REDSEA WIND ENERGY S.A.E.

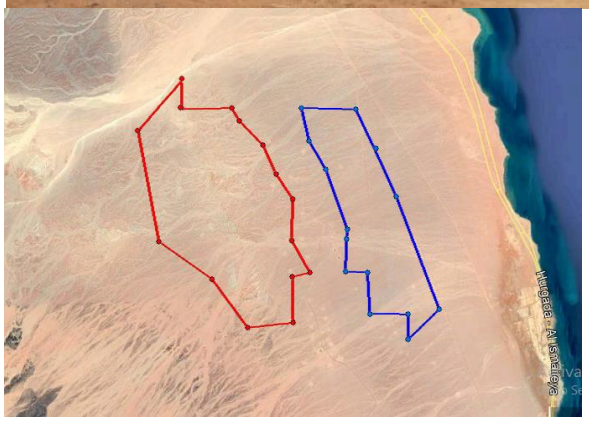
RCREEE
Regional Center for Renewable Energy and Energy Efficiency
المركز الإقليمي للطاقة المتجددة وكفاءة الطاقة

BOO Wind Power Plant 500MW at the Gulf of Suez

Site Specific ESIA and Analysis and Assessment of the Potential Risks and Impacts on habitats and the Biodiversity

Final ESIA Report – Deliverable D6 – Rev 8



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Abbreviations

- above sea level (A.S.L)
- Alternating Current (AC)
- Build, Own and Operate (BOO)
- Carbon Dioxide (CO2)
- Carbon Monoxide (CO)
- Central Agency for Public Mobilization and Statistics (CAPMAS)
- Community Based Organisations (CBOs)
- Community Integration Plan (CIP)
- Competent Administrative Authorities (CAAs)
- Consultant (ECO Consult and EcoConServ)
- Corporate Social Responsibility (CSR)
- decibels (dB)
- Direct Current (DC)
- Directorate of Health Affairs (DHA)
- Double-Circuit Transmission Towers (DCT)
- Egyptian Electricity Transmission Company (EETC)
- Egyptian Environmental Affairs Agency (EEAA)
- Egyptian pound (EGP)
- Electric and magnetic fields (EMF)
- ENGIE Energy Services S.A (ENGIE)
- Engineering, Procurement, and Construction (EPC)
- Environment, Health, and safety (EHS)
- Environmental and Social (E&S)
- Environmental and Social Impact Assessment (ESIA)
- Environmental and Social Management Plan (ESMP)
- Environmental and Social Standards (ESS)
- Environmental Impact Assessment (EIA)
- environmental management (EM)
- Environmental Management Unit (EMU)
- Environmental, Health & Safety (EHS)
- Environmental, Social, Health and Safety Management System (ESHS-MS)
- Equator Principle Financial Institutions (EPFIs)
- European Bank for Reconstruction and Development (EBRD)
- European Investment Bank (EIB)
- European Union (EU)
- Eurus Energy Holdings Corporation (EEH)
- Gigawatt hours (GWh)
- Government of Egypt (GoE)
- Green Economy Transition (GET)
- greenhouse gas (GHG)
- Gross Domestic Product (GDP)
- Gulf of Suez (GoS)
- Important Bird Areas (IBAs)
- Integrated Sustainable Energy Strategy (ISES)
- International Commission on Non-Ionizing Radiation Protection (ICNIRP)

- International Finance Corporation (IFC)
- International Financial Institutions (IFIs)
- International Organization for Standardization (ISO)
- International Union for Conservation of Nature (IUCN)
- Japan International Cooperation Agency (JICA)
- Kilowatt Hour (kWh)
- Line of Sight (LoS)
- Local Government Unit (LGU)
- Material Safety Data Sheet (MSDS)
- Medium Voltage (MV)
- Megawatt (MW)
- Migratory Soaring Birds (MSB)
- Minutes of Meeting (MoM)
- National Authority for Remote Sensing and Space Sciences (NARSS)
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- Nitrogen Dioxide (NO_2)
- Noise Pressure Levels (NPL)
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- Non-governmental Organisations (NGOs)
- Non-Technical Summary (NTS)
- Occupational Health and Safety Plan (OHSP)
- Oil and Gas (O&G)
- Operation and Maintenance (O&M)
- Orascom Construction S.A.E (OC)
- Overhead Transmission Line (OHTL)
- Particulate Matter (PM)
- Particulate Matter smaller than 10.0 microns in diameter (PM10)
- parts per million (ppm)
- Performance Requirements (PRs)
- Performance Standards (PSs)
- photovoltaic (PV)
- Planning Policy Statement 22 (PPS22)
- Power Purchase Agreement (PPA)
- Regional Center for Renewable Energy and Energy Efficiency (RCREEE)
- Right of Way (RoW)
- Shuttle Radar Topography Mission (SRTM)
- Stakeholder Engagement Plan (SEP)
- Strategic and Cumulative Environmental and Social Assessment (SESA)
- Sulphur Dioxide (SO_2)
- Supervisory Control and Data Acquisition (SCADA)
- Tool Box Talks (TBT)
- Total Suspended Particulate (TSP)
- Toyota Tsusho Corporation (TTC)
- United Kingdom (UK)
- Wastewater Treatment Plant (WWTP)
- Water Resources Research Institute (WRRI)
- wind turbine generators (WTG)
- World Bank (WB)

1 Non-Technical Summary

Background to the Project

1. In 2013, the Arab Republic of Egypt (through the Ministry of Electricity and Renewable Energy) had developed and adopted the Integrated Sustainable Energy Strategy (ISES) 2015 – 2035, which provides an ambitious plan to increase the contribution of renewable energy to 20% of the electricity generated by the year 2020, of which 12% of wind power plants is foreseen, mostly in the Gulf of Suez (GoS) due to the wind characteristics in the area.
2. In that respect, the Renewable Energy Law (Decree Law 203/2014) was issued to support the creation of a favourable economic environment for a significant increase in renewable energy investment in the country. The law sets the legal basis for the Build, Own and Operate (BOO) scheme to be implemented in which private investors are invited to submit their offers for solar and wind development projects.
3. Through the BOO mechanism, the Consortium that is incorporating Red Sea Wind Energy (RSWE) (hereafter referred to as 'the Developer'), has been selected for the development of a 500MW Wind Power Project in the GOS (hereafter referred to as 'the GOSII Project').
4. This executive summary presents the main outcomes of the Environmental and Social Impact Assessment (ESIA) that was undertaken for the Project. The ESIA was prepared in accordance with the Egyptian Environmental Affairs Agency's (EEAA) requirements as stipulated by the "Law No. 4 of 1994". In addition, the ESIA meets international best practice requirements to include the most comprehensive requirements of the International Finance Corporation (IFC).

Project Description

(i) Project Location

5. The Project is located in the Red Sea Governorate of Egypt, around 200km to the southeast of the capital city of Cairo. More specifically, the Project is located near the Red Sea shoreline and within the Ras Ghareb Local Governmental Unit of the Red Sea Governorate, where the closest villages include Ras Ghareb (located 40km to the southeast) and Zaafarana (45km to the north). Refer to figure below.
6. The Project is located within an 284km^2 area that has been allocated by the Government of Egypt to the New and Renewable Energy Authority (NREA) for development of wind farms. Within this, a land area of approximately 70km^2 has been allocated to the Developer by NREA for the development of this Project.

Figure 1-1: Project Location

(ii) Project Components

7. The key component of the Project includes the wind turbines. There will be 173 wind turbines spread over the Project site, each with a 2.9MW capacity. The turbine model has a hub height of 63m, rotor diameter of 114m and thus a tip height of 120m.

8. Other Project components include the following:

- Electrical Equipment: Project will feed electricity directly into the National Grid for end users. There are several electrical equipment which are required to convert the electricity produced from the turbines in a form that is appropriate for connection with the national grid. This includes transformers and connection cables; and
- Infrastructure and Utilities: those include (i) offices used for normal daily operational related work and a warehouse for storage of equipment and machinery, (ii) road network for access to the site and turbines; (iii) substation which collects electricity generated from the turbines.

(iii) Project Phases

9. The likely activities to take place during the Project development include three distinct phases: (i) planning and construction, (ii) operation and (iii) decommissioning each of which is summarized below.

- Planning and Construction: this mainly includes preparing a detailed design for the Project, transportation of the various Project components to the site, and site preparation activities for installation of the wind turbines and various other components. Site preparation will include excavations and land clearing activities.
- Operation: such a Project requires limited operational activities which mainly include maintenance of the turbines and the various electrical equipment. This includes for example,

turbine and rotor maintenance, lubrication of parts, washing of blades, maintenance of electrical components, etc.;

- Decommissioning: based on the signed agreement, the Project is expected to be operational for 20 years after which the Project could be decommissioned which will involve removing the tower and blades by crane, disassembly into components for final disposal or possibly for reuse or refurbishment.

10. According to the current timeline information available, construction of the Project is anticipated to commence around the end September 2020, and will require approximately 28 months for construction and commissioning (i.e. till January 2023). Operation of the Project is therefore anticipated to commence in February 2023 for a period of 20 years.

The Environmental and Social Impact Assessment of the Project

11. The Project will result in crucial positive environmental and economic impacts on the strategic and national level. Such positive impacts are important to consider and take into account and include the following:

- The Project allows for more sustainable development and shows the commitment of the Government of Egypt to realizing its energy strategy and meeting the set targets for renewable energy sources;
- The Project will contribute to increasing energy security through reliance on an indigenous, inexhaustible and mostly import-independent energy resource. The expected electricity generation from the Project will serve the annual electricity needs of more than 800,000 local households.

  The above has been calculated based on statistics obtained from Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS). The total household electricity consumption in Egypt for 2016 – 2017 (latest statistics available online) was 64,100 GWh (CAPMAS, 2018). In addition, in 2016 – 2017 the total number of household beneficiaries from the public electricity network was 23,383,521 Households (CAPMAS, 2017). Therefore, average electricity consumption per household per year can be assumed to be around 2,700 (kWh/household).
- The clean energy produced is expected to reduce consumption of conventional petroleum products used at thermal power plants for electricity generation. This will help in reducing greenhouse gas emissions as well as air pollutant emissions – the Project is expected to offset more than 1 million metric tons of CO_2 annually.

  The above has been calculated based on statistics obtained from Egyptian CAPMAS. Carbon Dioxide (CO2) emissions for 2016 – 2017 (latest statistic available) was 210 million tons, in which the electricity sector accounted for 43.3% of (i.e. around 91 million tons) (CAPMAS, 2019). In addition, the total electricity generated for 2016 – 2017 was around 190,000 GWh (CAPMAS, 2018). Therefore, CO2 emissions (Tones) per kWh is around 479g per kWh.

12. On the other hand, the Project will result in certain negative environmental impacts. Nevertheless, the ESIA in general concludes that such impacts do not pose any key or major issues of concern, and through the implementation of the appropriate mitigation and monitoring requirements they are considered not significant. Such mitigation and monitoring measures are presented in details within the Environmental and Social Mitigation and Monitoring Plan (ESMMP) in the ESIA document.

13. The table below provides an overview and summary of the key findings of the ESIA.

Table 1-1: Summary of E&S Issues

E&S Attribute	E&S Baseline Assessment	Further Requirements and Actions
Landscape and Visual	No key issues of concern noted. No sensitive visual receptors which could be impacted during construction or operation have been identified within the Project area and relevant radius surrounding the site (up to 15km).	▪ No detailed landscape and visual model required to assess impacts ▪ Routine mitigation and management measures are identified within the ESMMP
Land Use	No key issues of concern noted. Only land use activities within the Project area include the following: ▪ Petroleum storage facility and 1 oil rig operated by the General Petroleum Company ▪ Bedouin Groups (Ma'aza tribe) although they have no physical or economical activities within the site, the area is under their "Ghafra System" which entails involving such Bedouin groups in the Project (through jobs, services, etc.) for their support and providing security and protection for the Project.	▪ At planning stage, Developer to establish coordination via NREA/EETC with the relevant entity on the Project specific level to agree on any specific requirements to be taken into account as part of the detailed design for existing facilities such as the petroleum storage facility and oil rig, amongst other requirements. ▪ At planning stage, Developer to establish coordination with the Bedouin Groups for inclusion and engagement in employment and procurement opportunities during construction and operation.
Geology, Hydrology, Hydrogeology	No key issues of concern noted and based on preliminary assessment no flood risks are anticipated within the Project site.	▪ Routine mitigation and management measures for waste management are identified in ESMMP for construction and operation
Biodiversity	No key issues of concern noted. Project site is considered of low ecological significance due to its natural setting that is located in an arid environment with low vegetation cover and diversity (except for birds which is discussed further below).	▪ Spring 2020 biodiversity survey will be undertaken by Consultant to verify such outcomes ▪ Routine mitigation and management measures for biodiversity are identified in ESMMP for construction and operation
Birds	No key issues of concern noted based on the autumn survey since the majority of birds recorded belong to species of Least Concern while species of local and global significance (threatened) were recorded in low numbers. During spring survey, significant numbers were recorded and further analysis was undertaken showing records of globally threatened species and also numbers of global significance for Least Concern species. Since birds are considered as a key issue, including all soaring birds in the project area, which are protected by both national and international laws and regulations, regardless of their conservation status, a special focus should be given on all species where all species should be recorded and all species that are significant and local levels are important for the area never mind their numbers. Further assessments are critical to provide further evaluation of the significance of the project site to avifauna, including migratory soaring birds and also breeding birds.	▪ Autumn 2020 and spring 2021 in-flight monitoring to be carried out by Consultant to assess the project site avifauna.
Bats	No key issues of concern noted. Site expected to be of low significance as based on literature review, several bat species which could be present in area are considered of least concern and in addition low bat activity is expected within the area due to arid nature and low vegetation coverage.	▪ Spring 2020 bat survey will be undertaken by Consultant to verify such outcomes ▪ Based on the above, any additional mitigation or monitoring requirements will be identified for construction and operation (if required and applicable)
Archaeology	No key issues of concern noted. No site-specific archaeology or cultural heritage remains have been identified.	▪ Routine requirements for chance find procedures included in ESMMP for implementation during construction

Air Quality and Noise	No key issues of concern noted. Air quality and noise monitoring baseline indicates that all measurements are within allowable legal limits.	▪ Routine mitigation and management measures for dust and noise control during construction are identified in ESMMP
Infrastructure and Utilities	No key issues of concern noted. Key infrastructure and utility elements recorded onsite include: ▪ Telecommunication tower for General Petroleum company ▪ Five met masts onsite that are owned by the Developer ▪ Petroleum storage facility and oil rig (as discussed earlier) ▪ Electricity line and 4 pylons ▪ Existing road networks that are used by the General Petroleum Company	▪ At planning stage, Developer to establish coordination via NREA/EETC with the relevant entity on the Project specific level to agree on final requirements to be taken into account as part of the detailed design to include any requirements for telecommunication tower, road networks, and existing facilities located onsite. ▪ At planning stage, Developer to establish coordination with relevant entity to determine any specific requirements to be taken into account as part of the design for the onsite electricity networks. ▪ At planning stage, Developer to obtain non-objection for Project from relevant entities that govern telecommunication matters as well as civil/military aviation (if not undertaken already).
Occupational H&S	Baseline assessment considered irrelevant.	▪ Routine requirements for construction and operation included in ESMMP
Public Health and Safety	Closest 'potential' noise sensitive receptor is an Air Force Defence Unit located 3.4km to the east. Preliminary noise model indicates no key impacts. Model also took into account cumulative impacts to include nearby Lekala wind farm. Cumulative noise model indicates that cumulatively there will be likely noise impacts on the Unit. However, such receptors can be declassified as a noise sensitive receptor given that it includes offices, training grounds, radar system, and barracks for soldiers that is likely to include sleeping arrangements on a rotational basis, and is unlikely to include permanent residences.	▪ No detailed noise baseline and impact assessment model is required ▪ No additional mitigation or monitoring measures are required
	No impacts are anticipated in relation to shadow flicker.	▪ No additional mitigation or monitoring measures are required.
	In general, appropriate blade throw setback distance are implemented between turbines and populated areas. Key receptors onsite (petroleum storage facility, oil rig, road) not considered populated areas.	▪ At planning stage, Developer to establish coordination via NREA/EETC with relevant entity on requirements to be considered as part of the detailed design to include setback distances from onsite receptors.
	Other	▪ Routine requirements identified in ESMMP for other minor public health and safety impacts such as worker influx, public access to site, etc.
Socio-economics	No key issues of concern noted.	▪ Recommendations to enhance positive impacts identified in ESMMP to include development of a Community Integration Plan (CIP) for local job and procurement opportunities for local communities and Bedouin groups.

Key Additional Requirements for Planning and Micro-Siting of Project

14. Based on the outcomes of the ESIA, as summarized in the table above, this section identifies the key additional requirements to be taken into account by the Developer as part of the planning and micro-siting phase of the Project. This includes the following:

- Establish coordination with the Bedouin Groups for inclusion and engagement in employment and procurement opportunities during construction and operation.

- Establish coordination via NREA/EETC with the relevant entity on the Project specific level to: (i) determine any requirements to be taken into account as part of the detailed design for receptors noted onsite that are operated by the General Petroleum Company (such as the storage facility, oil rig, road network and telecommunication tower) which could include buffer distances; (ii) provide detailed design once available to include turbine locations, cables, roads, etc.; (iii) further identify access to land requirements, conditions and communication protocol for the Project; (iv) demonstrate safety compliance of all Project components based on excepted activities that could be undertaken by the General Petroleum Company throughout the Project's construction and operation phase (e.g. drilling and survey activities), and (v) any other issues as applicable.

- Establish coordination with relevant entity to provide information on the Project (to include location and specification of turbines as well as substation and overhead power line) to identify any specific requirement to be considered as part of the detailed design to include setback distance if required from electricity network and pylons located onsite.

