit/Approval	Regulation/Convention/Policy	Requirement	Nodal Authority	Remarks
								infrastructure viz. export cable landing, sub-station etc. is permissible in any intertidal area where mangrove patch >1000 sq.m. is identified. Activities are permitted only beyond 50m buffer zone of such mangrove patch subjected to CRZ clearance from competent authority as discussed.
37	Transportation of cargo by vessel during construction/operation/decommissioning phase of the project	Construction; Operations & Decommissioning	Offshore	Cargo Ship Safety Construction Certificate; Cargo Ship Safety Equipment Certificate	SOLAS 1974, regulation I/12, as amended by the GMDSS amendments; 1988 SOLAS Protocol, regulation I/12	For any cargo vessel of 500 gross tonnage and over to be deployed for the proposed project, a Cargo Ship Safety Construction Certificate and Ship Safety Equipment Certificate shall be issued after survey which satisfies the requirements for cargo vessels set out in regulation I/10 of SOLAS 1974.	Directorate General of Shipping (DG Shipping)	
38		Construction; Operations & Decommissioning	Offshore	Ship Safety Certificate	Merchant Shipping (Safety Convention Certificates) Rules, 1968 International Convention on Safety of Life at Sea (SOLAS), 1974	With respect to the proposed project, all vessels operating within coastal or territorial waters in India is required to obtain an Ship Safety Certificate from the Certifying Authority.	Directorate General of Shipping (DG Shipping)	
39	Laying of sub-sea power transmission lines/cables, onshore cables, O&M building facilities and construction of sub-station for power evacuation.	Construction & Operations	Offshore & Onshore	Coastal Regulation Zone (CRZ) Clearance	Coastal Regulation Zone (CRZ) Notification 2011	Per this notification and with respect to the proposed project all activities pertaining to laying of sub-sea power cables/transmission lines including setting up of sub-station for power evacuation from non-conventional energy sources within the coastal regulation zone (CRZ) will require necessary clearance to be obtained from Gujarat Coastal Zone Management Authority (GCZMA) and Ministry of Environment Forests & Climate Change (MoEF&CC). For the purpose of obtaining the CRZ clearance the following will be required: <ul style="list-style-type: none"> • Form-1 (Annexure-IV of the CRZ notification); • Rapid EIA Report including marine and terrestrial component; • Comprehensive EIA with cumulative studies for projects 	Gujarat Coastal Zone Management Authority/ Ministry of Environment Forests & Climate Change (MoEF&CC)	Among the permits identified, based on our experience the time required for obtaining CRZ clearance from the Gujarat Coastal Zone Management Authority (GCZMA) and Ministry of Environment Forest & Climate Change (MoEF&CC) may somewhere vary within 1-1.5 years. Generally no activities with respect to the development of

S. No.	Activity	Phase	Onshore/Offshore	Permit/Approval	Regulation/Convention/Policy	Requirement	Nodal Authority	Remarks
						<p>in the stretches classified as low and medium eroding by MoEF&CC based on scientific studies and in consultation with the State Governments;</p> <ul style="list-style-type: none"> • Disaster Management Report, Risk Assessment Report and Management Plan; • CRZ map indicating HTL and LTL demarcated by one of the authorized agency in 1:4000 scale; • Project layout superimposed on the above map; • The CRZ map normally covering 7km radius around the project site. • The CRZ map indicating the CRZ-I, II, III and IV areas including other notified ecologically sensitive areas; and • No Objection Certificate from the concerned State Pollution Control Boards or Union territory Pollution Control Committees for the projects involving discharge of effluents, solid wastes, sewage and the like.; 		<p>offshore infrastructure viz. export cable landing etc. is permissible in any intertidal area where mangrove patch >1000 sq.m. is identified. Activities are permitted only beyond 50m buffer zone of such mangrove patch subjected to CRZ clearance from competent authority as discussed.</p>
40		Construction & Operations	Onshore	Environmental Clearance (EC)	EIA Notification, 2006 (as amended)	<p>An Environmental Clearance (EC) may get triggered for the onshore structures likely to developed for the proposed project under the following circumstances:</p> <ul style="list-style-type: none"> • O&M building facilities designed with a total built up-area of >20000 sq.m. and <150000 sq.m. of built up area; and • Onshore cable lines route that passes through any notified ecologically sensitive area. 	Ministry of Environment Forests & Climate Change (MoEF&CC)	
41		Construction & Operations	Onshore	NOC from Pollution Control Board	Coastal Regulation Zone (CRZ) Notification 2011	No Objection Certificate from the concerned State Pollution Control Boards has to be obtained for project related activities that results in the discharge of effluents, solid wastes, sewage falling within CRZ limits defined (within 12 nautical miles)	Gujarat Pollution Control Board (GPCB)	
42		Operations	Onshore	Hazardous Waste Authorization	Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016	For the project loading and unloading vehicles and other construction equipments will generate hazardous waste in the form of hydraulic and waste fuel, engine oil, spent oil, etc. and will require to obtain authorization from State Pollution Control Board. Hazardous waste also to be disposed of through authorised vendor/ recycler.	Gujarat Pollution Control Board (GPCB)	