- Establish coordination (if not already undertaken by NREA) with the relevant entity to provide information on the Project (to include location and specifications of turbines in specific) to identify any specific requirements to be considered as part of the detailed design to include setback distances if required (e.g. from radar systems if applicable) and navigational safety requirements (e.g. navigational lights, blade paintings, etc.).

- Establish coordination (if not already undertaken by NREA) with the relevant entity to provide information on the Project (to include location and specifications of turbines in specific) and identify any specific requirements to be considered as part of the detailed design to include setback distances if required for telecommunication, radio and TV infrastructure (e.g. from Line of Sight connections).

2 INTRODUCTION

2.1 Background

The energy sector is a key driver for the socio-economic development of Egypt, representing around 13% of current GDP and thus making economic growth in the country contingent upon the security and stability of energy supply.

Since 2007, Egypt has experienced an energy supply deficit due to the rapid increase in energy consumption and the depletion of domestic oil and gas resources, shifting its position as a net hydrocarbon exporter for the last three decades to that of a net importer.

This has brought a set of challenges to the energy sector, including electricity shortages, caused in part by the decline of domestic gas production, as natural gas is the main source of electricity, accompanied by highly subsidized energy prices, with negative financial implications for already dwindling government revenues.

In response, the Government of Egypt (GoE) has taken bold steps to adopt an energy diversification strategy with increased development of renewable energy and implementation of energy efficiency, including assertive rehabilitation and maintenance programs in the power sector (IRENA, 2018).

To this extent, in 2013, the Arab Republic of Egypt (through the Ministry of Electricity and Renewable Energy) had developed and adopted the Integrated Sustainable Energy Strategy (ISES) 2015 – 2035, which provides an ambitious plan to increase the contribution of renewable energy to 20% of the electricity generated by the year 2020, of which 12% of wind power plants is foreseen, mostly in the Gulf of Suez (GoS) due to the wind characteristics in the area.

In that respect, the GoE issued the Renewable Energy Law (Decree Law 203/2014) to support the creation of a favourable economic environment for a significant increase in renewable energy investment in the country. The law sets the legal basis for the Build, Own and Operate (BOO) scheme to be implemented. Through the BOO mechanism, the Egyptian Electricity Transmission Company (EETC) invites private investors to submit their offers for solar and wind development projects, for specific capacities and the award will be made to that bidder with the lowest Kilowatt Hour (kWh) price. In addition, the GoE (through the New and Renewable Energy Authority (NREA)) provides the land for the investors.

Through the BOO mechanism, the Red Sea Wind Energy (RSWE) which is being incorporated by the consortium composed of Toyota Tsusho Corporation (TTC), Eurus Energy Holdings Corporation (EEH), ENGIE Energie Services S.A (ENGIE) and Orascom Construction S.A.E (OC) (hereafter referred to as 'the Developer'), has been selected for the development of a 500 Megawatt (MW) Wind Power Project (hereafter referred to as 'the GOSII Project'). The Project is located in the GoS on a land area of approximately 70km^2 provided by NREA.

2.2 Project Location and Components

The Project is located in the Red Sea Governorate of Egypt, around 200km to the southeast of the capital city of Cairo. More specifically, the Project is located near the Red Sea shoreline and within the Ras Ghareb Local Governmental Unit of the Red Sea Governorate, where the closest residential areas include Ras Ghareb city (located 40km to the southeast) and Zaafarana village (45km to the north).

The Project is located within a 1,200km^2 area that has been allocated by the Government of Egypt to NREA for development of wind farms. Within this area, 284km^2 area have been studied as a part a Strategic Environmental and Social Assessment (SESA), (presented in green in Figure 2-3 below). Within this, a land area of approximately 70km^2 (presented in red in Figure 2-3 below) has been allocated to the Developer by NREA for the development of this Project.

Figure 2-1: Project Site in Relation to the Capital City of Egypt (Consultant, 2019)

Figure 2-2: Project Site and Closest Villages (Consultant, 2019)

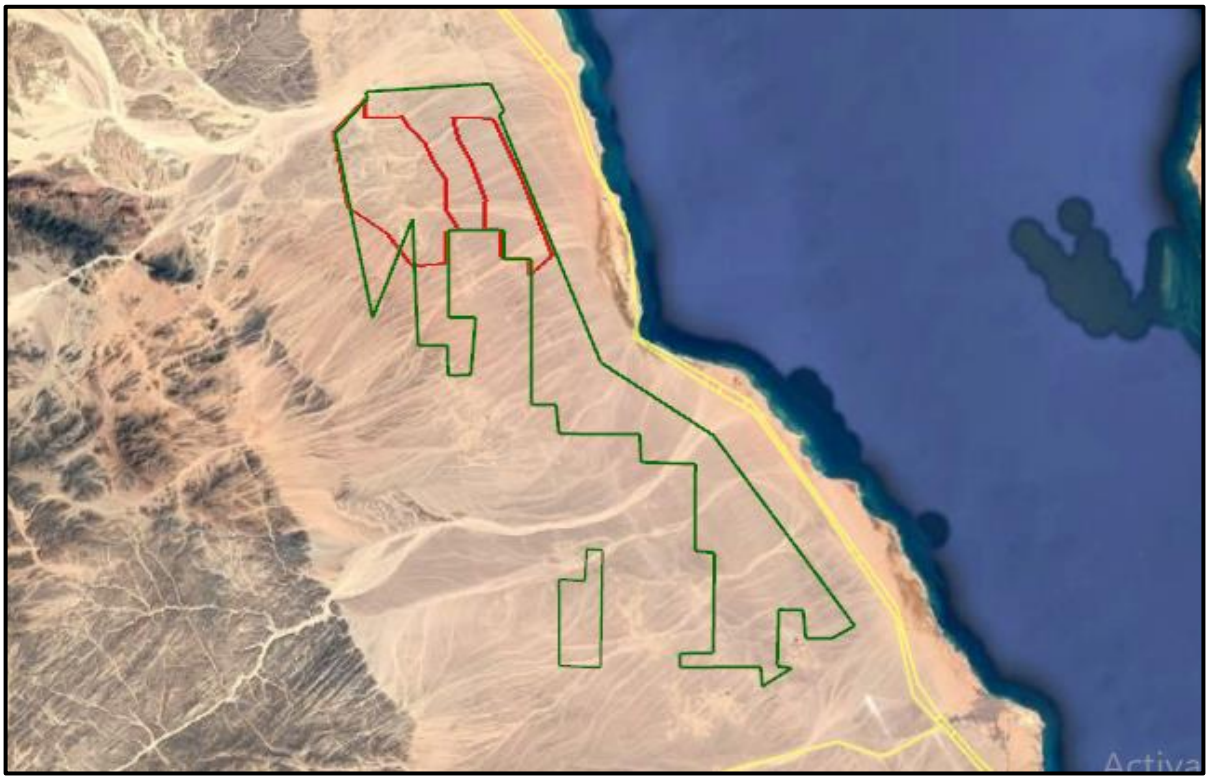

Figure 2-3: Project Site (Red) as Part of the 284km² Area Allocated for Wind Farm Developments (Consultant, 2019)

2.3 Environmental and Social Impact Assessment Report

The environmental clearance for this Project is governed by the Egyptian Environmental Affairs Agency (EEAA) as stipulated by the Law No. 4 of 1994 (Law on Protection of the Environment). Executive Regulations 1995 (Prime Ministers Decree 338) issued in accordance with the Law, classifies a wind farm development of such nature and capacity (i.e. this Project) as "Category C", requiring a comprehensive Environmental and Social Impact Assessment (ESIA) in order to obtain the environmental clearance and permit, in order to commence with construction and operational activities.

The Developer will be seeking financing for the Project from prospective lenders, including International Financial Institutions (IFIs). Therefore, the Developer wishes to design and manage the project in accordance with good international industry practice.

The IFI providing financing for the GOSII Project has not been identified yet. For the purpose of the ESIA, the following IFIs are considered:

- European Bank for Reconstruction and Development (EBRD)
- World Bank (WB)
- Japan International Cooperation Agency (JICA)
- European Investment Bank (EIB)
- International Finance Corporation (IFC)

IFC requirements have become the de facto international environmental and social performance benchmark for project financing and are considered the most comprehensive requirements related to Environmental and Social (E&S) assessments for wind projects. In general, other IFI institutions consider assessments undertaken

according to IFC E&S requirements comprehensive and sufficient. For this reason, this ESIA follows the requirements of the IFC.

ECO Consult was commissioned by the Regional Center for Renewable Energy and Energy Efficiency (RCREEE) on behalf of the Developer to prepare the ESIA for the Project in order to apply for the necessary environmental permit. ECO Consult subcontracted EcoConServ, which is a leading national environmental consultancy firm, as the local partner for undertaking the ESIA and responsible for undertaking the baseline studies, stakeholder consultation, and providing local context within this ESIA.

This report is the ESIA report to be submitted by the ESIA Practitioner (ECO Consult and its local partner) to the EEAA. This ESIA is undertaken in accordance with the "Law No. 4 of 1994" and its amendments, and the IFC requirements as set out in its Performance Standards (PSs) of Social and Environmental Sustainability E&S requirements and guidelines identified in Chapter 6.

2.4 Document Structure

The following table provides an overview of the Chapters within this ESIA document.

Table 2-1: ESIA Document Structure (Consultant, 2019)

Chapter	Description of Content
Chapter 3 – Project Description	Provides a detailed description of the Project in relation to its location, the key project components and an overview of the proposed activities that are to take place during the various Project phases.
Chapter 4 – ESIA Approach and Methodology	Presents the methodology and approach that was adopted for the ESIA study.
Chapter 5 – Project Stakeholders and Consultations	Discusses in details the stakeholder consultation and engagement plans which were undertaken as part of the ESIA process for the Project and provides an overview of the findings. In addition, this Chapter also discusses the future stakeholder engagement and consultation plans which are to take place at a later stage.
Chapter 6 – Policy, Legal, and Administrative Framework	Provides an overview of the environmental and social regulatory and policy framework applicable to the Project.
Chapter 7 – Analysis of Alternatives	This chapter investigates several alternatives to the Project development and the reasons for the preferred choice. This includes alternatives in relation to the Project site, selected technology, Project design, and finally investigates the 'no action alternative' – which assumes that the Project development does not take place.
Chapter 8 – Existing Physical, Biological, and Social Environment	This Chapter presents the baseline conditions within the Project site and surroundings. This includes the following: Landscape and Visual (section 8.1), Land Use (section 8.2), Geology/Hydrology/Hydrogeology (section 8.3), Biodiversity (section 8.4), Birds (section 8.5), Bats (section 8.6), Archaeology and Cultural Heritage (section 8.7), Air Quality and Noise (section 8.8), Infrastructure and Utilities (section 8.9), Occupational Health and Safety (section 8.10), Public Health and Safety (section 8.11), and Socio-economics (section 8.12).
Chapter 9 – Impact Assessment	This Chapter assesses the anticipated impacts from the Project throughout its various phases on such a receptor. For each identified impact a set of mitigation and monitoring requirements have been identified which aim to eliminate the impact and/or reduce it to acceptable levels. This includes the following: Overview of Strategic Environmental and Economic Impacts (section 9.1), Landscape and Visual (section 9.2), Land Use (section 9.3), Geology/Hydrology/Hydrogeology (section 9.4), Biodiversity (section 9.5), Birds (section 9.6), Bats (section 9.7), Archaeology and Cultural Heritage (section 9.8), Air Quality and Noise (section 9.9), Infrastructure and Utilities (section 9.10), Occupational Health and Safety (section 9.11), Public Health and Safety (section 9.12), Socio-economics (section 9.13), Summary of Anticipated Impacts (section 9.14), and Assessment of Cumulative Impacts (section 9.15).
Chapter 10 – Environmental and Social Management Plan (ESMP)	Presents the Environmental and Social Management Plan (ESMP) for the Project; which mainly summarizes the impacts identified as well as the mitigation measures and monitoring requirements to be implemented throughout the various Project phases. In addition, this Chapter describes the institutional framework and procedural arrangement for the ESMP implementation.

Chapter 11 – E&S Assessment for Project Substation	Presents the anticipated E&S impacts in specific for the Project's substation along with required mitigation and monitoring measures to be implemented.

2.5 Key Involved Entities

Different entities are involved in the planning and implementation of the Project. The responsibilities of each key entity which is of relevance to the ESIA are listed in the text below along with a general description of their roles.

- *Red Sea Wind Energy (RSWE) which consists of a consortium of ENGIE, Toyota Tsusho Corporation (TTC), Eurus Energy Holdings (EEH), and Orascom Construction (OC) (the Developer):* is the Project proponent and developer and will be the owner of the Project;
- *Regional Center for Renewable Energy and Energy Efficiency (RCREEE):* is responsible for managing certain aspects of the overall development process on behalf of the Developer. This includes in specific the overall management of the ESIA process with the Consultant including review of deliverables and submissions including conducting an ornithological survey at the GoS (about 70 km^2 area) in autumn 2019 and spring 2020 for the wind power project with the capacity of 500 MW under BOO scheme;
- *Egyptian Environmental Affairs Agency (EEAA):* the official governmental entity responsible for protection of the environment in Egypt. The EEAA is responsible for approval of the ESIA and making sure it complies with the "Environmental Protection Law No. 4 of 1994" and granting the environmental clearance for the Project;
- *National Renewable Energy Authority (NREA*): is the entity responsible for qualification of bids and selection of the Developer for this Project. In addition, they are also responsible for allocation of the land for the development of the Project;
- *Egyptian Electricity Transmission Company (EETC):* will be of the off taker of electricity and the responsible entity for signing the Power Purchase Agreement (PPA) with the Developer. In addition, they will also be responsible for designing, building and operating the associated interconnection facilities. This will include the Overhead Transmission Line (OHTL) that will connect to the existing national grid.
- *Wind Farm Engineering, Procurement, and Construction (EPC) Contractors:* responsible for the development of the Project on a turnkey basis. Responsibilities include the preparation of the detailed design of the Project; supply of the material and equipment (turbines, cables, transformers etc.); and construction of the Project and its various components (turbines, internal access roads, building infrastructure, connections, etc.). The EPC Contractors for this Project will be Orascom Construction for the construction and commissioning of the civil and electrical works, while Siemens Gamesa Renewable Energy (SGRE) will be responsible for the supply, erection and commissioning of the turbines;
- *Wind Farm Project Operator:* will be responsible for Operation and Maintenance (O&M) of the Project. The Owner will operate the wind farm for the duration of the PPA with the support of SGRE for the wind turbine scope under a Long-Term Service Agreement (LTSA); and
- *Consultant (ECO Consult & EcoConServ):* hereafter referred to as the 'ESIA Team' who is the ESIA Practitioner and the consultant commissioned by RCREEE to prepare the ESIA for the Project in accordance with the requirements of the "Law No. 4 of 1994" as well as the IFI E&S requirements.

3 PROJECT DESCRIPTION

3.1 Administrative Set-Up and Project Location

Egypt is divided into 27 Governorates. The Project site is located within the Red Sea Governorate that is bordered by the Red Sea Cost to the east and Beni Suef, Minya, Assyut, Sohag, Qena, Luxor and Aswan Governorates to the west, Suez Governorate to the North, and North Sudan to the south (Figure 3-1 below). Red Sea Governorate's total area is around 120,000 km2, forming 11.9% of the country's total area.

Administratively, the Red Sea Governorate is divided into 7 Cities (also known as Districts), each headed by a Local City Council (refer to Figure 3-1 and Figure 3-2). The capital of the Governorate is Hurghada that is located around 150km south of the Project site.

The Project site is located within the Ras Ghareb City (or District) and therefore administratively is under the Ras Ghareb City Council. The Ras Ghareb District is further divided into Ras Ghareb town as well as 2 rural (village) local units (Zaafarana and Wadi Dara). The closest community settlements to the Project site include Ras Ghareb town (located 40km to the southeast) and Zaafarana village (45km to the north).

Ras Gharib City is the second-largest city in the Red Sea Governorate, and the most important Egyptian city in terms of oil production.

As discussed earlier, the Project is located within a 284km^2 area that has been allocated by the GoE to NREA for development of wind farms. Within this, a land area of approximately 70km^2 has been allocated to the Developer by NREA for the development of this Project.

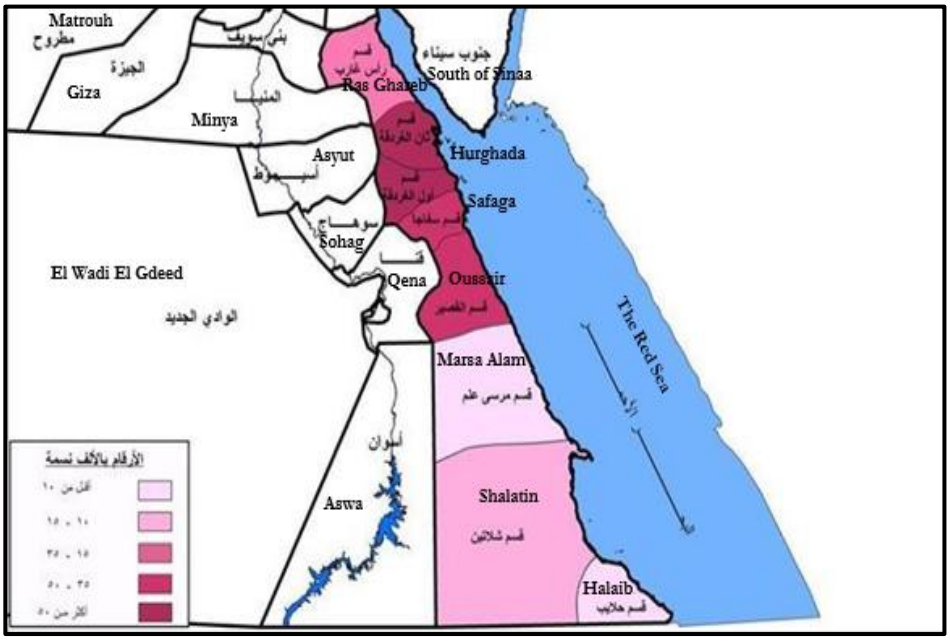

Figure 3-1: Administrative Borders of the Red Sea Governorate (Consultant, 2019)

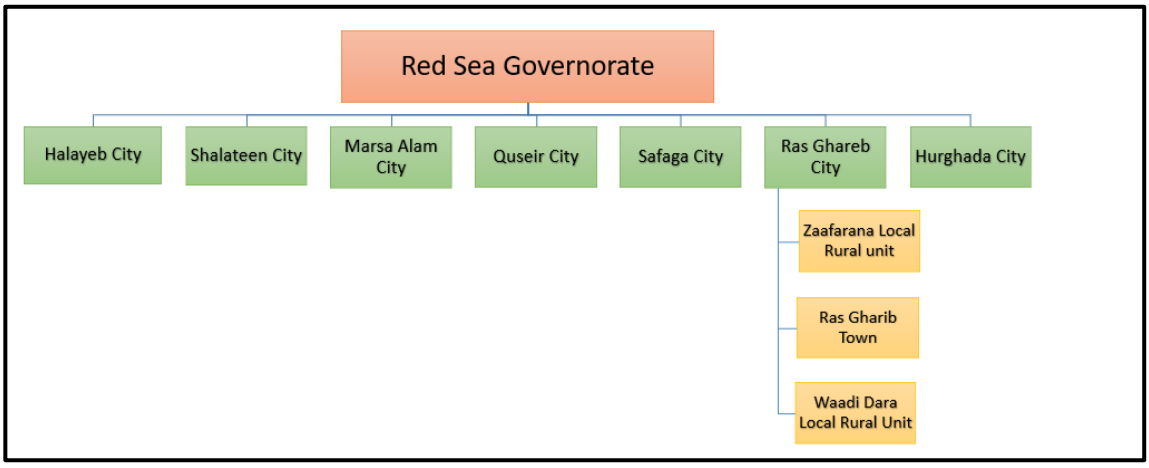

Figure 3-2: Administrative Division of Red Sea Governorate (Consultant, 2019)

Figure 3-3: Project Site and Closest Villages (Consultant, 2019)

3.2 Outline of Wind Turbine Technology

Wind turbine technology relies on harvesting the kinetic energy in wind (i.e. movement of wind) and turning it into mechanical energy which in turn is used for electricity generation. To capture wind, turbines consist of rotor blades which are elevated from the ground using towers to take advantage of faster and less turbulent wind. As wind speed increases, the rotor blade begins to rotate which then spins a shaft that is connected to a generator thereby converting wind energy to electricity.

Wind turbines produce electricity at a certain voltage which must be matched to the grid it connects to. Therefore, transformers are used to convert the output to a higher voltage that matches the grid.

3.3 Project Components

The table below provides a summary of the key Project components, along with a detailed description of each of those components to follow. It is important to note that the information included throughout this section is based on preliminary information provided by the Developer to date.

Table 3-1: Summary of Key Project Components (Consultant, 2019)

Component	Description
Project Generation Capacity (MW)	500
Technology Type	Wind Power
Number of Wind Turbines	173
Rated Power per Turbine (MW)	2.9
Rotor Diameter (m)	114m
Hub Height (m)	63m
Tip height (m)	120m
Project area to be covered	+/- 70 km^2
Infrastructure and Utilities	This includes: (i) internal road network; (ii) underground cables; (iii) warehouse and offices; (iii) substation; and (iv) associated facilities such as the high voltage overhead transmission line.

3.3.1 Wind Turbines

Generally, a wind turbine consists of a foundation, tower, nacelle, rotor blades, a rotor hub, and a transformer (Figure 3-4 below). The foundation is used to bolt the tower in place. The tower contains the electrical conduits, supports the nacelle, and provides access to the nacelle for maintenance. Typically, three (3) blades are connected to the hub which then connects with the nacelle; the box-like component that sits atop the tower and which most importantly contains the gear box (which steps up the revolutions per minute to a speed suitable for the electrical generator) and the generator (which converts the kinetic energy into electricity).

Foundations will be constructed to bolt the tower of the turbine in place (one for each turbine); where in general each foundation will consist of a circular footing of 20.5m diameter and a depth of 2.9m. The foundation will be built with concrete reinforced with structural corrugated steel. In addition, each turbine is equipped with a transformer that converts/steps up the output from the turbine to a higher voltage (from 11kV to 33kV) to meet a specific utility voltage distribution level that is appropriate for connection with a substation (explained in details below).

The Developer is currently undergoing a selection process for the EPC Contractor whom will be supplying the wind turbines and is preparing the detailed design of the Project; which as discussed earlier will most likely be Orascom Construction and Siemens Gamesa Renewable Energy (SGRE). Currently, preliminary information is available on the turbine specifications. Based on such preliminary information there will be 173 turbines, each with a rated power of 2.9MW (for a total generation capacity of around 500MW). Each turbine will have a hub-height of 63m, rotor diameter of 114m and therefore a tip height of 120m.

The potential EPC Contractors will also be preparing the detailed design for the Project which presents the layout of the wind turbines within the Project site. The preliminary design mainly takes into account technical criteria (wind resources in the specific Project site, spacing between the turbines to minimize wake effects which could lead to a decreased wind energy production, accessibility to the turbines, etc.). Any E&S constraints or considerations (based on the outcomes of the ESIA as identified throughout this document) will also be taken into account as part of the preliminary designs and the detailed design that will be prepared at a later stage.

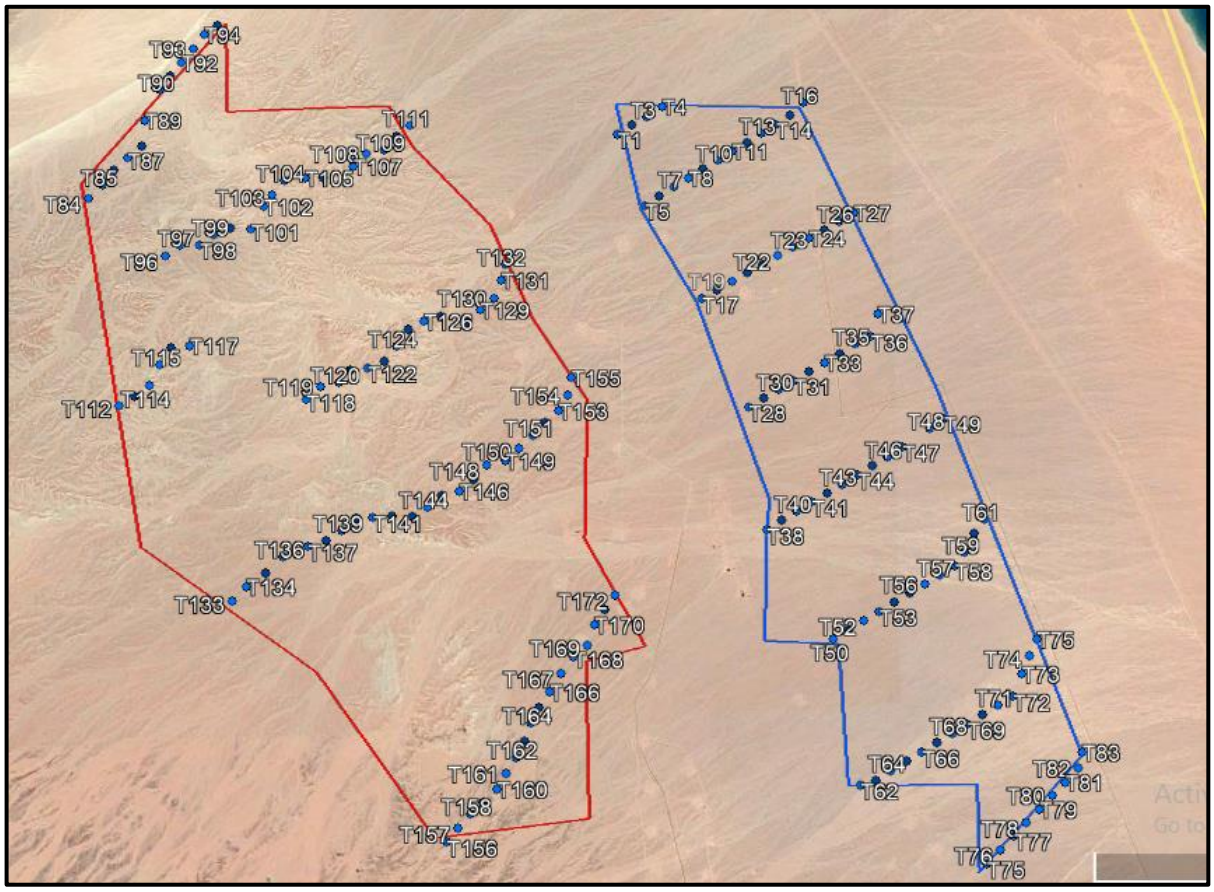

Figure 3-4: Project Layout (Consultant, 2019)

3.3.2 Infrastructure and Utilities

The following highlights the infrastructure and utilities requirements of the Project.

- **Medium Voltage (MV) Cables:** The wind turbines will be connected through medium voltage cables (33kV) to the substation. The connection between the turbines and the substation will be made using underground transmission cables buried in ground by trenches.
- **Communications Network:** the Project will have a Supervisory Control and Data Acquisition (SCADA) system for the remote operation of the facilities. A communication network will be installed which will consist of fibre optic cables connecting the turbines together to the SCADA system at substation. The communication system will be installed in the same trenches as the MV cables discussed above.
- **Substation:** The substation is a high voltage transformer substation that collects and converts the output from the turbines to a higher voltage (from 33 kV to 220 kV) that is appropriate for connection with the High Voltage National Grid (220 kV). One substation will be located within the Project area. A typical 220 kV substation is presented in Figure 3-6.
- **Project Electricity Transmission Line:** electricity generated from the Project will be connected from the substation to the National Grid through an Overhead Transmission Line (OHTL) and will be developed by EETC. *It is important to note that the Overhead Transmission Line (OHTL) that will connect from the substation to the national grid (to be developed by EETC) is not included in the ESIA given that no information is available on it at this stage (e.g. specific route, length, etc.) A separate ESIA will be performed for the 220 kV EETC OHTL.*
- Other infrastructure and utilities in the Project site will include the following:

- **Building Infrastructure:** onsite building infrastructure will be required for the daily operation of the Project. Such buildings could include an administrative building (offices) used for normal daily operational related work, control room and a warehouse for storage of equipment and machinery such as spare parts, oil cartridges, fuel, lubricants, etc.;
- **A crane pad** next to each wind turbine to accommodate cranes for the installation of the wind turbines and for maintenance activities during operation. The crane pads will be suitable to support loads required for the erection, assembly an operation and maintenance of the turbines. Generally, each crane pad has an area of around 1,500m^2.
- **Road network:** a road network will be required for installation of the turbines during the construction process and for ease of access to the turbines for maintenance purposes during operation.

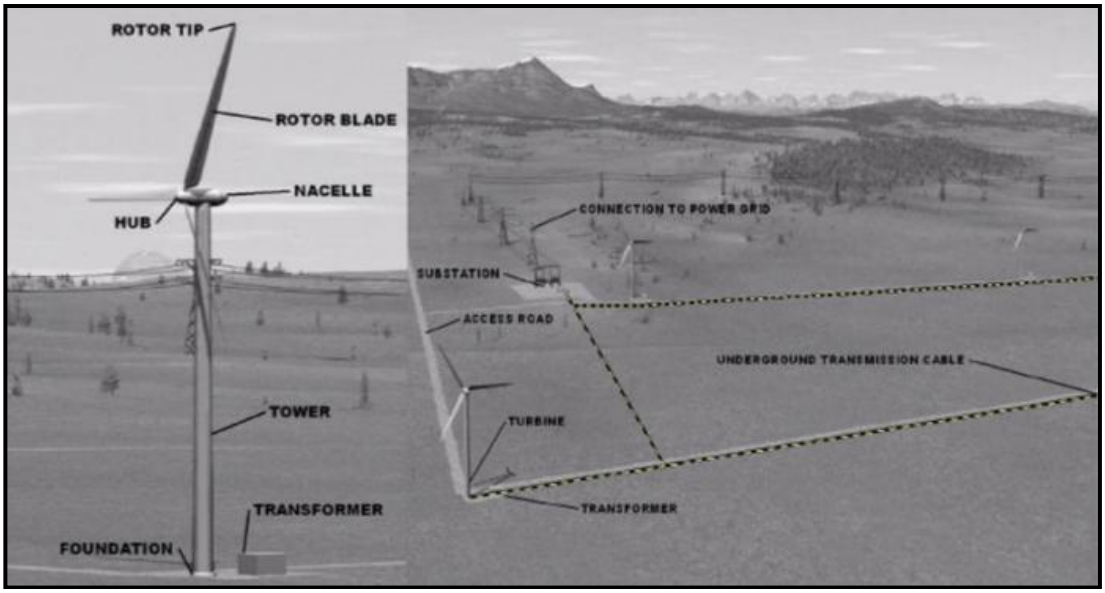

Figure 3-5: (a) Typical Structural Components of a Wind Turbine, (b) Typical Components of a Wind Farm (Source: EHS Guidelines for Wind Energy, IFC)

Figure 3-6: Typical 33/220kV Substation (Consultant, 2019)

3.4 Footprint of the Project Components

This section provides *an estimate* on the footprint of the Project taking into account the components discussed in the previous section and based on assumptions made by the ESIA team to determine footprint values. As noted in the table below, the total area of disturbance for the Project is significantly small, calculated at around 2% of the total boundary of the Project area (which is around 70km^2).

Table 3-2: Footprint of the Project Components (Consultant, 2019)

Component	Footprint	Description
Turbines	0.31km^2	This includes the footprint for the foundation and the crane pad area for each of the 173 turbines. Typically, each crane pad is around 1,500m^2 in area, whereas each foundation typically consists of a circular footing of 20m diameter.
Substation and Warehouse and Storage facilities	0.07 km^2	Typically, footprint for substation and building facilities is around 0.02km^2.
Trenches for MV cables and communication cables	0.5 km^2	This includes trenches with a calculated length of around 80km and a width of 6m.
Road networks	0.6 km^2	This includes the road network with a total length of 100km and a width of 6m.
Total Project Footprint	1.48km^2	
Total Project site Boundary Area	70km^2	Project footprint is around 2% of the total boundary of the Project area.

3.5 Overview of Project Phases

This section presents the likely activities to take place during the Project development and which will include three distinct phases: (i) planning and construction, (ii) operation and (iii) decommissioning each of which is summarised below.

3.5.1 Wind Farm

Planning and Construction Phase

The typical activities that will take place during the planning and construction phase for wind farms include the following:

- Preparation of the detailed design and layout of wind turbines within the Project site in addition to the various other infrastructure/utility elements (buildings, roads, substation, etc.);
- Transportation of wind turbine components to the Project site. The components are expected to be transported to the closest Port and then transported by road to the Project site;
- Site preparation of the turbine foundation. Such activities are limited to relatively small individual footprints of the foundations and will include excavations and land clearing activities for bolting of the tower to the foundation;
- Installation of turbine components to include tower assembly, hub, rotor, and nacelle lift and rotor assembly which most likely will occur through onsite mobile cranes;
- In addition to the erection of each turbine, there is additional construction work (which could include excavations, land clearing activities, electrical work, etc.) that must be conducted to connect each turbine to the power grid, this could include the installation and laying of transmission and communication cables, installation of substations, and installation of project transmission line; and
- Other construction works (which could include excavations, land clearing activities, etc.) for the potential access road construction or upgrade and for the building infrastructure (warehouse and offices).

Operation Phase

Wind turbines generally require limited operational activities as this mainly includes the following:

- Commissioning tests of the wind farm which usually involves standard electrical tests for the electrical infrastructure as well as the turbine, and inspection of routine civil engineering quality records. Careful testing at this stage is vital if a good quality wind farm is to be delivered and maintained. Commissioning of an individual turbine can take little more than two days with experienced staff;
- Normal daily operation of the wind farm. The long-term availability of a commercial wind turbine is usually in excess of 97 percent (i.e. 97% of the time, the turbine will be available to work); and
- Maintenance will also take place through a dedicated team. Typical routine maintenance time for a modern wind turbine is 40 hours per year. Non-routine maintenance may be of a similar order. Although minimal, maintenance activities may include turbine and rotor maintenance, lubrication of parts, washing of blades, maintenance of electrical components, full generator overhaul, etc.

Decommissioning Phase

According to the PPA agreement, the Project is expected to be operational for 20 years. In the case of complete decommissioning of a wind turbine, the tower and blades of the removed wind turbine will be taken down by crane, disassembled into components, and then the turbine will be refurbished at source and used elsewhere for another Project. The base will typically be left in place and covered by gravel and peat or loam. Tracks used for maintenance vehicles will be restored and can be kept as agricultural routes. Gates and fences will be removed.

3.5.2 Project Schedule

According to the current timeline information available by the Developer, construction of the Project is anticipated to commence around end of September 2020, and will require approximately 28 months for construction and commissioning (i.e. till January 2023). Operation of the Project is therefore anticipated to commence in February 2023 for a period of 20 years based on the PPA signed.

3.6 Workforce and Training

According to information provided by the Developer, the Project will require the following workforce throughout the construction and operation phase:

- Around 1,600 job opportunities at peak during the construction phase for a duration of approximately 28 months. This will mainly include around 300 skilled job opportunities (to include engineers, technicians, consultants, surveyors, etc.) and 1,300 unskilled job opportunities (mainly labourers but will also include a number of security personnel).
- Around 40 job opportunities during the operation phase for a duration of 20 years. This will include skilled job opportunities (such as engineers, technicians, administrative employees, etc.) and unskilled job opportunities (such as security personnel, drivers, etc.).

Taking the above into account, the Developer is aiming to hire local community members to the greatest extent possible throughout the construction and operation phase for skilled and unskilled jobs. The Developer is committed to adhering to transparent recruitment procedures which includes local community members as discussed in further details in ‘Section 8.12’.