S. No.	Activity	Phase	Onshore/Offshore	Permit/Approval	Regulation/Convention/Policy	Requirement	Nodal Authority	Remarks
43		Construction	Offshore	No Objection Certificate (NOC) for operations near sub-sea cable zones & Sub-Sea Cable Crossing Agreement	National Offshore Wind Energy Policy-2015 issued in Gazette notification dated 07 October 2015	For project activities viz laying of sub-sea transmission lines/power cables which may fall within the subsea communication cable zone, No Objection Certificate (NOC) is to be obtained from DoT to operate outside this zone. Based on the scoping exercise undertaken it is understood that there may exist subsea cables within the project area that connects the island of Shiyal Bet with the mainland at Chanch Bandar (details shared in the scoping report). Cross cabling is also anticipated considering the distance from some substation (e.g. 93 km to Timbdi Substation). However the requirement of sub-sea cable crossing agreement need to be ascertained based on the route identified for the proposed project cable crossing. If such cable crossings are identified necessary agreement need to be formulated with the concerned owner/developer.	Department of Telecommunications (DoT)	Agreements with 'cable owners' would be required for any crossings
44	Laying of onshore cables	Construction & Operations	Onshore	Cable Crossing Agreements	National Offshore Wind Energy Policy-2015 issued in Gazette notification dated 07 October 2015	As discussed in Sl. No. 43 there exists potential for cross cabling during laying of onshore power cables. If such cable crossings are identified then necessary agreement need to be formulated with the concerned owner/developer.	Department of Telecommunications (DoT)	Agreements with 'cable owners' would be required for any crossings
45	Construction of any infrastructure within port limits	Construction	Offshore & Onshore	Permission from Port Authority for development of project related port infrastructure	Gujarat Maritime Board Act, 1981	As per section 35 of the Act, the erection or fixation of any wharf, dock, quay, stage, jetty, and pier, place of anchorage, erection or moorings with respect to the proposed project within the limits of port or port approaches will require prior permission from the Port Authority.	Gujarat Maritime Board (GMB)	
46		Construction & Operations	Offshore & Onshore	Coastal Regulation Zone (CRZ) Clearance	Coastal Regulation Zone (CRZ) Notification 2011	As discussed in Sl. No. 39, construction of any structures like jetties etc. within the CRZ limits will trigger a CRZ clearance to be obtained from the Gujarat Coastal Zone Management Authority (GCZMA) and MoEF & CC. For the purpose of obtaining clearance, an EIA has to be prepared and submitted to the aforesaid authorities	Gujarat Coastal Zone Management Authority/ Ministry of Environment Forests & Climate Change (MoEF&CC)	
47	Berthing of project vessels at port involved in project offshore surveys, raw material supply and construction, operation and decommissioning activities	Pre-construction; Construction; Operations & Decommissioning	Offshore	Permission from Port Authority for berthing of vessels	Indian Ports Act, 1908	In case berthing of vessel is required at any of the west coast port then accordance to provision of section 43 of the Ports Act necessary port clearance needs to be obtained through payment of	Gujarat Maritime Board (GMB)	

S. No.	Activity	Phase	Onshore/Offshore	Permit/Approval	Regulation/Convention/Policy	Requirement	Nodal Authority	Remarks
						port charges as levied by the Central Government.		
B	Social							
48	Engagement of Labour for survey, construction, operations and decommissioning	Pre-construction; Construction; Operations & Decommissioning	Offshore & Onshore	Principal Employers Registration under Contract Labour (Regulation and Abolition) Act, 1971	Contract Labour (Regulation and Abolition) Act, 1970	Principal Employer has to be registered under the act for engaging more than twenty contract labour	Department of Labour	
49		Pre-construction; Construction; Operations & Decommissioning	Offshore & Onshore	Labour License under Contract Labour (Regulation and Abolition) Act, 1970	Labour License under Contract Labour (Regulation and Abolition) Act, 1970	All contractors have to be registered for engaging labour.	Department of Labour	
50		Pre-construction; Construction; Operations & Decommissioning	Offshore & Onshore	Principal Employer Registration under Interstate Migrant Worker Act, 1979	Interstate Migrant Worker Act, 1978	Principal Employer Registration under Interstate Migrant Worker Act, 1979 if interstate migrant workers are to engaged	Department of Labour	
51		Construction, Operations & Decommissioning	Onshore	Registration under Building and Other Construction Works Act, 1996	Building and Other Construction Works Act, 1996	Building and Other Construction Works Act, 1996- registration and payment of BOCW cess (1% of construction cost)	Department of Labour and BOCW Welfare Board	
52	Land Acquisition/Purchase	Preconstruction	Onshore	For government led acquisition- Right to Fair Compensation and Transparency in Land Acquisition Resettlement and Rehabilitation 2013	Right to Fair Compensation and Transparency in Land Acquisition Resettlement and Rehabilitation 2013	Requirements as stated under the RTFCTLARR Act 2013 will have to be implemented for assessment, valuation and disbursement of compensation and provisions for Resettlement and Rehabilitation	Land Acquisition Officer- District Magistrate/Sub-divisional Magistrate	
53		Preconstruction	Onshore	Private Purchase- All private /direct land purchase - Gujarat Land Revenue Rules 1972	Gujarat Land Revenue Rules 1972	Direct Purchase of private land will follow the rules as down in Gujarat Land Revenue Rules 1972	Gujarat Revenue Department	
54		Preconstruction	Onshore	Transmission Line- to follow the guidelines for compensation payment in regard to right of way for transmission line	Guidelines for payment of compensation towards damages in regard to Right of Way for transmission lines. 15th October 2015	<p>Compensation @ 85% of land value as determined by District Magistrate or any other authority based on Circle rate/ Guideline value/ Stamp Act rates for tower base area (between four legs) impacted severely due to installation of tower/pylon structure;</p> <p>Compensation towards diminution of land value in the width of Right of Way (RoW) Corridor due to laying of transmission line and imposing certain restriction would be decided by the States as per categorization/type of land in different places of States, subject to a maximum of 15% of land value as determined based on Circle rate/ Guideline value/ Stamp Act rates;</p> <p>For this purpose, the width of RoW corridor shall not be more than that prescribed in Annex 2 of the guidelines</p>	Land Acquisition Officer- District Magistrate/Sub-divisional Magistrate	
55		Preconstruction, Construction & Operations	Offshore	Leasing of sea-bed and allocation of blocks	National Offshore Wind Energy Policy-2015 issued in Gazette notification dated 07 October	National Institute of Wind Energy (NIWE) will enter into contract/lease with the	NIWE	

S. No.	Activity	Phase	Onshore/Offshore	Permit/Approval	Regulation/Convention/Policy	Requirement	Nodal Authority	Remarks
					2015Circular No: NIWE/OW&IB/Offshore/2017/01 as issued by National Institute of Wind Energy (NIWE): Detailed Draft Guidelines for Offshore Studies and Surveys by Private sector	developer of offshore wind energy power project and collect lease fee from the developer during survey, construction and operation phases. The lease will be limited to exploration and exploitation of wind energy in the allocated block(s). The broadparameters of the contract will include, time frame for completion of the installation & commissioning of the wind farm, period of contract, committed Minimum Work Programme (MWP) in terms of project capacity in the allocated block, monitoring & inspection by MNRE/NIWE and decommissioning plan.		

**APPENDIX E TERMS OF REFERENCE (TOR) FOR ENVIRONMENTAL
AND SOCIAL IMPACT ASSESSMENT (ESIA)**

1 TERMS OF REFERENCE FOR ESIA STUDY

1.1 FIRST OFFSHORE WIND POWER PROJECT IN INDIA (FOWPI)

First Offshore Wind Power Project in India (FOWPI) is part of the Clean Energy Cooperation with India (CECI), which aims at enhancing India's energy generation capacity with least carbon residual, thereby contributing to the mitigation of global climate change. The project is funded by the European Union (EU) and led by COWI A/S Denmark, WinDForce Management Service Pvt. Ltd. (WFMS) and COWI India Private Limited. The Project is also supported by the Ministry of New and Renewable Energy (MNRE) and National Institute of Wind Energy (NIWE) in India.

The proposed offshore wind turbines, transmission lines, substations and ancillary components have been hereinafter referred to as 'Project'.

The salient features of the Project has been provided in **Table 1.1**

Table 1.1 Salient features of the Project

S.N.	Aspect	Details
1.	Location of the Project	<p><u>Onshore Project Components:</u> the landfall point ⁽¹⁾, proposed onshore pooling substation, stock yard, storage area and site office is located within a 10 km radius of the Pipavav Port in Village Rampara, Taluk Rajula, District Amreli in Gujarat, India.</p> <p><u>Offshore Wind Turbines:</u> 150 to 300 turbines and potentially one or more offshore pooling substation(s) will be located approximately 9.0 to 23.5 nautical miles in the southeast direction from Pipavav Port in the Gulf of Khambhat, off the coast of Gujarat, India.</p>
2.	Type of WTGs	<p>The make and model of the wind turbine generators are unknown at this stage of the Project. Two configurations being considered in the feasibility study are:</p> <ul style="list-style-type: none">333 WTG units each rated 3.0 MW resulting in 999 MW installed power; and166 WTG units each rated 6.0 MW resulting in 996 MW installed power. <p>The turbines will be sited between 0.5 km apart (for 3 MW option) to 1.0 km apart (for 6 MW option).</p>
3.	Power Evacuation	<p>Power generated from the offshore wind turbines will be evacuated through subsea export cables (length and capacity unknown) to an onshore Pooling Substation (PSS) near the onshore landing point. Alternatively, the use of array cables (length and capacity unknown) to connect the individual turbines to one or more offshore PSS near the wind turbines will be considered.</p> <p>The Project will be connected to the grid through onshore cabling (length and capacity unknown) that connects the onshore/offshore PSS to an under-planning 400/220 kV substation being planned by GETCO at Village Pipavav, Taluk Rajula, District Amreli or existing GETCO substation near the Ultratech Unit in Village Kovaya, Taluk Rajula, District Amreli. The onshore cabling will be either buried or overhead.</p>
4.	Seascape	<p>A total Project area of approximately 400 sq. km. has been determined for the offshore wind turbines.</p>
5.	Land Requirement	<p><u>Offshore Components</u></p>

(1) Point where the export cabling route touches the shore

S.N.	Aspect	Details
		<p>The Project team will have to enter into a contract/lease with the National Institute of Wind Energy (NIWE) for seabed allocation. The total area required will depend on the finalized WTG components and offshore pooling substation.</p> <p><u>Onshore Components</u></p> <p>In case of onshore PSS requirement, the Project will require a single land parcel of undetermined area for the construction of the PSS. Additionally, Right of Way (RoW) needs to be obtained for the landfall point and export cabling route leading up to the PSS.</p> <p>For the offshore PSS and/or onshore cabling from the onshore PSS, RoW needs to be obtained to establish the onshore cables upto the selected GSS location.</p> <p>Furthermore, to meet the requirement of area during construction as well as operation and maintenance phases of the Project, FOWPI is in discussion for obtaining approximately 50,000+ m² area within the Pipavav Port.</p>
6.	Project Status	The project is in the planning stages and is presently undergoing multiple technical studies to determine feasibility. The tentative Commercial Operation Date (CoD) is five (05) years from the awarding of the Project.
7.	Contractor and Subcontractors	Not determined at this stage of the project