4 ESIA APPROACH AND METHODOLOGY

This chapter of describes the approach and methodology that was adopted for the ESIA study including the following:

- Approach for the analysis of alternatives;
- Approach to stakeholder engagement;
- Approach to determining the spatial and temporal study area;
- Methodology for assessment of the baseline environmental and social conditions;
- Methodology used to assess the potential environmental and social impacts of the Project - including the approach to determining significance, development of mitigation measures and the assessment of residual effects;
- Approach used for the assessment of cumulative and trans-boundary effects; and
- Approach for development of an ESMP.

4.1 Analysis of Alternatives

The Egyptian Regulations to include the "Guidelines of Principles and Procedures for Environmental Impact Assessment" (EEAA, 2009) requires that the ESIA identify and analyse alternatives and present the main reason for the preferred choice. The examination of alternatives is also considered to be a key element of the ESIA process under good international practice, to include but not limited to the: (i) IFC Performance Standard 1 (IFC, 2012) and the associated "IFC Guidance Note 1" (IFC, 2012); (ii) EBRD Performance Requirement 1; and (iii) WB Environmental and Social Standard 1.

Environmental and social considerations have been part of the planning of the Project and a core element of the decision-making process. The analysis of alternatives is presented in "Chapter 7". The chapter discusses and compared several alternatives to the Project development in relation to: (i) the Project site, (ii) the chosen technology, (iii) the Project design, and finally investigated the 'no action alternative' - which assumes that the Project development does not take place.

4.2 Stakeholder Engagement

Stakeholder consultation and engagement is an essential part of the ESIA process, and has been carried out in accordance with the regulatory requirements in Egypt and the requirements of WB/IFC/EBRD. The previous and future stakeholder consultation and engagement for the Project are summarized below and discussed in detail in "Chapter 5".

The Project to date has included extensive stakeholder consultation and engagement with various stakeholder groups such as national governmental entities, local governmental entities, non-governmental organizations, local businesses, as well as citizens and Bedouins in the area. This has been undertaken through bi-lateral meetings, e-mail communication, phone communication, formal letters, and other. In addition, a public disclosure session has been undertaken with stakeholders to present the findings and recommendations proposed within the ESIA. "Chapter 5" identifies in details the stakeholder groups, objective and method of engagement, and key outcomes and how they have been taken into account as part of the ESIA study.

"Chapter 5" also discusses future stakeholder engagement and consultations which are to take place at a later stage. This mainly includes the implementation of the Stakeholder Engagement Plan (SEP) by the Developer which describes the planned stakeholder consultation activities and engagement process' to take place after the ESIA approval.

4.3 Delineation of Study Boundaries and Scope of Assessment

4.3.1 Definition of Spatial Study Area

The overall Study Area for the ESIA represents the potential area of influence of the Project. This is 'the area over which significant effects of the Project could reasonably occur, either on their own, or in combination with those of other developments and projects'.

In general terms, the study area for the Project ESIA includes the footprint of Project disturbance as demarcated in Figure 4-1 below. This includes the Wind Farm Project Site that is divided into two plots with a total area of approximately 70km^2, in addition to the buffer area between the plots.

However, for certain environmental and social parameters (such as landscape and visual, noise and shadow flicker, infrastructure and utilities, socio-economics, etc.), the study area goes beyond the actual footprint of the Project site, and therefore an appropriate thematic study area is determined for each theme on a case by case basis. Such a thematic study area is clearly identified within the relevant chapter it relates to throughout this ESIA.

In identifying these thematic study areas, the type and degree of the potential direct and indirect effects were taken into consideration. The core area where direct effects are likely to occur was determined, as well as the wider area of influence where indirect, combined and cumulative effects are likely to occur on the surrounding areas and communities.

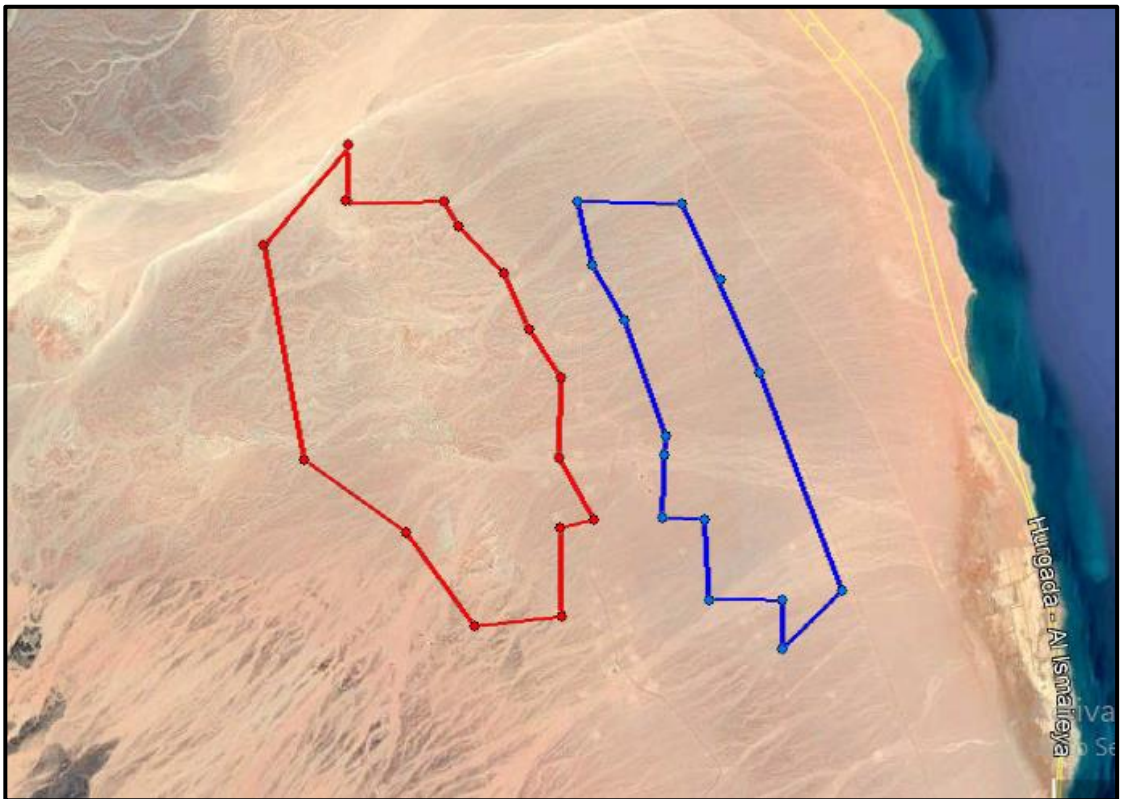

Figure 4-1: Study Area (Consultant, 2019)

4.3.2 Temporal Scope of the Assessment

The Project will be developed in a three-phase sequence as follows. The potential impacts are assessed throughout the various Project phases.

- Planning and Construction Phase;

- Operation Phase; and
- Decommissioning Phase.

(i) Planning and Construction Phase

This includes onsite construction activities which will be undertaken by the Wind Farm EPC Contractors under the guidance of the Project Owner. This mainly includes preparing the detailed design and layout of the turbines, transportation of Project components onsite, construction of the substation, as well as onsite site preparation and construction activities for installation of wind turbines.

(ii) Operation Phase

This includes activities to be undertaken by the Wind Farm Project Operator. Activities expected to take place mainly include the normal daily operation of the Project and the routine maintenance activities.

(iii) Decommissioning Phase

Generally, the anticipated impacts throughout the decommissioning phase are similar in nature to impacts assessed during the construction phase – and specifically in impacts related to soil and groundwater (from improper management of waste streams), air quality and noise, and occupational health and safety. Therefore, the assessment of impacts for those receptors and mitigation identified during the construction phase is assumed to apply to this phase in particular without the need to reiterate or emphasize this throughout subsequent chapters.

4.4 Environmental and Social Baseline Conditions

As part of the ESIA process, the baseline environmental and social conditions of the study area were established. Describing the baseline includes identifying and defining the importance and sensitivity of the various environmental and social resources and receptors likely to be impacted, i.e. within the study area. Understanding the value or sensitivity of the resources and receptors to impacts and changes is an important consideration when determining the significance of effects, and allows for better identification of the most appropriate measures that could be employed to avoid impacts, and to mitigate any adverse impacts.

The description of environmental and social baseline conditions has considered a wide range of data and information gathered from various sources, including:

- Desk-based studies and literature reviews;
- Data from statutory and non-statutory stakeholders; and
- Field surveys and site investigations.

These studies have covered all the environmental and social aspects related to the Project. The baseline conditions are treated as those conditions which would prevail in the absence of the Project.

Studies of the environment and social baseline are described in “Chapter 8” to include the following: landscape and visual; land use; geology/hydrology/hydrogeology; biodiversity; birds (avi-fauna); bats; archaeology and cultural heritage; air quality and noise; infrastructure and utilities; and socio-economic conditions. Within each chapter, the methodology which was undertaken for assessment of the each of those baseline conditions is described in detail.

4.5 Impact Assessment Methodology

Given the scale and type of the Project, the ESIA commences with an assessment of the positive environmental and economic impacts on the strategic and national level given the current challenges the energy sector in Egypt faces – as highlighted in "Section 9.1".

It then moves forward into the main body of the ESIA undertaking the assessment of impacts on environmental and social parameters for each receptor under the relevant chapter, from "Section 9.2" to "Section 9.13". The following section provides a description of the approach, methodology and process adopted for the impact assessment presented within this ESIA.

4.5.1 Approach to Assessment of Impacts

The adverse and beneficial environmental and social impacts of the Project have been identified and assessed against the established baseline. A consistent approach to the assessment of impacts was followed to enable environmental and social impacts to be broadly compared across the ESIA. A set of generic criteria were used to determine significance (see below) which were applied across the various environmental social and environmental parameters.

As far as possible, environmental and social impacts were quantified. Where it was not possible to quantify impacts, a qualitative assessment was conducted using professional experience, judgment and available knowledge, and including the consideration of stakeholder views. Where there were limitations to the data, and/or uncertainties, these have been recorded in the relevant chapters, along with any assumptions that were taken during the assessment.

In order to determine the significance of each impact, two overall factors are considered:

- The importance and/or sensitivity of the environmental and social receiving parameter, as determined during the assessment of baseline conditions; and
- Magnitude and Nature of the impact.

4.5.2 Sensitivity of the Receiving Parameter:

Receiving parameter sensitivity was determined using information taken from the baseline description on the importance, significance or value of the social or environmental component under examination. It is important to understand the sensitivity of the receiving parameter, as this is a measure of the adaptability and resilience of an E&S parameter to an identified impact. The following categories of sensitivity were applied to the assessment:

- *High*: The E&S parameter/receptor is fragile and an impact is likely to leave it in an altered state from which recovery would be difficult or impossible.
- *Medium*: The parameter/receptor has a degree of adaptability and resilience and is likely to cope with the changes caused by an impact, although there may be some residual modification as a result; and
- *Low*: The parameter/receptor is adaptable and is resilient to change.

4.5.3 Magnitude and Nature of the Impact:

The magnitude of the impact is the scale of change which the impact may cause compared to the baseline and how this change relates to accepted thresholds and standards. The following categories were applied to the assessment:

- *High*: a large change compared to variations in the baseline. Potentially a clear breach of accepted limits;
- *Medium*: change which may be noticeable and may breach accepted limits; and
- *Low*: when compared with the baseline, change which may only just be noticeable. Existing thresholds would not be exceeded.

Furthermore, in determining the magnitude of the impact it is important to take into account and consider several other factors which define the nature of the impact. This includes the following:

Type of Impact

- *Positive*: applies to impacts that have a beneficial E&S result, such as enhancement of conditions; and
- *Negative*: applies to impacts that have a harmful aspect associated with them such as loss or degradation of environmental resources.

Type of Effect

- *Direct*: applies to impacts which can be clearly and directly attributed to a particular E&S parameter (e.g. generation of dust directly impacts air quality); and
- *Indirect*: applies to impacts which may be associated with or are subsequent to a particular impact on a certain E&S parameter (e.g. high levels of dust could affect occupational health and safety).

Duration (how long the stressor or its effect last)

- *Short Term*: applies to impacts whose effects on the environment will disappear within a 1-year period, or once construction activities are completed;
- *Medium Term*: applies to impacts whose effects on the environment will disappear within a 5-year period; and
- *Long Term*: applies to impacts whose effects on the environment will disappear in a period greater than 5 years.

Reversibility

- *Reversible*: applies to impacts whose significance will be reduced and disappeared over time (either naturally or artificially), once the impacting activity ceases; and
- *Irreversible*: applies to impacts whose significance will not be reduced nor disappeared over time (either naturally or artificially), once the impacting activity ceases.

4.5.4 Assessing the Significance of the Impacts

The concept of 'significance' is central to the ESIA process and aids the identification and categorization of E&S effects. As noted, in order to determine impact significance, the sensitivity of each E&S parameter/receptor is considered in combination with the magnitude of the impact. The table below demonstrates how these parameters are considered in the assessment of significance.

Table 4-1: Determination of significance

Magnitude of Impact / Sensitivity of Receiving Parameter/Receptor	**Low**	**Medium**	**High**
Low	Not significant	Minor	Minor
Medium	Minor	Minor	Moderate
High	Minor	Moderate	Major

While the above matrix provides a framework for the determination of significance, and enables comparison across E&S parameters, a degree of professional judgement must be used and some parameter-specific factors to be considered in making the determination of significance. Below provides additional guidance to the degrees of significance used in this ESIA. Note that positive impacts are defined, but are not rated for significance.

- *Major significance*: requires thorough investigation in the ESIA. These impacts have been studied extensively by consulting expertise in the areas of the identified impacts to design needed mitigation and environmental management measures. Moreover, conducting specific studies and assessments to some of the key issues identified;
- *Moderate significance*: requires reasonable investigation in the ESIA. These impacts have been studied by expertise in the areas of the identified impacts to design needed mitigation and environmental management measures.
- *Minor significance*: must be listed, and addressed in some way, but which did not require detailed assessment in the ESIA.
- *Not significant*: for completeness, impacts which have been included in the assessment but determined not to be significant, are rated formally as 'not significant'.

4.5.5 Management Measures

Based on the impact assessment undertaken a set of management measures are identified for each impact which aims to address it. Management measures include the following:

- Additional Requirements: those are generally regulatory requirements which have been identified and which must be taken into account at a later stage.
- Additional Studies: for certain E&S receptors additional studies must be undertaken at a later stage. Such studies and their scope, timing, etc. have been highlighted were relevant.
- Mitigation Measures: a vital step in the ESIA process is the identification of measures that can be taken to ensure that impacts are mitigated or reduced to acceptable levels. The ESIA will firstly consider the significance of any impacts caused by the Project and then assigned mitigation options through applying the following hierarchy:
  - Avoiding or 'designing out' impacts wherever possible;
  - Considering alternatives or modifications to the design to reduce the impacts wherever possible;
  - Applying measures to minimize and manage impacts on the receptor; *then*
  - As a last resort, identifying fair compensation, remediation and offsetting measures to address any potentially significant residual effects.

  Some negative impacts can be easily mitigated, whilst others cannot or are too difficult and costly to mitigate. The various potential impacts are described in this ESIA, along with the provision of 'feasible mitigation measures' that can be implemented.
- Recommendations: for positive impacts it is not possible to identify mitigation measures, but rather recommendations have been identified which aim to enhance the positive impact.

4.5.6 Assessment of Residual Significance

If there are mitigation measures it is then necessary to make an assessment of the 'residual significance' after mitigation has been taken account. A re-assessment of Project impacts is then made, taking into account the effect of the proposed mitigation measures in order to determine the significance of the *residual effects*. Residual effects are discussed for each E&S theme in the ESIA chapters, and their significance determined and summarized in an Impact Assessment Table in "Section 9.14".

4.6 Assessment of Cumulative Impacts

For each of the impacts assessed, the ESIA investigates the cumulative impacts which could result from incremental impacts from other known existing and/or planned developments in the area, and based on currently available information on such existing/planned developments. Assessment of cumulative impacts is presented in "Section 9.15".

4.7 Development of Environmental and Social Management Plan (ESMP)

Based on the results of the impact assessment, development of management measures, and development of monitoring plan, an ESMP was compiled into a single table that details all of the above. The ESMP will be a key document and will list the environmental/social requirements and detail the procedures necessary for managing the significant environmental/social issues connected to proposed Project activities. The ESMP will be developed specifically to provide flexibility in the nature and exact location of operations, while ensuring all potential impacts are identified and properly mitigated and monitored throughout the later stages of the Project. This ESMP can be used as a stand-alone document during the different phases of the Project by Developer, EPC Contractors, EEAA, and other responsible parties.

4.8 Assessment of Associated Facilities

The key component related to the associated facilities would be the Overhead Transmission Line (OHTL) which will run from the Project site (from substation area) to the connection point with the National Grid. As discussed earlier, the design, construction and operation of the OHTL will be responsibility of EETC.

The route for the OHTL is provided in the figure below. However, it is important to note that the ESIA did not include the OHTL given that key official information was not available or provided at the time of undertaking of the associated surveys and assessments as part of the ESIA (e.g. route, specifications number of towers, etc.). Therefore, a standalone ESIA will be undertaken at a later stage once such required information is available and provided on the OHTL and any of its components which must also take into account SESA requirements.

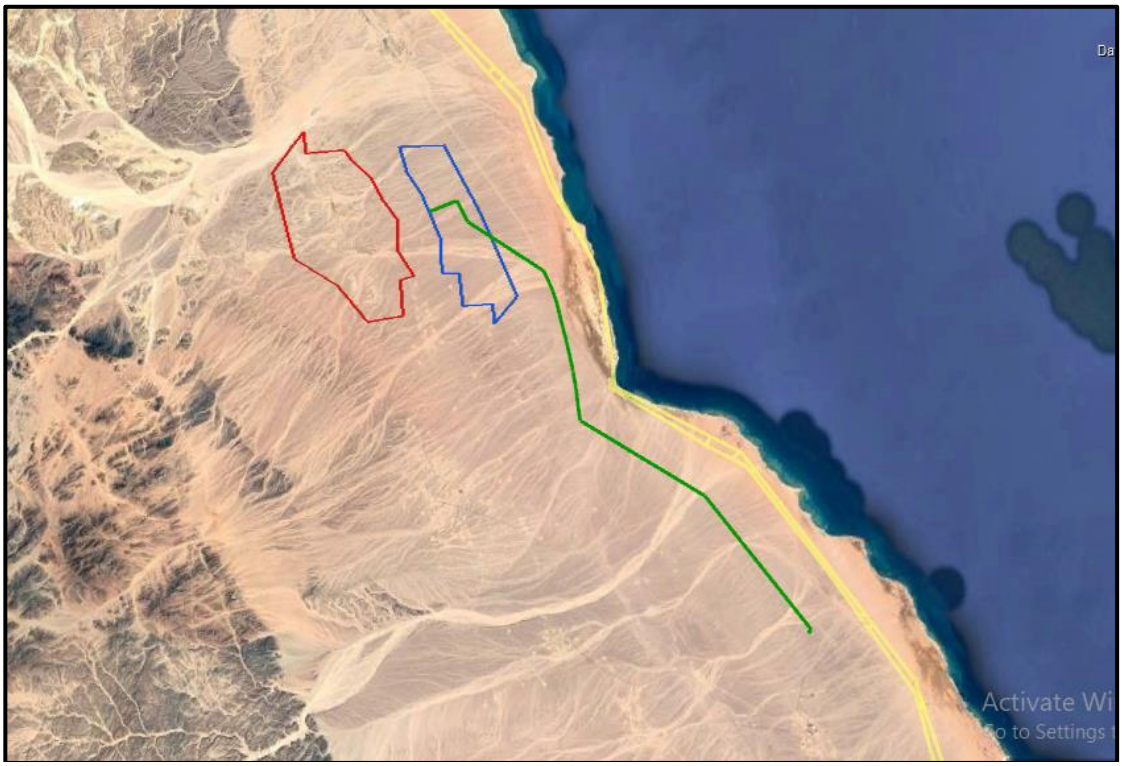

Figure 4-2: OHTL Route for the Project

5 PROJECT STAKEHOLDERS AND CONSULTATIONS

This Chapter discusses in details the stakeholder consultation and engagement plans which were undertaken as part of the ESIA process for the Project and provides an overview of the findings. In addition, this Chapter also discusses the future stakeholder consultation and engagement plans which are to take place at a later stage of the ESIA process as well the Project development.

5.1 Introduction

Stakeholder engagement is an integral part of ESIA good practice and is a statutory requirement of the national EIA legal framework in Egypt and within under good international practice, to include IFC/EBRD/WB requirements. The Developer is committed to a technically and culturally-appropriate approach to consultation and engagement with all stakeholders affected either directly or indirectly by the Project. The consultation program for the Project is based on informed consultation and participation in line with good international practice requirements with affected people, and is designed to be both fair and inclusive. Consultation activities have been an ongoing process since the commencement of the ESIA study in August 2019.

Stakeholders are persons or groups who are directly or indirectly affected by a project, as well as those who may have interests in a project and/or the ability to influence its outcome, either positively or negatively.

Stakeholders may include: 1. locally affected communities or individuals and their formal and informal representatives, 2. national or local government authorities, politicians, religious leaders, civil society organisations and groups with special interests, 3. the academic community, or other businesses.

Stakeholder consultation is an inclusive process for sharing information that enables stakeholders to understand the risks, impacts, and opportunities of a development or project, allowing them to express their views and articulate their perceptions towards it.

5.2 Objectives

The objective of stakeholder consultation is to ensure that a participatory approach takes place, which in turn documents concerns of all stakeholder groups and makes sure that such concerns are considered, responded to, and incorporated into the decision-making process of the development. Stakeholder consultation needs to be a two-way communication process that imparts information to stakeholders, but also obtains additional and on-the-ground information from them. Stakeholder consultation and engagement must take place at the inception phase of the ESIA process and implemented all through the study period.

The specific objectives of this chapter are to:

- Summarise national and international legal & policy requirements for stakeholder engagement;
- Describe and identify the stakeholders affected and/or with an interest in the Project;
- Summarise stakeholder engagement and consultation conducted to date. In addition, describe how the views and issues raised have informed and influenced the development of the Project; and
- Outline the future plans and approach to stakeholder engagement.

5.3 Requirements for Stakeholder Engagement

Egyptian Legislation Requirements

Egyptian legislative requirements for stakeholder engagement are mainly included within the undertaking of the ESIA. The “Environment Law No. 4 of 1994 and subsequent amendments” require that an ESIA study shall

be undertaken for projects with significance impacts, including two phases of stakeholder consultation: scoping and public consultation.

The scoping should include targeted stakeholder consultations with key stakeholders as applicable (refer to "Section 5.5" below for additional details). In addition, the public consultation is required to include the following entities (refer to "Section 5.6" below for additional details):

- Representatives of the EEAA
- Related government authorities
- Representatives of the Governorate and local units where the project is located
- Affected groups including local businesses and communities
- NGOs and civil society groups

EEAA guidelines methodology

The articles covering the guidelines on conducting public consultations as part of the ESIA study are as follows:

- Paragraph 6.4.3.1 Scope of Public Consultation
- Paragraph 6.4.3.2 Methodology of Public Consultation
- Paragraph 6.4.3.3 Documentation of the Consultation Results
- Paragraph 7 Requirement and Scope of the Public Disclosure

Financing Requirements

The IFIs providing financing for the GOSII Project have not been identified yet. Nevertheless, stakeholder engagement activities undertaken as part of the ESIA meets international best practice requirements to include the relevant environmental and social requirements of IFIs as follows:

- International Finance Corporation (IFC):
  - Performance Standards (PS) (2012) to include PS 1: Assessment and Management of Environmental and Social Risks and Impacts; PS 2: Labour and Working Conditions; and PS 4: Community Health, Safety and Security
  - EHS Guidelines to include: General EHS Guidelines (2007); EHS Guidelines for Wind Energy (2015); and EHS Guidelines for Electric Power Transmission and Distribution (2007)
- European Bank for Reconstruction and Development (EBRD) Performance Requirements (PR) to include:
  - PR 1: Assessment and Management of Environmental and Social Impacts and Issues; PR 2: Labour and Working Conditions; PR 4: Health and Safety; and PR 10: Information Disclosure and Stakeholder Engagement
- World Bank Environmental and Social Standards (ESS) to include:
  - ESS1 Assessment and Management of Environmental and Social Risks and Impacts; ESS2 Labour and Working Conditions; ESS4: Community Health and Safety, ESS5: Land Acquisition; Restrictions on Land Use and Involuntary Resettlement; and ESS10: Stakeholder Engagement and Information Disclosure
- Japan International Cooperation Agency (JICA) Guidelines for Environmental and Social Considerations (2010)

- EIB Environmental and Social Standards grouped across 10 thematic areas to include: Standard 1: Assessment and management of environmental and social impacts and risks; Standard 6: Involuntary resettlement; Standard 7: Rights and interests of vulnerable groups; Standard 8: Labour standards; Standard 9: Occupational and public health, safety and security; and Standard 10: Stakeholder engagement.

IFC requirements have become the de facto international environmental and social performance benchmark for project financing and are considered the most comprehensive requirements related to E&S assessments for wind projects. In general, other IFI institutions consider assessments undertaken according to IFC E&S requirements comprehensive and sufficient. For this reason, the SEP follows the requirements of the IFC in relation to stakeholder engagement process and activities.

Performance Standard (PS) 1 "*Assessment and Management of Environmental and Social Risks and Impacts*" addresses Stakeholder Engagement and sets out the following requirements:

- Stakeholder Engagement is an on-going process that may involve: stakeholder analysis & planning, disclosure & dissemination of information, consultation & participation, grievance mechanism, and ongoing reporting to Affected Communities.
- A Stakeholder Engagement Plan (SEP) must be developed and implemented that is scaled to the project risks and impacts and development stage, and be tailored to the characteristics and interests of the Affected Communities.
- Affected Communities will be provided with access to relevant information on: (i) the purpose, nature, and scale of the project; (ii) the duration of proposed project activities; (iii) any risks to and potential impacts on such communities and relevant mitigation measures; (iv) the envisaged stakeholder engagement process; and (v) the grievance mechanism.
- When Affected Communities are subject to identified risks and adverse impacts from a project, a process of consultation will be undertaken in a manner that provides the Affected Communities with opportunities to express their views on project risks, impacts and mitigation measures, and allows the client to consider and respond to them.
- The extent and degree of engagement should be commensurate with the project's risks and adverse impacts and concerns raised by Affected Communities.
- The consultation process will be tailored to language preferences of Affected Communities, their decision-making process, and the needs of disadvantaged or vulnerable groups.
- For projects with potentially significant adverse impacts, the client will conduct an informed consultation and participation.
- A grievance mechanism will be established to receive and facilitate resolution of Affected Communities' concerns and grievances about the client's environmental and social performance.

5.4 Stakeholder Identification and Analysis

The purpose of stakeholder identification is to identify and prioritise Project stakeholders for consultation. Stakeholder identification is an ongoing process, and thus key stakeholders will be identified during different stages of the Project. A systematic approach is used to map the stakeholders based on the Project zone of impacts. In this approach, by mapping the zone of social impacts, stakeholders are identified by the impact area.

As a result of the stakeholder mapping, Project stakeholders are categorised into two main categories:

- Primary stakeholders are the individuals and groups who are affected directly by the Project; and

- Secondary stakeholders are those parties who have influence on the Project and/or interested in the Project, but are not necessarily directly impacted by the Project.

The key stakeholders identified are presented in the following table.

Table 5-1: Identified Groups of Stakeholders (Consultant, 2019)

Level of Stakeholder interest in/involvement to the Project

1. Stakeholders who may be directly or indirectly affected by the Project

- Nearby local community from Ras Ghareb and Zaafarana to include:

Community people	- Locals have a vested interest in the Project, as they might be able to land a job opportunity - Locals will receive the impacts (positive/negative) as a result of the Project
Community Leaders	- They are socially active members and known figureheads for community members, who may or may not hold government positions. Community leaders involved in the Project are the heads of affected communities.
Business Community (Local Large-Scale Contractors)	- Responsible for performing some contracting works on-site. - Responsible for providing workers with food and amenities.

- Bedouin groups in the general area where the Project is located (named El-Ma'aza)
  - Arab tribes will be helpful in providing security to the Project sites.
  - Additionally, they might be able to provide supplies to the workers (water, food, etc.)
  - Arab tribes include the group of people described as 'wise men' (El-Awaqel). They are responsible for Urfi juridical activities. All local communities abide by their judgments.
  - Responsible for communication between the Project and their local communities.

2. Secondary Interested Parties/Stakeholders

Stakeholders who may participate in implementation of the Project

- Regional Centre for Renewable Energy & Energy Efficiency (RCREEE): RCREEE acts on behalf of the Consortium in developing, managing, and implementing the site-specific Environmental and Social Impact Assessment (ESIA) and the Active Turbine Management Program (ATMP).
- IFIs, and investors

National Government & Permitting Authorities

- Ministry of Environment –Egyptian Environmental Affairs Agency (EEAA): Responsible for reviewing and approving ESIAs, as well as for monitoring the implementation of the Environmental Management Plan.
- Environmental Office within the Governorate: Responsible for monitoring compliance to environmental requirements.

Entity	Scope
Egyptian Electricity Transmission Company (EETC)	Purchase of electrical energy produced from power plants, which authorizes local and foreign investors to create, and sell them on the ultra-effort networks. The implementation of projects for the electricity transmission.
New & Renewable Energy Authority (NREA)	NREA act as the national focal point for expanding efforts to develop and introduce renewable energy technologies to Egypt on a commercial scale together with implementation of related energy conservation programs. NREA is entrusted to plan and implement renewable energy programs in coordination with other concerned national and international institutions within the framework of its mandate
General Petroleum Company	A national State-owned company engaged in exploration, production and development of hydrocarbons, is responsible for the management of oil and gas exploration and production activities on behalf of the State. It is one of the subsidiary companies affiliated to the Ministry of Petroleum It has the right of concession for petroleum exploration in some parts of the Project area and adjacent areas Represents the main investment activity in the Project area
Ministry of Defence: Army Intelligence force, Border guards	They also provide permissions to get into the desert area Secure and support the Project
Red Sea Governorate	The main role of the governorate is supporting the Project by providing the various permissions needed, and infrastructure maps in case if needed.
Ras Gharib City Council	Give permits for any construction Provide maps of the floods in the area

	Supervision and follow-up from the Environmental Department in Ras Ghareb City Council during the construction phase. Coordinate with them to solid waste disposal through the construction contractors (In the case of contracting with them)
Media: Newspaper, Television, Internet	They disclose information about the Project.
Water and wastewater Company in Ras Ghareb	Provide the Project needs of water and wastewater disposal during the construction phase; through the construction contractors (In the case of contracting with them)
Civil Aviation	Issuing a permit for height requirements and warning signs
public health: Directorate of Health in Red Sea Governorate, Ras Ghareb General Hospital	They provide the health services and facilities to the local districts
Education providers (in particular technical / vocational training institutes)	Provides knowledge and skills required in for various occupations, including renewables and wind power in specific that is delivered through formal, non-formal and informal learning processes. The education curriculum in undergraduate, postgraduate, or Technical and Vocational Education and Training (TVET) could be reviewed and revised to match the market and workforce requirements.
Manpower Directorate: Labour Office in Red Sea Governorate	Data of the labour force in Suez Governorate and complaints of workers Monitor labour recruitment standards during construction
Roads Directorate in Red Sea Governorate	Services and development of external roads in the governorate Issuing permits for any construction work on the external roads
Ministry of Interior	MI is responsible for national and local security, as well as approving emergency response and firefighting plans for establishments/projects

Local Government

- Red Sea Governorate and Local Unit in Ras Gharib: The main role of the Governorate is to support the Project by providing the various permissions needed, as well as infrastructure maps, if required.

Non-governmental Organisations (NGOs) and Community Based Organisations (CBOs)

- Organizations with direct interest in the Project, and which may have useful data or insight into local issues of relevance to the Project. These organizations can also influence the views of others regarding the Project, both nationally and internationally.
- NGOs are responsible for sharing information with the community.

NGOs/ CBOs	**scope**
Association for the Conservation of the Environment in Red Sea (HEPCA)	Environment protection
Red Sea Ecotourism	Social and cultural services
Environmental protection in the Red Sea	Environment protection
Ababdeh Sons Association in Ras Ghareb	Community Development
Resala Association	Social and family services
Firdous Association	Social and family services
Egyptian Red Crescent	Community Development

Further to the above, a PRELIMINARY STAKEHOLDER ANALYSIS is undertaken below to clarify stakeholders' interest in the Project and their ability to impact the Project's development. Accordingly, a priority contact list is identified.

High rating for priority contact list indicates importance of continuous and regular consultation and engagement. On the other hand, medium rating for priority contact list does not reduce the importance of the entity as a stakeholder but indicates that their engagement is required at specific stages or milestones of the Project (i.e. when the involvement of these entities is triggered for a specific purpose such as obtaining a specific service).

Table 5-2: Preliminary Stakeholder Analysis and Priority Contact List for the Project

#	Stakeholder Group	Level of Interest			Ability to Impact			Priority		
		Low	Medium	High	Low	Medium	High	Low	Medium	High
1.	**Stakeholders who may be directly or indirectly affected by the Project**									
	▪ Nearby local community from Ras Ghareb and Zaafarana			√			√			√
	▪ Bedouin groups in the general area where the Project is located			√			√			√
2.	**Secondary Interested Parties/Stakeholders**									
	▪ Regional Centre for Renewable Energy & Energy Efficiency (RCREEE)			√			√			√
	▪ IFIs, and investors		√			√			√	
	▪ National Government & Permitting Authorities									
	- Ministry of Environment –Egyptian Environmental Affairs Agency (EEAA)			√			√			√
	- Environmental Office within the Governorate			√		√			√	
	- Egyptian Electricity Transmission Company (EETC)		√			√			√	
	- New & Renewable Energy Authority (NREA)		√			√			√	
	- General Petroleum Company		√		√				√	
	- Ministry of Defence: Army Intelligence force, Border guards		√				√		√	
	- Red Sea Governorate		√				√		√	
	- Ras Gharib City Council		√			√			√	
	- Media: Newspaper, Television, Internet		√			√			√	
	- Water and wastewater Company in Ras Ghareb	√				√			√	
	- Civil Aviation	√				√			√	
	- public health: Directorate of Health in Red Sea Governorate, Ras Ghareb General Hospital	√			√			√		
	- Education providers (in particular technical / vocational training institutes)		√			√			√	
	- Manpower Directorate: Labor Office in Red Sea Governorate			√		√			√	
	- Roads Directorate in Red Sea Governorate	√			√			√		
	- Ministry of Interior	√			√			√		
	▪ Non-governmental Organisations (NGOs) and Community Based Organisations (CBOs)			√		√			√	
	▪ Academia and research		√			√			√	
	▪ Other community members at the national level	√			√			√		

5.5 Stakeholder Consultation and Engagement To-Date

5.5.1 Scoping Process Stakeholder Consultation and Engagement

The table below provides a summary of the key stakeholders that were previously consulted and engaged throughout the Project to date. The table provides a summary of the stakeholder groups that were engaged, date of engagement, and the main objective and outcome.

As noted earlier, the Egyptian ESIA includes requirement for stakeholder engagement under the scoping process. The table below identified the stakeholder groups that were consulted as part of the scoping process in addition to other stakeholders that were engaged by the Developer.