1.2 ESIA OF THE PROPOSED OFFSHORE WIND PROJECT

An Environmental and Social Impact Assessment (ESIA) is a proposed mechanism to identify environmental and social risks and impacts that might arise from establishment of a project and to ensure that the project operation, maintenance and decommissioning is consistent with good international industry practice (GIIP). The ESIA process should be based on up-to-date information including detailed description of the project in its geographical, ecological, social, health and temporal context (defined as the “baseline”). The identification of project- and site-specific risks and impacts should be based on current and verifiable primary information that can then be supported by relevant secondary data. Where the project identifies physical elements, aspects and facilities that are likely to generate impacts, it should identify extent and complexity of potential adverse impacts and risks in the context of the project area and surrounding area of influence.

Typically, an ESIA² includes the following components:

- **Introduction:** purpose of the report, identification of project & project proponent, Brief description of nature, size, location of the project and its importance to the country, region and scope of the study
- **Project Description:** identification of project components and their proposed locations, site setting, phase-wise implementation, land and resource requirement and the parties involved in establishment and operation of the project.
- **Administrative Framework:** regulatory and institutional context including national, state and local laws, which the Project will comply and benchmark to determine GIIP.

² As per EIA notification 2006 and international good practices

- **Description of the Environment:** study area, study period, components and methodology, current and up-to-date description of the project context through primary surveys and supported by secondary data. Base map for all the environmental and social components.
- **Anticipated Environmental Impacts and Mitigation Measures:** Details of investigated impacts due to project location, possible accidents, project design, project construction, regular operations, final decommissioning or rehabilitation of a completed project, measures for minimizing and /or offsetting adverse impacts identified, assessment of significance of the impacts and mitigation measures.
- **Analysis of Alternatives (Technology and Site):** determination of alternate technologies, locations and designs that will lead to the least environmental and social risks and impacts. The AoA will also considers a no project scenario.
- **Environmental Monitoring Programme:** Technical aspects of monitoring the effectiveness of mitigation measures (incl. measurement methodologies, frequency, location, data analysis, reporting schedules, emergency procedures, detailed budget & procurement schedules).
- **Additional Studies:** Risk Assessment and Disaster Management, Social Impact Assessment, Stakeholder Engagement, etc.
- **Project Benefits:** summary of benefits of projects
- **Environmental and Social Management Plan (ESMP):** summary of mitigation measures and implementation protocol for all phases of the Project.
- **Summary and Conclusion:** overall justification of implementation of the project, explanation on how adverse effects have been implemented.
- **Disclosure of Consultants Engaged:** the name of the consultants engaged with their brief resume and nature of consultancy provided.

1.3 *RATIONALE AND OBJECTIVE OF THE STUDY*

1.3.1 *Rationale*

Wind power projects do not require an Environmental Clearance (EC) as defined in the Environmental Impact Assessment (EIA) Notification, 2006 and as amended. However, FOWPI is an unprecedented project in India and therefore local laws and regulations may be inadequate in identifying the regulatory context for the project. The proposed ESIA will therefore be guided by the EIA requirements for offshore installations (e.g. oil and gas platforms) with inputs from key decision makers in regulatory agencies.

1.3.2 *Objectives of the Study*

The purpose of the ESIA will be to assess environmental, social and ecological impacts and risks that may arise from the establishment and operation of FOWPI and suggest management strategies that align the Project with the applicable reference framework.

Specifically, the objectives of the study are as follows:

- Develop a baseline environmental, social and ecological profile of the 10 km radius from the Project site;
- Assess the significance of any impacts that might arise when the Project activities interact with the resources and receptors that are identified in the established baseline;
- Provide mitigation measures that practice avoidance, reduction and minimization of impacts and determine opportunities for enhancement;

- Analyse alternate locations, technologies, transmission line routes and a no project scenario to determine the least impactful strategy for establishment of the wind farm;
- Prepare an Environmental and Social Management Plan (ESMP) for the recommended mitigation measures and identify site-specific management and monitoring plans that need to be prepared for the Project; and
- Consult with key stakeholders in the private and public sector who are decision makers or will be impacted by the project to understand the applicability of international, national, state and local laws and regulations. Determine concerns of the stakeholders that are not covered in the prevalent laws and regulations that could be applied to FOWPI during the Project life cycle.

1.3.3 Administrative Framework

Relevant environmental and social laws, regulations and policies of India including:

- National Offshore Wind Energy Policy 2015;
- EIA Notification 2006 and as amended;
- Coastal Regulation Zone Notification 2011 and as amended;
- European Union (EU) Guidance Note on Environmental Impact Assessments of offshore wind farms;
- World Bank Group (WBG) Environmental, Health and Safety (EHS) Guidelines for Wind Energy, 2015;
- WBG EHS Guidelines for Electric Power Transmission and Distribution 2007;
- WBG General EHS Guidelines, 2007;
- IFC Stakeholder Engagement Handbook; and
- Good Practice Handbook on Cumulative Impact Assessments and Management: Guidance for the Private Sector in Emerging Markets.

1.4 SCOPE OF WORK

To meet the aforementioned objectives, the scope of work for the ESIA study should include the following:

Table 1.2 Scope of Work for the ESIA

Scope Parameter	Details
Executive Summary	This section should give a brief of the entire study, will include project description, baseline conditions, potential impacts and suggested mitigation measures and project category.
Introduction	This section should give purpose of the report, brief of project and project proponents, brief description of nature, size, location of the project and its importance to the country. It should give details of scope of the study and details of regulatory scoping carried out for the project.
Project Description	The ESIA should provide a 'Project Description' with a focus on understanding the environmental and social setting of the Project. The Project Description should include: <ul style="list-style-type: none"> ■ Need of the project; ■ Location (map showing general location, specific location, boundary and site layout); ■ Proposed schedule for approval and implementation; ■ Cost of the project; ■ Technical details of the project: ■ Capacity, make and model of turbines;

Scope Parameter	Details
	<ul style="list-style-type: none"> ■ Capacity and length of transmission lines; ■ Capacity of pooling substation; ■ Land requirement and procurement/leasing process; ■ Resource requirement i.e. water, power, manpower and raw materials (sand, stone, aggregate, etc.); ■ Step-wise process for establishment of the Project; ■ Addition or upgrade of existing infrastructure including deck strength, vessels and access roads; and ■ Details of ancillary and temporary facilities including labour camp(s), batching plant(s), storage areas, stock yard, site office and central monitoring systems.
Administrative Framework	<p>The Administrative Framework should identify policies, regulations and conventions that are applicable at the international, national, state and local level to the Project operation. An initial administrative framework has been discussed in the scoping report but will need to be updated based on consultations with key decision makers. If gaps exist in the initial framework, then clear suggestions need to be provided to bridge any gaps.</p>
Description of Environment and Socio Economic	<p>The baseline provides the current environmental, social and ecological sensitivities prevalent in the Project site and 10 km study area prior to any activities being undertaken for FOWPI. The baseline should include a combination of primary data (direct observation, community consultation, monitoring and stakeholder consultations) and secondary data (information available in the public domain). The data should be relevant to decisions about project location, design, construction, operation or mitigation measures.</p> <p>The data generation should specifically focus on the issues highlighted subsequently.</p> <p>Environmental Baseline</p> <p><i>Offshore Environment</i></p> <ul style="list-style-type: none"> ■ Physical environment including bathymetry, geological environment (e.g. seismic surveys) and metocean environment (meteorology including wind climate and hydrodynamics including tide range, tidal elevation, tidal current, wind condition, current, wave regime); ■ Sea bed sediment (sampling and analysis), sediment type and sediment transport; ■ Marine water quality in and around the proposed offshore and intertidal components; ■ Noise & vibration levels and modelling for both underwater and airborne systems; ■ Detailed information on shipping traffic; AIS data ⁽³⁾ to understand shipping density and movement across the study area; and ■ Offshore oil & gas platform in the area and its associated infrastructure, future plans if any, subsea pipeline and cables in the study area. <p><i>Onshore Environment</i></p> <ul style="list-style-type: none"> ■ Air quality, soil quality, water resource, noise level and hazards / risk level of the onshore area; ■ Traffic study of the route selected for transportation for both construction and operation phase; ■ Land use of the terrestrial components of the wind farm; ■ Topographic survey and drainage pattern in and around the onshore components (including cabling route); ■ Location of radars in the study area (civil, ministry of defence, any other radar) and operational helipad sites; and

(3) Automatic Identification System (AIS) is an automatic reporting system widely installed in ships initially for collision avoidance by reporting their kinematic and identity information continuously. Shipping density maps have been derived from these distinct records.

Scope Parameter	Details
	<p>Social Baseline</p> <p><i>Offshore Environment</i></p> <ul style="list-style-type: none"> ■ Understanding of fishing practices, fishing-allied activities, fishing gear and fishing equipment used by local communities. <p><i>Onshore Environment</i></p> <ul style="list-style-type: none"> ■ Demographic Profile of the study area which should include population, density, growth rates, literacy, sex ratio and social groups including scheduled castes and scheduled tribes; ■ Livelihood Profile: to include main sources of livelihood i.e. agriculture, fishing, wage labour, industrial activities and employment etc.; ■ Physical and Social Infrastructure: to include- transportation, electricity, water supply and sanitation, education and health facilities, banking and credit, forms of association like unions, cooperatives etc.; ■ Vulnerability- to include discussion on women, elderly, physically challenged, single women, scheduled castes and scheduled tribes, migrant workers, economically weaker sections etc.; ■ Vulnerability of cultural heritage sites such as Savai Bet to the proposed construction and operation of the wind farm; ■ Discussions with salt pan owners and assessment of impacts from establishment of onshore cabling (including right of way); ■ Socio-economic surveys of fishing households (sample); and ■ Discussions with land sellers and impacted households. <p>Ecological Baseline</p> <p>Proximity of the site to ecologically sensitive areas including National Parks, Wildlife Sanctuaries, Important Bird and Biodiversity Areas, Important Coastal and Marine Biodiversity Areas, Marine Protected Areas, Key Biodiversity Areas, Biosphere Reserves and Conservation Reserves</p> <p><i>Offshore Environment</i></p> <ul style="list-style-type: none"> ■ Inventory of marine flora and fauna (plankton, aquatic flora, fishes, benthic systems, intertidal systems and marine megafauna⁽⁴⁾); ■ Migratory bird activity, seabird movement and key migration pathways that traverse the Project site; ■ Mapping of habitats and micro-habitats in the marine environment; and ■ State of commercial fisheries in the region with an understanding of fish stock, fishing grounds and fish spawning/nursing sites. <p><i>Onshore Environment</i></p> <ul style="list-style-type: none"> ■ Distance and ecological connectivity to wetlands of conservation importance; ■ Mapping of habitats through the aforementioned land use assessment to determine type and health of existing habitats in the region; ■ Migratory bird activity and key migration rest stops that are identified in a 10 km radius of the terrestrial components of the wind farm; ■ Inventory of terrestrial flora, terrestrial fauna (herpetofauna, avifauna and mammals) and aquatic species (plankton, aquatic flora, fishes, benthic fauna and marine megafauna); ■ Location of turtle nesting sites along the Amreli District coast; and