Table 5-3: Summary of Previous and Recent Stakeholder Engagement Activities (Consultant, 2019)

Stakeholder	Phase / Entity	Method of Engagement	Objective of Consultation
Red Sea Governorate Ras Gharib City Council	ESIA / Consultant	Bilateral Interviews	In general, such entities acknowledged the importance of the Project and were much in favour of energy developments and showed their willingness to support the Project as required. In addition, such entities stressed on the importance of the Project. They also emphasized on the importance of taking into account the views and concerns of local communities as well as providing job opportunities and service provisions, as well as engaging in social investment initiatives that benefit the local communities. In addition, throughout such meetings the following was investigated and discussed: ▪ Key and critical visual receptors in the area (refer to Section 8) ▪ Formal and informal land use planning for the Project site (refer to Section 8.2) ▪ Potential for flood risks within the Project site (refer to Section 8.3) ▪ Infrastructure and utility elements related to waste/wastewater/hazardous waste disposal (refer to Section 8.9) ▪ Other views, issues of concern and requirements for the Project site
Red Sea Archaeology and Cultural Heritage Inspectorates	ESIA / Consultant	Bilateral Interviews	Throughout such meetings the following was investigated and discussed: ▪ Secondary data on any available archaeology and cultural heritage in the Project site (refer to Section 8.7) ▪ Discuss outcomes of site survey undertaken and identify any additional requirements or issues of concern to be taken into account (refer to Section 8.7).
Head of Bedouin Groups	ESIA / Consultant	Bilateral Interviews	The key Bedouin groups that are known within the Project area include El-Ma'aza tribe. Meetings undertaken investigated and discussed the following: ▪ Land use activities and details that are undertaken in the area (refer to Section 8.2) ▪ Obtain socio-economic information on such Bedouin groups (refer to Section 8.12) ▪ Other views, issues of concern and requirements for the Project site
	Initial Planning / Developer	Bilateral Interviews	Initial discussions and agreements were undertaken between the Developer and such Bedouin groups for integration in the Project to include in specific provision of security arrangements at this stage.
General Petroleum Company	ESIA / Consultant	Bilateral Interviews	The Project site is located within a concession area for oil exploration and an area with extensive petrolatum activities. In general, the company stressed their keenness to cooperate and provide services as applicable to the Project. In addition, throughout such meetings the following was investigated and discussed: ▪ Formal and informal land use planning for the Project site (refer to Section 8.2) ▪ Infrastructure and utility elements in the Project site (refer to Section 8.9) ▪ Potential for flood risks within the Project site (refer to Section 8.3) ▪ Other views, issues of concern and requirements for the Project site
	Initial Planning / NREA and Developer	NREA and Developer	NREA signed a coordination of work agreement with the General Petroleum Company which identifies obligations on both entities for use of lands and undertaking of activities within a 700km2 area (in which the Project site is located).
Ras Ghareb Water Company	ESIA / Consultant	Bilateral Interviews	Meetings undertaken investigated and discussed the following: ▪ Water supply to the project (refer to Section 8.9) ▪ Any water related infrastructure and utility elements in the Project area (refer to Section 8.9) ▪ Other views, issues of concern and requirements for the Project site
Ras Ghareb Electricity Company	ESIA / Consultant	Bilateral Interviews	Meetings undertaken investigated and discussed the following: ▪ Any electricity related infrastructure and utility elements in the Project area (refer to Section 8.9)

			▪ Other views, issues of concern and requirements for the Project site

5.5.2 Public Disclosure Session

Once the Draft ESIA has been completed, a public consultation session was held in GoS in Ras Gharib City, Red Sea Governorate (Orchidia Hall) on 24th February 2020. The objective of the session included the following:

- Introduce the Project to stakeholders;
- Identify the key anticipated impacts;
- Present the methodology for the ESIA study;
- Present key outcomes and conclusions; and
- Allow interested stakeholders to comment on the scope of work undertaken, key issues identified and any other issues of concern they might have.

The list of invitees was identified jointly between RCREEE in coordination with the ESIA consultant and included EEAA Headquarter and regional branch, New and Renewable Energy Authority (NREA), environmental office of the Governorate, other governmental entities, local community representatives and other. In coordination with the ESIA Consultant, invitees were informed of the date and location of the Public Consultation. Participants were invited through:

- Invitations sent by the ESIA consultant to governorate stakeholders by fax
- Invitations sent by RCREEE via e-mails
- Telephone communication by the ESIA Consultant
- An advertisement in an official daily newspaper as presented in the figure below (Gomhoryia Newspaper).

In total, seventy-five (75) people attended the public disclosure session to include around 63% males and 37% females. The table below, provides a summary of the entities that attended the session. A non-technical executive summary of the ESIA was prepared and distributed to the attendees. Sample photos of the session are presented in the figure that follows.

Table 5-4: Distribution of Participants

Entity	No.	Percentage
EEAA	3	3
EEAA - Red Sea	4	6
EETC	1	1
RCREEE	3	4
NREA	3	4
Ras Ghareb City Council	7	9
Local Community representatives	48	65
Red Sea Wind Energy Company	4	5
ESIA Consultant	2	3
Total	75	100

Figure 5-1: Newspaper Advertisement

Figure 5-2: Selected Photos of the Session

The session was moderated by the following key entities: (i) Red Sea Wind Energy Company Representatives (as the Developer); (ii) RCREEE representatives; and (iii) ESIA consultants (ECO Consult and EcoConServ)

The public consultation began with a welcoming speech by Mr. Ahmed Khalil (RCREEE representative). Following that, Mr. Amr Syed (Developer representative) presented the project in details (to include location,

key components, phases, etc.) and also discussed the company's social responsibility program aimed and its keenness to contribute in the field of vocational education and training. Finally, the ESIA consultant (ECO Consult & EcoConServ) presented in details the ESIA study to include methodology adopted, outcomes of E&S baseline surveys, key impacts anticipated and outcomes of the impact assessment, key mitigations and monitoring requirements to be implemented, and other as appropriate.

After the presentations above, an open discussion took place where the attendees were given the chance to comment on the ESIA and its outcomes, results and conclusions. The table below, presents a summary of the key comments raised during the construction as well as the response on such comments.

Table 5-5: Key Outcomes and Responses of the Public Disclosure Session

Issue	Questions and comments	Responses
Avi-fauna and Birds	*Dr. Osama Al Jabali* *Director of the Migratory Soaring Birds Project, the Ministry of Environment.* He emphasized the strategic importance of the project site as one of the main passages for bird migration in the Red Sea region and stated that the project is located within the second most important paths for migratory birds. He further explained that the layout* indicated that the distribution of the turbines irregularly in rows at the project site would hinder the avi-fauna monitoring and turbine shutdown during operation when required. In addition, he stated that there must be escape corridors for the birds between the turbines as required in the SESA. *It is important to note that the comment raised above is related to a previous layout that was considered and included within the ESIA and presented in the disclosure session and which is presented in Figure 7-4 in 'Section 7.3' (and not the current and final layout presented throughout the document and in Figure 3-4.	It was explained that as part of the ESIA an avi-fauna survey has been undertaken during the fall season (fall 2019). It was further explained that additional avi-fauna surveys are being undertaken for 3 additional seasons (spring 2020, fall 2020 and spring 2021) and results will be studied and appropriate mitigations will be identified (as discussed in Section 8.5). It was further explained that the distribution of turbines differs from the western region of the project and the eastern region due to the topographical nature of the land in the western area. Nevertheless, the layout takes into account the recommendations of the SESA which identifies 'migration corridors' as space between wind farms in the area to enable large soaring birds to safely migrate over the coastal desert plains and continue migration during spring and autumn time and seasons. Such 'migration corridors' have been avoided and no turbines were placed within such area (refer to Section 7.3 for additional details).
	Why was the third plot of land designated for the project not included in the distribution of the turbines?	The Developer agreed that redistributing the turbines on the three plots will be better, however, the wind energy in the third plot is weak, which increases the loss of electricity. Therefore, the third plot of land was not used to reduce the loss of produced electricity, although the bird's corridors was taken into account in the two plots of land plans to be used as discussed above.
	The cumulative impact of wind energy projects in the region should be taken into consideration	It was explained that cumulative impacts of wind energy project in the region have been considered as part of the SESA. The key outcomes and recommendations of the SESA in relation to cumulative impacts from wind farm developments

Issue	Questions and comments	Responses
		have been taken into account and reiterated within the ESIA study.
Socio-economics	*Mahmoud Hussein Baghdadi* *Chairman of the Board of the Educational Administration in Ras Gharib City* He stressed the importance of the project to open new fields of investment in the area to contribute of solving the unemployment problem in the city	It was explained that the project is expected to provide at least job opportunities for local communities, which in turn may contribute to improving the standard of living. However, it was also stressed that the socio-economic development of the area is not hinged on a single project but rather on implementing collective and coordinated actions, including other development projects within the area. More importantly, it was explained that the ESIA (as discussed in 'Section 9.13) recommends that the Developer adopt and implement an action plan with the local community that addresses the following: - Managing expectations so that the local communities close to the project site have priority in obtaining job opportunities from the project according to the project's employment needs, - Determine the number of job opportunities for skilled and unskilled workers that target the local community during the construction and employment stages, - Provide transparent recruitment procedures to the local community. Such measures must provide equal opportunities for all, - Provide details of additional areas that local community members can participate in, as well as job opportunities for those with the required skills and experience (for example hiring local contractors) - Consider implementing a social responsibility program.
	Khaled Abu AlHajjaj *General Administration of Environmental Affairs in the governorate* The jobs required for the project must be announced in a clear place for the people of Ras Gharib, so that they can know about it	
Occupational Health and Safety	*Ras Gharib community members* stressed in their comments on the importance of maintaining occupational safety and health for workers because it can affect community health and safety	It was explained that during the construction and operation phase, there will be a possibility of general occupational health and safety hazards for workers that may increase the risk of injury resulting from accidents. This includes risks of working at altitudes, electric shocks and burns, movement of machinery, etc. In addition, it was further explained that the ESIA (as discussed in 'Section 8.10') study requires that the EPC Contractors and Project Operator prepare a detailed project and site-specific occupational health and safety plan for the construction and operation phase. The objective of the plan is to ensure the health and safety of all workers and prevent to the greatest extent possible any incidents or accidents onsite.

Issue	Questions and comments	Responses
Energy Supply	*Adel Abdul Hamid* *Director of Administrative Affairs Department, Ras Gharib City Council* Will the city of Ras Ghareb benefit from the energy produced from the project?	It was explained that the project allows for more sustainable development, and shows the government's commitment to achieving its energy strategy and meeting the goals set for renewable energy sources. The project will contribute to increasing energy security by relying on inexhaustible natural energy resources, and most importantly, they are independent sources. More importantly, it was explained that such benefits are not limited to Ras Gharib only, but it covers the entire region.
Flood Risks	*Adel Abdul Hamid* *Director of Administrative Affairs Department, Ras Gharib City Council* Did the ESIA study focus on flood risk onsite?	It was explained that as part of the ESIA study, a preliminary flood risk assessment was undertaken that included review of secondary data, field investigations as well as consulting with the concerned departments of Ras Gharib City Authority to find out the current map of the flood paths in the project area. The assessment concludes that there are no flood risks onsite.
Associated facilities	*Mohamad Akmal* *New and Renewable Energy Authority NREA* Who is responsible for conducting the ESIA of the OHTLs from the project, to study in particular the impact of these lines on the bird's migration	It was explained that the ESIA did not include the OHTL given that key official information was not available or provided at the time of undertaking of the associated surveys and assessments as part of the ESIA (e.g. route, specifications number of towers, etc.). Therefore, a standalone ESIA will be undertaken at a later stage once such required information is available and provided by the relevant entity.
Biodiversity	*Al Matwli Shahat* *Environmental Affairs Agency, the regional branch of the Red Sea* It is important to take into account the fauna and flora in the area and if there are any sensitive or important habitats, before starting construction work, especially with fluctuating rains	It was explained that as part of the ESIA, a biodiversity baseline assessment was undertaken (to include flora and fauna) based on desktop review and site survey. Results indicate that the project site is of low ecological importance and no major or sensitive habitats were observed and all recorded flora and fauna were in general considered common and typical for such habitats. In addition, it was further explained that another biodiversity survey will be undertaken in spring 2020 and results will be updated within the "Analysis and Assessment of the Potential Risks and Impacts on Habitats and the Biodiversity" report to be submitted at a later stage. Refer to Section 8.4 for additional details.
Land Use	*Al Matwli Shahat* *Environmental Affairs Agency, the regional branch of the Red Sea* The main roads should be taken into account in anticipation of future expansion plans for the area.	It was explained that the official plans for the Project area have been studied as part of the ESIA, and the results indicate that the official plans in the local unit in Ras Ghareb stipulate that the area has been allocated to the New and Renewable Energy Authority NREA to develop wind energy projects. The project does not conflict with any formal plan that has been prepared for the use of land by various government agencies, so the project will not have impacts on the official use of land. In addition, the ESIA identified

Issue	Questions and comments	Responses
		some infrastructure and utility elements onsite and the ESIA also identified additional measures to be taken into account which include mainly that the Developer coordinate through NREA and EEAA with the concerned authorities to take into account within the design appropriate requirements to prevent impacts on the infrastructure elements recorded in the area. Refer to Section 8.2 for additional details.

As required by EEAA, in addition to the above session, the ESIA Consultant also communicated with the following key stakeholder groups in specific and provided them with a Non-Technical Summary (NTS) on the ESIA and its outcomes. The objective was to also obtain any concerns, inquires or comments on the ESIA and the Project from such stakeholder groups in specific.

Table 5-6: Stakeholder Response for Additional Consultations Undertaken

Entity	Response
Ras Gharib City Council	No specific concerns, inquiries or comments were provided to date
Ras Ghareb Water and Wastewater Company	No specific concerns, inquiries or comments were provided to date
Environmental Management Unit – Ras Ghareb City Council	Stated that after review of all documentation provided, there are no comments or concerns to be taken into account as part of the ESIA study.
General Petroleum Company – Ras Gharib Office	Stated that after review of all documentation provided, there are no comments or concerns to be taken into account as part of the ESIA study.
Roads Management Unit – Ras Gharib City Council	No specific concerns, inquiries or comments were provided to date
Armed Forces – Ras Gharib	No specific concerns, inquiries or comments were provided to date
CBO representatives / Environmental Protection Association at Ras Ghareb	Stated that after review of all documentation provided, there are no comments or concerns to be taken into account as part of the ESIA study. However, stated that Project should consider social responsibility programs for Ras Ghareb city. This has been taken into account – refer to "Section 9.13" for additional details.

5.6 Future Stakeholder Engagement and Consultation

Future stakeholder engagement and consultations will mainly include the following, each of which is discussed in further details below: (i) disclosure of the E&S documents; (ii) public disclosure sessions; and (iii) implementation of the Stakeholder Engagement Plan (SEP) by the Developer.

5.6.1 Disclosure of the ESIA document

The final ESIA, Non-Technical Summary (NTS) and the SEP will be disclosed on the Developer's website. Such documents will be disclosed for a minimum of 60 calendar days to allow any stakeholder to review the studies and comment on the scope of work undertaken, key issues identified and any other issues of concern they might have. At the end of the disclosure period, all received comments will be addressed and taken into account and an updated ESIA will be provided.

5.6.2 Stakeholder Engagement Plan

Stakeholder Engagement is an on-going process that involves: stakeholder analysis & planning, disclosure & dissemination of information, consultation & participation, grievance mechanism, and on-going reporting to Affected Communities. A Stakeholder Engagement Plan (SEP) is developed and implemented that is scaled to the Project risks and impacts and development stage, and be tailored to the characteristics and interests of the Affected Communities and key stakeholders.

The SEP for the Project describes the planned stakeholder consultation activities and engagement process and includes the following:

- Define the Project's approach to future stakeholder engagement;
- Identify stakeholders within the area influenced by the Project;
- Profile identified stakeholders to understand their priorities;
- Propose an action plan for future engagement with identified stakeholders; and
- Set out the grievance/project complaints mechanism.

The Developer is committed to implementing the requirements of the SEP throughout the lifetime of the Project. The SEP is provided as a standalone document.

6 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

This chapter first provides an overview of the environmental clearance process for the Project as governed by the environmental legal requirements of the Egyptian Environmental Law 4 of 1994 amended by Law 9/2009 and its executive regulations No. 338 of 1995 modified by Prime Minister Decree no. 1741/ 2005, modified in 2011/2012 and 2015 as well as the EEAA Guidelines for Environmental Impact Assessment (EIA) issued 2009.

The Chapter then discusses the regulatory context which is directly related to environmental compliance which must be adhered to by all parties involved in the Project throughout the planning and construction, operation, and decommissioning.

The Chapter goes on to summarise the relevant international agreements and conventions to which Egypt is a signatory.

Finally, as the Project is seeking financing from prospective lenders, this Chapter highlights the environmental and social policies and requirements of the potential lenders and IFIs which must be adhered to by the Developer.

6.1 Regulatory and Policy Framework at the National Level

6.1.1 Egyptian Environmental Institutional Framework

Egyptian Environmental Affairs Agency (EEAA)

The EEAA is an authorised state body regulating environmental management issues. Egyptian laws identify three main roles of EEAA:

- A regulatory and coordinating role in most activities, as well as an executive role restricted to the management of natural protectorates and pilot projects.

- The responsibility of formulating the environmental management (EM) policy framework, setting the required action plans to protect the environment and follow their execution in coordination with Competent Administrative Authorities (CAAs).
- The responsibility of EEAA in reviewing and approving the ESIA studies for new projects/expansions undertaken as well as monitoring the implementation of the ESMP.