(4) Megafauna is a generic term used for all shark, whale, turtle, dolphin, etc. species that are identified in the Gulf of Khambhat

Scope Parameter	Details
	<ul style="list-style-type: none"> ■ List of species of conservation importance including species threatened as per the IUCN Red List (latest online version), Wildlife Protection Act, 1972 Schedules and have a restricted global range; and <p>The section should include base maps of all environmental, ecological and social components.</p>
Impact Assessment & Mitigation Measures	<p>Environmental and social impacts from the project activities during its various stages (starting from planning to decommissioning stage) should be identified, interpreted and analysed. The impacts identified and evaluated should include direct & indirect impacts as well as adverse & beneficial impacts. An overall evaluation should be carried out for all the impacts to and prioritised based on their potentiality. The extent and potential consequences of the impacts should be compared against national and international standards, protocols and guidelines. Assessment should also include impacts and risks associated with construction and operation of the transmission line and the proposed pooling substation. An indicative list (but not limited to) of various impacts that needs to be identified and analysed is as mentioned below.</p> <p>Environmental Impacts</p> <ul style="list-style-type: none"> ■ Potential impact on marine water quality due to increase in suspended sediment concentration during installation of foundations or cables, or the initial phases of seabed scouring around foundations; ■ Impact on traffic due to transportation of construction machinery, manpower and raw material; ■ Noise and vibrational impacts from boat movement, construction activities and foundation excavation/pile driving; ■ Changes in land use; ■ Impact from loss of vegetation cover include sensitive habitats (if identified) such as mangroves; ■ Changes to air quality, soil quality, groundwater quality and surface water quality from project construction and operation; ■ Impact on the fishing vessels due to change in route, increase in risks of accidental damage, collision of vessel with turbines and other vessels – navigational risk assessment; and ■ Cumulative impacts on noise, water quality, air quality and boat traffic from Tapti decommissioning and Pipavav Port expansion. <p>Social Impacts</p> <ul style="list-style-type: none"> ■ Impact on livelihood due to land procurement; ■ Impact on fishing activities due to off shore and onshore project activities; ■ Impact on Common Property Resources; ■ Impact on Cultural Heritage; ■ Visual Impacts; ■ Increased employment opportunities and benefits to community from influx of people; ■ Impact due to labour influx and in-migration during construction stage; and ■ Impacts on Community Health and Safety due to transportation, security arrangements etc. <p>Ecological Impacts</p> <ul style="list-style-type: none"> ■ Impact on marine mammals and fishes due to increase in noise & vibration level due to movement of vessel, trenching and piling activities, etc.; ■ Changes in benthic habitat and loss of benthic species; ■ Artificial reef effect and potential for benthic growth and provision of shelter for fish/shellfish species;

Scope Parameter	Details
	<ul style="list-style-type: none"> ■ Impact to aquatic ecology from changes in water quality and increased sedimentation; ■ Ecological impacts on marine and terrestrial fauna from the habitat modification, vessel/vehicle movement, noise and vibration, trenching and piling activities; ■ Increased human-wildlife conflict and potential for road kills, trapping, hunting, etc. of sensitive and protected species; ■ Collision and electrocution risk to flying fauna including migratory birds and seabirds; and ■ Cumulative impacts (i.e. noise, barrier effects, etc.) to aquatic fauna from the combination of current oil and gas activities and the proposed wind farm. <p>The measures taken for minimizing and / or offsetting adverse impacts should be identified and proposed as part of the impact assessment process.</p>
Analysis of Alternatives (AoA) (Technology and Site)	<p>The ESIA should consider reasonable alternatives to the proposed Project site, technology, design and operation. The AoA should identify the least impactful transmission line route for the connection to the grid with reasonable justification.</p> <p>The AoA should be justified by identifying the approach to pollution prevention and abatement for each of the reasonable alternatives. A no project scenario should be considered.</p>
Environmental Monitoring Program	<p>Environmental monitoring program shall be prepared to ensure compliance to all regulatory and other requirements as well as of parameters that will indicate that the impacts are within acceptable limits. This section should also include total capital and recurring cost for environmental pollution control measures.</p> <p>This section should also include details of environmental and safety related documentation within the company including documentation and proposed occupational health and safety Surveillance Safety Programme for all personnel at site.</p>
Project Benefits	<p>This section should include benefits associated with project like increase in India's energy generation capacity with least carbon residual and improve energy efficiency, employment potential and other tangible benefits.</p>
Environmental and Social Management Plan	<p>A detailed environmental and social management plan should be proposed to mitigate adverse impacts and recommend good practices. The mitigation measures should be targeted at reducing impacts to acceptable limits as prescribed in various national and international standards and guidelines. The mitigation measures if implemented should be able to effectively eliminate or minimise adverse impacts on receptors. The environment & social management plan should also have recommendations for improving environmental performance and good practices adopted by progressive companies. The ESMP should provide recommendations for all phases of the project i.e. planning, construction, operation and decommissioning.</p> <p>The indicative list of specific management plan and its constituents have been provided below:</p> <ul style="list-style-type: none"> ■ Stakeholder Engagement Plan and Grievance Redressal Mechanism; ■ Biodiversity Management Plan: <ul style="list-style-type: none"> - Cetacean identification and management; - Migratory bird activities; - Disturbance to Asiatic lion movement and prey species; - Management of protected, threatened and endemic species; - Turtle nesting sites; - Opportunities for habitat and biodiversity enhancement; ■ Labour Influx Management Plan; ■ Hazardous Materials Management Plan; ■ Waste Management Plan;

Scope Parameter	Details
	<ul style="list-style-type: none"> ■ Community Health and Safety Plan; ■ Traffic Management Plan including boat traffic; ■ Emergency Preparedness and Response Plan (EPRP); ■ Disaster Management Plan (DMP); ■ Occupational Health and Safety Management Plan; ■ Procedure for handling oily water discharges from deck washing, drainage systems, bilges etc. ■ Procedure for preventing spills and spill contingency plans.
Summary and Conclusion	<ul style="list-style-type: none"> ■ Summary and conclusion section should include overall justification for implementation of the project. ■ The conclusion drawn from the study to include any key action plans that need to be addressed by COWI during the course of the Project life cycle.
Disclosure of Consultants engaged	This section should include the names of the Consultants engaged and their brief resume and nature of work performed.

Box 1.1 Time sensitive surveys recommended in ESIA

The following surveys recommended for the ESIA are time-sensitive and therefore need to be prioritized for the planning of the study:

- Year-long avifaunal survey to understand variations in species composition in the summer season (May-July), post-monsoon season (September-November) and winter season (October-March). The individual seasons are also important for identifying changes in bird behaviour as the summer season is the primary breeding season, post-monsoon season has the highest availability of water for wader species and winter season is the primary migratory season.
- Cetacean study will require significant input from commercial fisherman and movement of species across a larger study area in Gulf of Khambhat and the Arabian Sea. Considering the large study area and variation in seasons, the cetacean study will need to be prioritized for planning of the ESIA.
- Fishing activity for communities will require multiple visits to the Project site primarily due to changes in fishing practices across the various seasons. The scoping study has also identified seasonal fisherman, part-time fisherman and artisanal fisherman who will need to be captured in the livelihood profile and would require undertaking the surveys across multiple visits in a given year.
- Turtle nesting behaviour in the area is normally identified in the start of the calendar year i.e. January to March. The turtle nesting assessment would therefore have to coincide with the nesting period.

Primary environmental data will need to be collected for establishing the baseline of the Project site and 10 km radius. The environmental monitoring parameters that need to be considered has been presented in **Table 1.3**.

Table 1.3 Environmental monitoring parameters

Environmental attribute	Details
Ground Water Quality (Onshore)	Groundwater quality should be measured to determine compliance to the Indian Drinking Water Standards (IS 10500:2012).
Air Quality (Onshore)	Ambient Air Quality (AAQ) should be measured to determine compliance to the National Ambient Air Quality Standards (NAAQS) for the onshore components, in particular substations and transmission lines construction areas.

Environmental attribute	Details
Soil Quality (Onshore)	<p>Soil quality should be measured for the onshore components (mainly substation area/s). The key parameters that are measured include:</p> <p><i>Particle size distribution, texture, % moisture, alkalinity, acidity, specific gravity, bulk density, porosity, infiltration capacity, pH, electrical conductivity, nitrogen, phosphorus, potassium (NPK), calcium, magnesium, chloride, sulphate, carbonate, iron, copper, zinc, boron, sodium, cation exchange capacity, alkali metals, sodium absorption ratio (SAR), permeability and water holding capacity.</i></p>
Marine Water Quality	<p>Marine water quality should be measured in and around the proposed wind farm area (and offshore pooling substation area, if option is chosen) as well as the export cable route. The key parameters that are measured include:</p> <p><i>Temperature, pH, Salinity, Dissolved Oxygen, Suspended Solids, Turbidity & Visibility, Nitrites and Nitrates, Phosphates, Silicates, Oil & Grease, Total Petroleum Hydrocarbons (TPH), radioactive materials, all heavy metals, chlorophyll a , phytoplankton and zooplankton.</i></p>
Marine Sediment Quality	<p>Marine sediment quality should be measured in and around the proposed wind farm area (and offshore pooling substation area, if option is chosen) as well as the export cable route. The key parameters that are measured include:</p> <p><i>Particle Size, % Sand, % Silt, % Clay, TPH, Poly nuclear aromatic hydrocarbons (PAH), all heavy metals, micro and macro benthos</i></p>
Aquatic Ecology (onshore and offshore)	<p>Documentation of aquatic fauna like macro-invertebrates, zooplankton, phytoplankton, benthos etc. (based on interaction with project activities)</p>

1.4.1 Impact Assessment Process

The ESIA identifies the interaction between the project activities (identified in the 'Project Description' chapter of the ESIA) with the environmental and social receptors/resources (identified in the 'Baseline' chapter of the ESIA). Based on the interaction, impacts are generated and can be measured quantitatively, semi-qualitatively or qualitatively in the impact assessment process. The impact is provided a significance value based on the magnitude of the impact and sensitivity/vulnerability of the receptor or resource.