Environmental Management Unit (EMU)

The Environmental Management Unit (EMU), at Governorate and district level, is responsible for the environmental performance of all projects/facilities within the Governorates premises. The Governorate has established EMUs at both Governorate and city/district levels. EMUs are responsible for the environmental protection within the Governorate boundaries. They are mandated to undertake both environmental planning and operation-oriented activities. EMU is mandated to:

- Follow-up the environmental performance of the projects within the Governorate during both construction and operations phases to ensure the project is in compliance with the laws and regulations as well as with the mitigation measures included in its ESIA approval.
- Investigate any environmental complaints filed against projects within the Governorate.
- EMUs are administratively affiliated to the Governorate, yet technically to EEAA. EMUs submit monthly reports to EEAA with their achievements and inspection results.
- The Governorate has a solid waste management unit at Governorate and district level. The units are responsible for the supervision of solid waste management contracts.

Competent Administrative Authorities (CAAs)

The Competent Administrative Authorities (CAAs) are the entities responsible for issuing licenses for project construction and operation. The ESIA is considered one of the requirements of licensing. The CAA for this project is NREA. NREA is thus responsible for receiving the ESIA studies, checking the information included in the documents concerning the location and for the suitability of the area to the project activity. It is also responsible for ensuring that the activity does not negatively impact the surrounding activities and that the location is in compliance with the ministerial decrees related to the activity. NREA forwards the documents to EEAA for review and to issue its response in 30 days period. They are the main interface with the project proponents in the ESIA system. The CAA is mandated to:

- Provide technical assistance to Project Proponents
- Ensure the approval of the Project Site
- Receive ESIA Documents and forward it to EEAA
- Follow-up the implementation of the ESIA requirements during post construction field investigation (before the operation license).

Other related national government & permitting authorities

Table 6-1: Other Related National Government & Permitting Authorities (Consultant, 2019)

Entity	Scope
Egyptian Electricity Transmission Company (EETC)	Purchase of electrical energy produced from power plants, which authorizes local and foreign investors to create, and sell them on the ultra-effort networks. The implementation of projects for the electricity transmission.
New & Renewable Energy Authority (NREA)	NREA act as the national focal point for expanding efforts to develop and introduce renewable energy technologies to Egypt on a commercial scale together with implementation of related energy conservation programs.

	NREA is entrusted to plan and implement renewable energy programs in coordination with other concerned national and international institutions within the framework of its mandate
General Petroleum Company	A national State-owned company engaged in exploration, production and development of hydrocarbons, is responsible for the management of oil and gas exploration and production activities on behalf of the State. It is one of the subsidiary companies affiliated to the Ministry of Petroleum It has the right of concession for petroleum exploration in some parts of the project area and adjacent areas Represents the main investment activity in the project area
Ministry of Defence: Army Intelligence force, Border guards	They also provide permissions to get into the desert area Secure and support the project
Red Sea Governorate	The main role of the governorate is supporting the project by providing the various permissions needed, and infrastructure maps in case if needed.
Ras Gharib City Council	Give permits for any construction Provide maps of the floods in the area Supervision and follow-up from the Environmental Department in Ras Ghareb City Council during the construction phase. Coordinate with them to solid waste disposal through the construction contractors (In the case of contracting with them)
Water and wastewater Company in Ras Ghareb	Provide the project needs of water and wastewater disposal during the construction phase; through the construction contractors (In the case of contracting with them)
Civil Aviation	Issuing a permit for height requirements and warning signs
public health: Directorate of Health in Red Sea Governorate, Ras Ghareb General Hospital	They provide the health services and facilities to the local districts
Manpower Directorate: Labour Office in Red Sea Governorate	Data of the labour force in Suez Governorate and complaints of workers Monitor labour recruitment standards during construction
Roads Directorate in Red Sea Governorate	Services and development of external roads in the governorate Issuing permits for any construction work on the external roads
Ministry of Interior	MI is responsible for national and local security, as well as approving emergency response and firefighting plans for establishments/projects
EEAA	Issues the Environmental approval for the project Monitors the compliance with the conditions of approval
Ministry of Electricity and Renewable Energy	The ministry of electricity is the responsible entity for the generation, transmission and distribution of electricity in Egypt, under which operates NREA, Egyptian Electricity Holding company and EETC
Ministry of Environment	The ministry of Environment is the entity responsible for the formulation of environmental policies. The preparation of necessary plans for environmental protection and environmental development projects and following up on the implementation of all of the above. Under the ministry, the EEAA and the Nature protection bureau operate.
Ministry of petroleum and mineral resources	The ministry of petroleum is the entity responsible for the supervision of the exploration, production, marketing and distribution of oil, gas and other natural resources
Ministry of Antiquities	The ministry of antiquities is the entity responsible for the preservation and protection of the heritage and ancient history of Egypt, under which operates all inspector offices in the governorates
Red Sea Governorate antiquities inspector offices	First contact in case of any chance finds during construction Responsible for protecting and managing antiquities in the area

6.1.2 Egyptian Environmental Clearance Process

The ESIA is governed by the Law No. 4 of 1994 and its amendments, the Law on Protection of the Environment and its Executive Regulations 1995 and its amendments (Prime Ministers Decree 338). According to Law 4 of 1994, applications for a license from an individual, company, organization or authority, an assessment of the likely environmental impacts of development projects should be undertaken. An ESIA is required for all electricity generation projects including renewable energy projects.

Based on the categorisation of development projects included within the Guidelines for EIA issued by the EEAA in 2009, wind farm projects are considered under Category C projects (projects with high potential impacts) which require undertaking a full ESIA including public scoping and consultation activities, in addition to a public disclosure with an Arabic executive summary.

The ESIA process is set according to the guidelines issued by the EEAA including: EIA Guidelines (2009), and the Environmental Impact Assessment Guidelines and Monitoring Protocols for Wind Energy Development Projects along the Rift Valley/Red Sea Flyway with a particular reference to wind energy in support of the conservation of Migratory Soaring Birds (MSB) (2013). The ESIA process is stipulated in the figure below.

Upon submission of the ESIA report by the ESIA Practitioner to the CAA in charge of issuing licences, sends the EIA to EEAA for evaluation. The EEAA shall review the ESIA and provide comments or feedback within 30 days. The CAA in charge of issuing licences in case of wind power projects is the NREA.

After submission of an ESIA for review, EEAA may request revisions in the ESIA report within 30 days, including additional mitigation measures, before issuing the report approval.

Furthermore, it is important to mention that specific legal requirements for wind park construction are defined in the Law No. 101/1996, Building Construction and Decree No. 326/1997.

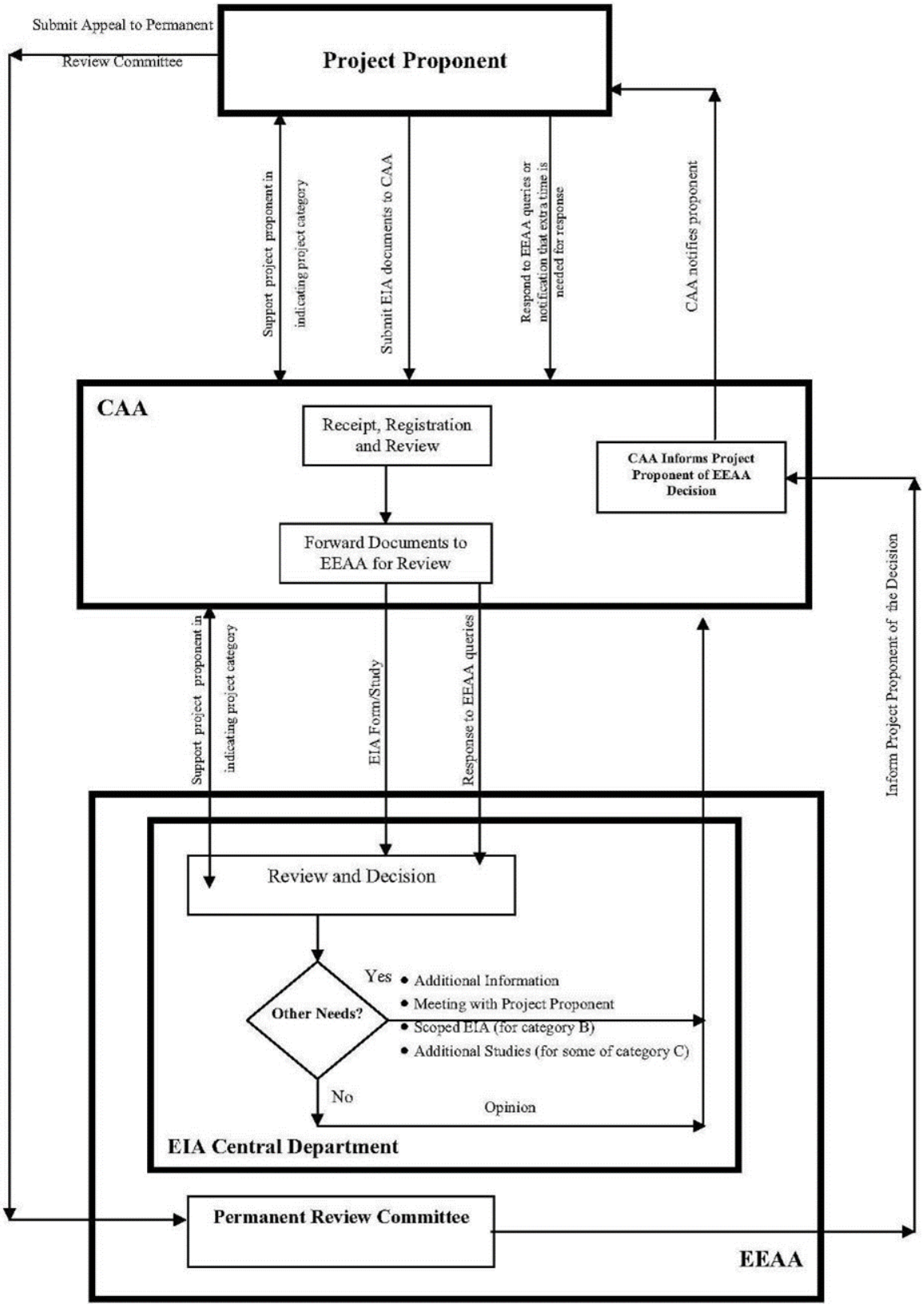

Figure 6-1: ESIA Process Followed for Development Projects in Egypt, (EEAA EIA Guidelines, 2010)

6.1.3 Egyptian Environmental and Social Regulatory Context

This section lists those legislations that are directly related to environmental and social compliance that must be adhered to by all parties involved in the Project throughout the planning and construction, operation, and decommissioning phase. These legislations include: (i) those issued by EEAA (laws, regulations and instruction), and (ii) the relevant national legislations issued by other line ministries (laws, regulations, instructions, standards).

The table below lists the key relevant legislation and regulator/entity relevant to each of the environmental and social parameter being studied and assessed within this ESIA. Throughout the following Chapters, reference to the requirements set out within those legislations is provided under each relevant parameter.

Table 6-2: National Legislation and Guidelines Governing the E&S Compliance for the Project during all Phases (Consultant, 2019)

Legislation	Relevant Article	Requirements
Land Use		
Electricity Law 87/2015	Article 53	▪ stipulates the right of proper compensation for the affected persons due to the establishment of Electricity projects
	Article 55	▪ Identifies the Right of Way that should be avoided for the OHTL and the underground cables: - 25 meters from the centre for extremely high voltage OHTL - 13 meters from the centre for the high voltages OHTL - 5 meters for the medium voltage OHTL - 5 meters for the high and extremely high voltage cables - 2 meters for low and medium voltage cables ▪ The Owner of the land should be compensated in case of land acquisition. The right of way stated in article 55 should be abided by
Law 10/1990	The project will not entail any land acquisition activities	▪ The main site is located on a state-owned land which does not trigger any expropriation activities, according to law no. 10/1990.
Law 577/1954	Law 577/54, later amended by Law 252/60 and Law 13/162	▪ Establishes the provisions pertaining to the expropriation of real estate property for public benefit and improvement. ▪ The project will not entail any land acquisition activities
Civil code 131/1948	Articles 802-805	▪ Recognises private ownership right. - Article 802 states that the owner, pursuant to the Law, has the sole right of using and/or disposing his property. - Article 803 defines what is meant by land property - Article 805 states that no one may be deprived of his property except in cases prescribed by Law and would take place with an equitable compensation. ▪ Land for the Project was allocated by NREA and was not previously owned and thus no compensation would be needed
Unified Building Law No. 119 of year 2008	Article 39	▪ Apply and a receive the construction permit before start of the implementation ▪ Ensure that all designs abide by the building codes of Egypt
Geology, hydrology, hydrogeology		
Law 4/1994	Article 33 of the Executive regulations of Law 4/1994	▪ The owner of the project is responsible to decontaminate the area/soil in case of relocation or decommissioning
Management of solid waste and hazardous waste generated from the facility during generation, handling, transportation and disposal		
Law 4/1994 amended by Law 9/2009 and ER 1095/2011 amended by Decree 710/2012)	Articles 28, 29, 33, 37, 39	▪ Identification: Using the HW lists issued by the competent authority. ▪ Minimization: strive to reduce quantitatively and qualitatively the generation of the HW

		▪ Segregation: HW is to be separated from other types of non-hazardous waste. In addition, the different types of HW must not be mixed together. ▪ On site Storage: HW is to be stored in a designated area, and containers must be made of suitable materials and be properly sealed to avoid any leakages or spills into the surroundings. ▪ Off-site transportation: HW is to be submitted to authorized HW contractors. ▪ Obtaining a license from the competent authority to handle Hazardous waste
	Article 22 and Article 17 of the Executive Regulations	▪ The establishment should maintain an environmental register in accordance with Annex 3 of the Executive regulations
	Article 39 and Article 41 of the Executive Regulations	▪ Article 39: The establishment should maintain the cleanliness of garbage bins and vehicles. Garbage collection bins shall be tightly covered and waste shall be transported at suitable intervals. ▪ Article 41: The establishment shall undertake necessary precautions to secure the safe storage and transportation of waste. These precautions include the following: - Construction waste storage is to be carried out at site such that it does not obstruct movement of vehicles and personnel. - waste subject to emission should be covered to avoid air pollution - waste is to be submitted to authorized waste contractors
	Articles 26, 28 and 29 of the Executive regulations	▪ The establishment should maintain a register for the hazardous waste should be maintained as well as record for the hazardous substances used
Control of the wastewater discharge into the sewage system and public network.		
Ministerial Decree 44/2000, Decree of Law 93/1962	Article 14	▪ The law prohibits the disposal of domestic, industrial and commercial wastewater, treated or untreated, in public drainage system without obtaining a prior approval. ▪ Article 14 of the executive regulations set the parameters required regarding the quality of the wastewater discharged to the public sewage network. ▪ The owner of the project should abide by the limits stated in article 14 of the Executive regulations of Law 93/1962
Biodiversity, Birds, and Bats		
Law 4 of 1994	Article 28, as amended by Law 9 of 2009. Annex 4 of the Executive Regulations of law 4/1994, amended by Prime Minister Decree 1095 of 2011	▪ Defines fauna and flora which are forbidden to be hunted or disturbed. ▪ Ensure that no species are being disturbed and implement all mitigation measures needed to reduce the impact on any fauna and flora in the vicinity of the project
Environmental Impact Assessment Guidelines and Monitoring Protocols for Wind Energy Development Projects along the Rift Valley/Red Sea Flyway with a particular reference to wind energy in support of the conservation of Migratory Soaring Birds (MSB)	Section One Guidelines for Environmental Impact Assessment for Wind Energy Development in Egypt 1.5 Description of EIA Study Components for Wind Farm Projects – 0.7 Project Environmental Setting	▪ Defines the ecological components of plant, animals and their habitats, including threatened species and areas that have been identified as protected areas or IBAs and requests the review IUCN Red List of Threatened Species. ▪ Defines baseline information requirements for birds at Wind Farm Projects.
	Section Two Guidelines on Mitigation, Monitoring and Training 2.2 Monitoring Protocols	▪ Defines standard methods and models to predict risk for migratory birds. ▪ Define standard methods used in pre- and post-construction studies of Wind Energy Facilities are focused on assessing impacts on birds.