For each of the identified impacts, an overall qualitative value to the impact magnitude (negligible, small, medium or large) is determined based on one or more of the characteristics provided in **Table 1.4**. There are a range of factors that need to be taken into account to determine the sensitivity or vulnerability of a resource or receptor including distance from Project site, importance (e.g. drinking water resource), condition (e.g. water quality), sensitivity to change, cultural importance, availability of alternatives (e.g. agricultural land), etc. Identification of all the impact magnitude characteristics and sensitivity/vulnerability factors can then be calculated (quantitatively or qualitatively) to determine an impact significance.

Table 1.4 Impact magnitude

Impact Magnitude Characteristic	Definition
Impact Type	The impact type identifies the relationship of the impact to the Project i.e. is it direct, indirect or induced.
Impact Extent	The impact extent identifies the reach of the impact in terms of relative distance i.e. local, regional or international
Impact Duration	The time period in which the resource or receptor will be affected that is measured as short-term, long-term, temporary or permanent.
Impact Scale	The size of the impact is measured at a quantitative scale to determine the distance radius from the point of impact.
Impact Frequency	The frequency determines if the impact will be constant, periodic or one-time.

1.5 DELIVERABLES

The ESIA study covering the project and associated facilities should be reported in a Draft Report that can then be finalized based on comments from Project Developer. Deliverable to Project Developer will include:

- Draft ESIA report as per approval scoping report and Terms of Reference by Project Developer as well as the regulators;
- CRZ map indicating High Tide Line (HTL) and Low Tide Line (LTL) demarcated by one of the authorized agency in 1:4000 scale – covering 7 km around the Project Site;
- Project Layout superimposed on the CRZ map; and
- Coastal Zone Management Plan.

The above studies are also required to meet the specific disclosure requirements as well as presentations to the regulators as part of the approval process, prior to start of any construction activities.

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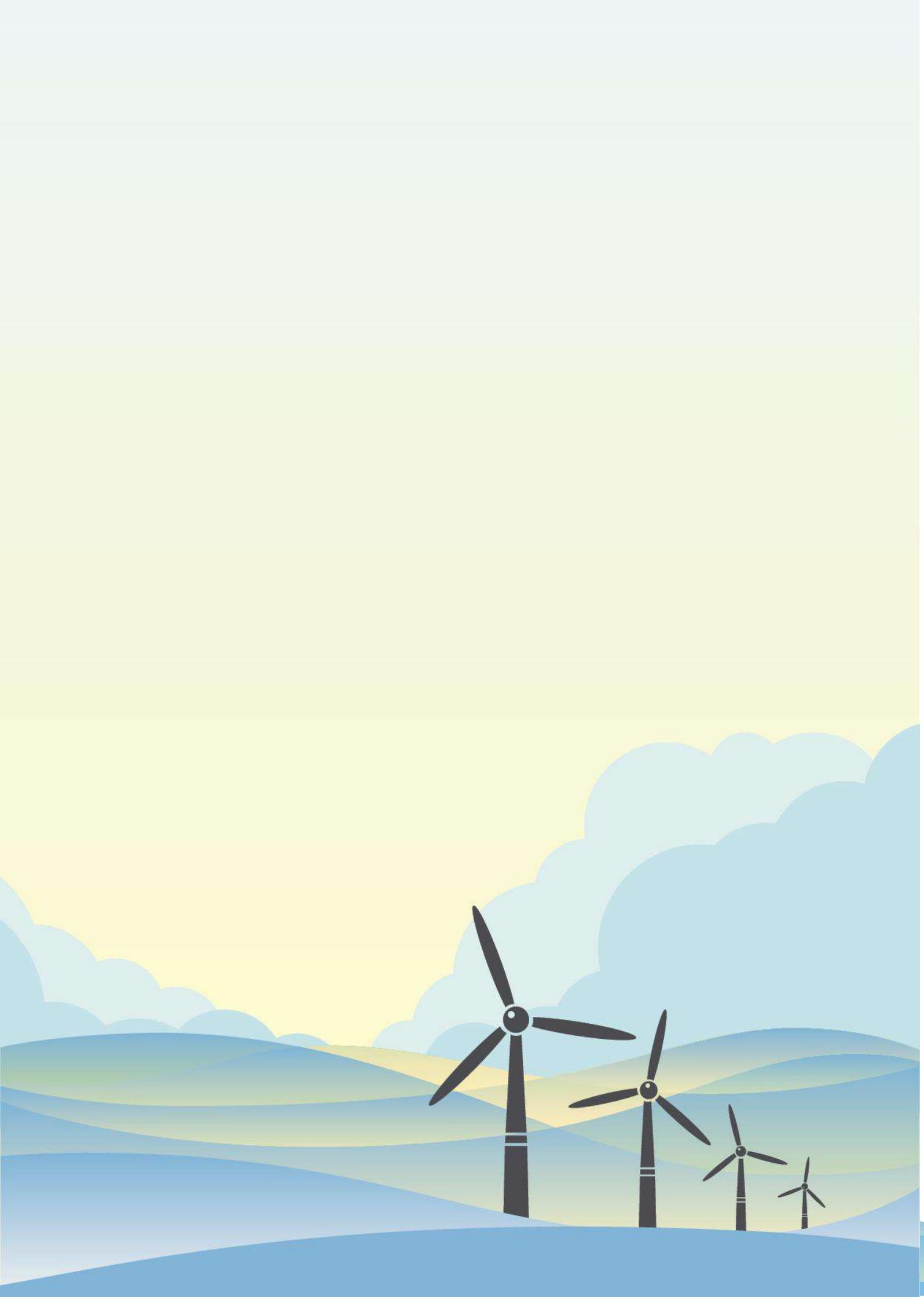
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