		▪ Define standard protocol to be implemented building on results of species recorded and numbers of passage birds recorded during studies.
Archaeology and cultural heritage		
Law 117/1983	Article 1	▪ Defines a monument as a building or movable property produced by different civilizations or by art, sciences, literature and religions from prehistoric era and during successive historical eras until a hundred years ago or historical buildings.
	Article 2	▪ States that any building or movable property that has an historical, scientific, religious, artistic or literary value could be considered as a monument whenever the national interest of the country imposes its conservation and maintenance without adherence to the time limit contained in the preceding Article no.1
	Article 5	▪ States that the Supreme Council of Antiquities (SCA) is the competent authority responsible for antiquities in Egypt.
	Article 20	▪ States that license of construction in archaeological sites or land is not permitted. It is prohibited to make any installation or landfill or digging channels, construct roads, agricultural land or for public benefits in the archaeological sites or land within its approved border lines. ▪ The Article additionally, states that a buffer zone around the monument or the site is defined as three kilometres in the uninhabited areas or any distance determined by the SCA to achieve environmental protection of the other parts of the monument in the surroundings (article 20-Ch.1). ▪ The provisions of this article (20) apply on land which appears to the SCA - based on conducted studies – that there is a probable existence of monuments in the subsoil. ▪ The provisions of this article are also applied to desert and areas where quarrying work is licensed.
	Article 22	▪ States that license of construction in the immediate vicinity of archaeological sites within populated areas could be delivered by the competent authority, after the approval of SCA. ▪ The competent authority must state in the license the conditions which the SCA emphasizes to guarantee that the building does not have a negative visual impact on the monument and its direct buffer zone protecting the archaeological and historical surroundings. ▪ The SCA has to pronounce its verdict on the license demand within 60 days of the date of submission. Otherwise, the elapsing of this period is regarded as a decision of refusal.
	Article 23	▪ States that the SCA should take the necessary steps to expropriate land that is found in or kept in place and registered according to the rules of this Law. (Article 23-Ch.1). [These rules are defined in the second chapter of the Law 117 – articles 26-30]. ▪ The Ministry of State for Antiquities must be notified in the event that an unrecorded ruin is found by any person (Article 23).
	Article 24	▪ States that everyone finding by chance part or parts of a monument in its place must promptly inform the nearest administrative authority within forty-eight hours. ▪ Although there are no cultural heritage areas in the site vicinity, the ESIA report will refer to relevant regulations for unexpected cases of chance finds.
Air quality and noise		

Law 4/1994 amended by Law 9/2009 and ER 710/2012	Article 42 of Law 4/1994 amended by Law 9/2009 Article 44 of ER 710/2012	▪ Maximum allowable limits for ambient noise intensity and maximum exposure duration
	Article 38 of ER	▪ Open burning of garbage and non-hazardous solid waste is strictly prohibited, and garbage and solid waste shall only be dumped or treated in designated areas away from residential, industrial, agricultural and waterways.
		▪ Dumping areas should be bound by a wall, away from obstruction, traffic and pedestrians and take into account the coverage of volatile soil so as not to cause air pollution. ▪ Transporting waste and dust resulting from excavation, demolition and construction in special containers or using transport vehicles prepared and licensed for this purpose. ▪ (A) The vehicle shall be equipped with a special box or a tight cover that prevents the spread of dust and debris to the air or falling on the road. ▪ (B) The vehicle shall be equipped with special equipment for loading and unloading. ▪ (C) The car should be in good condition according to the rules of safety, durability and lights and equipped with all safety devices. ▪ Ensure that the places to which this type waste transported so that a distance of not less than 1.5 km from the residential areas and be of a low contour level and settled after filling and filling.
ERs (amended by Decree 1095/2011 amended by Decree 710/2012)	Annex 5	▪ Maximum limits of ambient air pollutants
	Annex 6	▪ Permissible limits of air pollutants in emissions
	Annex 8 and Annex 9	▪ Maximum allowable limits for air emissions, heat stress, ventilation rates within the work environment
Modified ERs (710/2012) of Law 4/1994	Article 37	▪ Maximum allowable limits for exhaust gases from machines, engines and vehicles.
Law 4/1994	Article 36	▪ It is prohibited to use machines, engines or vehicles whose exhaust emissions exceed the limits set by the executive regulations of this Law.
Law 4/1994 and its modified ERs	Article 35 of Law 4/1994 and article 34 of its modified ERs	▪ Maximum allowable limits for ambient air pollutants stated should be met by the contractors and operator throughout the lifetime of the plant.
Infrastructure and utilities		
Petroleum pipelines Law 4/1988	Decree 292/1988	▪ The owner of a property should allow the passing of pipelines transporting liquid or gaseous hydrocarbons beneath the ground surface in accordance with the procedure mentioned in the executive regulations
	Article 2	▪ Specifies that no buildings or trees, other than agricultural land trees, should be constructed or planted at a distance less than 2 m on each side of the pipeline inside urban and 6 m on each side of the pipeline outside the urban areas. ▪ If it is necessary to place the pipelines at a closer distance than what is specified in the law, it is allowed through a decision from the chairman of Egyptian General Petroleum Corporation (EGPC); taking into consideration the necessary safety precautions. ▪ also specifies that if the activities done in accordance to the law will result in damage to the property, the owner has the right to a fair compensation to be decided by a committee formed by a decision from the Minister of Petroleum, and the executive regulations include the guidelines for compensation estimation.
Occupational health and safety		

Law 4/1994	Articles 43 – 45 of Law 4/1994, which address air quality, noise, heat stress, and the provision of protective measures to workers.	▪ The owner of the project should abide by the limits stated in Annex 7 of the Executive regulations ▪ In case the limits are exceeded, special protective equipment should be made available (earmuffs, masks…) (Annex 9) ▪ In case the limits are exceeded, the workers should have rests as specified by the limits (especially for noise and vibration from electric jack hammers or any other ramming equipment) ▪ Conduct regular medical check-ups for workers that are facing noise, vibration or heat stress exceeding the limits
Law 12/2003 on Labour and Workforce Safety	Articles 80-87	▪ Regulates working hours and rest times for workers ▪ The working hours shall include a period of one or more meals and rest not less than one hour in total and the period shall not exceed five consecutive hours. The competent minister may, by a decision, determine the cases or works which are imperative for technical reasons or operating conditions. ▪ Work hours and rest periods should be organized so that the period between the beginning and the end of working hours does not exceed ten hours per day. ▪ Work shall be organized at the facility so that each worker shall receive a weekly rest of not less than 24 hours after six working days at most. In all cases, weekly rest shall be paid. ▪ The employer shall put on the main doors used by the workers for entry, as well as in a visible place in the establishment a schedule showing the weekly rest day, working hours and rest periods for each worker and the amendment to this schedule.
	Book 3 - Single worker contract: Article 32	The employer shall be obliged to issue the contract in writing in Arabic in three copies. The employer shall keep one and deliver a copy to the worker. In particular, the contract shall include the following data: ▪ Name of employer and place of work. ▪ The name of the worker, ▪ his qualification, ▪ his profession or craft, ▪ his insurance number, ▪ his place of residence and what is necessary to prove his identity. The nature and type of work being contracted. ▪ If there is no written contract for the worker, the unit to prove his rights, all methods of proof. The employer shall be given a receipt for the papers and certificates he has deposited with him.
Law 12/2003 on Labour and Workforce Safety and Book V on Occupational Safety and Health (OSH) and assurance of the adequacy of the working environment	Minister of Labour Decree 48/1967. Minister of Labour Decree 55/1983. Minister of Industry Decree 91/1985 Minister of Labour Decree 116/1991.	▪ The owner of the project is bound with the provision of protective equipment to workers and fire-fighting/emergency response plans. Moreover, the following laws and decrees should be considered: ▪ The contractors should have appropriate number of first aid kits in relation to the size of the site and the number of workers on site
	Article 211 and article 34 of the Decree of the Minister of Labour and Manpower no. 211/2003	▪ The establishment should prepare records/reports/register for chemical safety
Law 137/1981	Article 117	▪ The employer should inform his workers of the hazards associated with non-compliance with safety measures
Decree 458/2007		▪ Egyptian Drinking Water Quality Standards should be met for all water bought and stored on site for the workers' use.

Socio-economics		
Law 94/2003		▪ The Law on Establishing the National Council for Human Rights (NCHR) aims to ensure respect, set values, raise awareness and grant observance of human rights. ▪ At the forefront of these rights and freedoms are the right to life and security of individuals, freedom of belief and expression, the right to private property, the right to resort to courts of law, and the right to fair investigation and trial when charged with an offence. ▪ This Constitution came into force after a public referendum on 11th September 1971 and was amended on 22nd May 1980 to introduce the Shoura Council and the press.
EEAA EIA guidelines	▪ Paragraph 6.4.3.1 Scope of Public Consultation ▪ Paragraph 6.4.3.2 Methodology of Public Consultation ▪ Paragraph 6.4.3.3 Documentation of the Consultation Results ▪ Paragraph 7 Requirement and Scope of the Public Disclosure	▪ Conduct a public consultation as part of the ESIA study according to the EEAA guidelines methodology. The involvement of the public and concerned entities in the EIA planning and implementation phases is mandatory for Category C projects through the public consultation process with concerned parties. ▪ Preparation of the Public Consultation Plan before starting the consultation activities in the EIA scoping phase, the project proponent prepares a plan indicating the methodology of the public consultation to be adopted in the two public consultation phases (EIA scoping phase and consultation on the draft EIA). The plan should indicate the concerned parties that will be consulted, method of consultation and other points. ▪ An individual chapter in the EIA will be prepared for public consultation ▪ Disclosure of relevant material is an important process and should be undertaken in a timely manner for all Category C projects. This process permits meaningful consultations between the project proponent and project-affected groups and local NGOs is required to take place. Before the public consultation on the draft EIA, the draft technical summary in Arabic should be disclosed to all concerned parties.

6.1.4 International Agreements

Egypt has signed and ratified a number of international conventions committing the country to the conservation of environmental resources and protection of workers' health & safety and labour rights. The following Table lists the key conventions:

Table 6-3: Relevant international Conventions and agreements to which Egypt is a signatory (Consultant, 2019)

Name of Multilateral Environmental Agreement	Date
Biodiversity and Natural Resources	
International Plant Protection Convention	1951
Agreement for the Establishment of a Commission for Controlling the Desert Locust in the Near East	1965
Convention on Wetlands of International Importance Especially as Water Fowl Habitat (RAMSAR)	1971
Convention Concerning the Protection of the World Cultural and Natural Heritage	1972
Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)	1973
Convention on the Conservation of Migratory Species of Wild Animals	1979
Protocol to Amend the Convention on Wetlands of International Importance Especially as Water Fowl Habitat	1982
Convention on Biological Diversity (CBD)	1992
Agreement for the Establishment of the Near East Plant Protection Organization	1993
United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa	1994
Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean	1995
African Convention on the Conservation of Nature and Natural Resources (revised)	2003
International Tropical Timber Agreement	2006

Name of Multilateral Environmental Agreement	Date
Hazardous Materials and Chemicals	
Convention Concerning Prevention and Control of Occupational Hazards Caused by Carcinogenic Substances and Agents	1974
Convention on the Prohibition of the Development, Production and Stock-Piling of Bacteriological (Biological) and Toxin Weapons, and on their Destruction	1972
Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and their Disposal	1976
Convention on the Prohibition of Military or any other Hostile Use of Environmental Modification Techniques	1976
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	1989
Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa	1991
Amendment to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	1995
Stockholm Convention on Persistent Organic Pollutants (POPs)	2002
Atmosphere, Air Pollution and Climate Change	
Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space Including the Moon and Other Celestial Bodies	1967
Vienna Convention for the Protection of the Ozone Layer	1985
Montreal Protocol on Substances that Deplete the Ozone Layer	1987
(London) Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	1990
United Nations Framework Convention on Climate Change	1992
(Copenhagen) Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	1992
Kyoto Protocol	1997
Paris Agreement under the United Nations Framework Convention on Climate Change	2015
Health and Worker Safety	
International Labour Organization Core Labour Standards	1936
Convention Concerning the Protection of Workers Against Ionizing Radiation	1960
Convention Concerning the Protection of Workers Against Occupational Hazards in the Working Environment due to Air Pollution, Noise and Vibration	1977
Occupational Safety and Health Convention	1979

6.2 Requirements for Project Financing

6.2.1 Summary of Different IFI Environmental and Social Requirements

The IFI providing financing for the GOSII Project has not been identified yet. The ESIA Practitioner considered different IFIs and reviewed their environmental and social requirements. Summary of findings is provided in the table below.

Table 6-4: Summary of Different IFI Environmental and Social Requirements (Consultant, 2019)

European Bank for Reconstruction and Development (EBRD)
▪ In accordance with EBRD's 2014 Environmental and Social Policy, EBRD seeks to ensure, through its environmental and social appraisal and monitoring processes, that the projects it finances: - Are socially and environmentally sustainable; - Respect the rights of affected workers and communities; and - Are designed and operated in compliance with applicable regulatory requirements and good international practice. ▪ To translate this objective into successful practical outcomes, EBRD has adopted a comprehensive set of Performance Requirements (PRs) covering key areas of environmental and social impacts and issues. ▪ EBRD is committed to promoting European Union (EU) environmental standards as well as the European Principles for the Environment, to which it is a signatory, and which are also reflected in the PRs. EBRD expects clients to assess and manage the environmental and social issues associated with their projects so that projects meet the PRs. ▪ The applicable EU Directives for this project are: - EU EIA Directive (Directive 2014/52/EU) - The Birds Directive (Directive 2009/147/EC) - The Habitats Directive (Directive 92/43/EC) - The Bern Convention (June 1979) - The Aarhus Convention (June 1998) ▪ The EBRD Performance Requirements applicable to this project are: - PR 1: Assessment and Management of Environmental and Social Impacts and Issues

- PR 2: Labour and Working Conditions
- PR 3: Resource Efficiency and Pollution Prevention and Control
- PR 4: Health & Safety
- PR 5: Land Acquisition, Involuntary Resettlement and Economic Displacement
- PR 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- PR 8: Cultural Heritage
- PR 10: Information Disclosure and Stakeholder Engagement

- The EBRD developed a greenhouse gas (GHG) assessment methodology through which the GHG impact of any project is estimated. The principal objectives are to estimate the change in GHG impact that each project will have, and to demonstrate climate change mitigation benefits that a number of EBRD projects are designed to achieve. The environmental and social policy of the bank directs all clients to collect and report the data for GHG assessment of projects whose emissions might exceed 25 Kiloton of CO_2 equivalent/year. Projects that are expected to reduce GHG emission by less than 25 Kiloton of CO_2 equivalent/year may also be subject to a GHG assessment.
  (ref: EBRD protocol for assessment of greenhouse gas emissions)
- EBRD has also established The Green Economy Transition (GET) approach in 2015. The key goal of EBRD is to preserve and improve the environment, the GET approach seeks to increase the volume of green financing. The GET approach broadens the environmental dimension, emphasises innovation and makes selective use of public delivery channels to maximize. GET supports a wider range of projects whose purpose is to prevent pollution and mitigate the damage to ECO systems. The table below presents the main topics and environmental benefits of GET projects.
  (ref:
  https://www.ebrd.com/cs/Satellite?c=Content&cid=1395250237163&d=Mobile&pagename=EBRD%2FContent%2FContentLayout

World Bank (WB)

- The World Bank Environmental and Social Framework sets out the World Bank's commitment to sustainable development, through a Bank Policy and a set of Environmental and Social Standards that are designed to support Borrowers' projects, with the aim of ending extreme poverty and promoting shared prosperity.
- The World Bank Environmental and Social Policy for Investment Project Financing sets out the requirements that the Bank must follow regarding projects it supports through Investment Project Financing
- The Environmental and Social Standards set out the requirements for Borrowers relating to the identification and assessment of environmental and social risks and impacts associated with projects supported by the Bank through Investment Project Financing.
- The ten Environmental and Social Standards establish the standards that the Borrower and the project will meet through the project life cycle, as follows:
  - Environmental and Social Standard 1: Assessment and Management of Environmental and Social Risks and Impacts;
  - Environmental and Social Standard 2: Labour and Working Conditions;
  - Environmental and Social Standard 3: Resource Efficiency and Pollution Prevention and Management;
  - Environmental and Social Standard 4: Community Health and Safety;
  - Environmental and Social Standard 5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement;
  - Environmental and Social Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
  - Environmental and Social Standard 8: Cultural Heritage; and
  - Environmental and Social Standard 10: Stakeholder Engagement and Information Disclosure.

Japan International Cooperation Agency (JICA)

- JICA is an independent governmental agency that implements Official Development Assistance of Japan.
- JICA assists the economic and social growth of developing countries and promotes international cooperation through schemes including Technical Cooperation, Loan Aid, Grant Aid, Volunteer Programmes, and Emergency Disaster Relief.
- In 2010 JICA adopted a new set of guidelines for Environmental and Social Considerations (ESC Guidelines) to ensure that its assistance will lead to sustainable development.
- The basic principles behind the ESC Guidelines include the following:
  - ESC is a prerequisite for JICA's assistance
  - Respect human rights for inclusive development
  - Avoid adverse impacts
- The essential points of the ESC Guidelines include the following:
  - A wide range of impacts must be addressed including impacts on the environmental and on the society.
  - Participation of local stakeholders is crucial
  - Information on ESC must be disclosed to the public
- Standards and references
  - Host country's laws, standards, policies and plans
  - The World Bank's Safeguard Policies
  - Internationally accepted standards

European Investment Bank (EIB)

- EIB operates within and outside Europe as the financial arm of the EU. The bulk of its lending is directed towards projects in the Member States but projects elsewhere get considered so long as they align with the EU external cooperation policies, EU Sustainable Development Strategy, the Cotonou Agreement and the European Consensus on Development.
- EIB operations conform to the standards and principles defined by the EU E&S aspects.
- The EIB has adopted and developed an Environmental Statement in an effort to address its Corporate Responsibility by outlining the environmental and social requirements applied to the projects it finances.
- The Environmental Statement is the reference upon which projects are assessed and judged.
- These requirements are stipulated in the "EIB Environmental and Social Handbook", which covers the following:
  - Assessment and Management of Environmental and Social Impacts and Risks,
  - Pollution Prevention and Abatement,
  - EIB Standards on Biodiversity and Ecosystems,
  - EIB Climate-Related Standards,
  - Cultural Heritage,
  - Involuntary Resettlement,
  - Rights and Interests of Vulnerable Groups,
  - Labour Standards,
  - Occupational and Public Health, Safety and Security, and
  - Stakeholder Engagement.

International Finance Corporation (IFC)

- IFC requirements have become the de facto international environmental and social performance benchmark for project financing and are considered the most comprehensive requirements related to E&S assessments for wind projects.
- In general, other IFI institutions consider assessments undertaken according to IFC E&S requirements comprehensive and sufficient.
- For this reason, this ESIA follows the requirements of the IFC. Details about IFC stipulations are included below.

6.2.2 International Finance Corporation (IFC) Requirements and Performance Standards

ECO Consult was commissioned to prepare the ESIA for the Project in order to apply for the necessary environmental permit. This report is the ESIA report to be submitted to the EEAA. This ESIA is undertaken in accordance with the "Law No. 4 of 1994" and its amendments as well as other related national legislations.

In addition to national requirements, the international standards which are applicable to the Project include the "International Finance Corporation Policy on Social and Environmental Sustainability" (IFC, 2012) including the IFC Performance Standards (PS) and the Environmental, Health & Safety (EHS) Guidelines.

The "IFC Policy on Social and Environmental Sustainability" (IFC, 2012) sets out the environmental, health & safety and community requirements for projects financed by IFC. Through the implementation of the Equator Principles, IFC requirements have become the de facto international environmental and social performance benchmark for project financing.

IFC requirements are set out in its Performance Standards (PSs) of Social and Environmental Sustainability, which are summarized in the table below.

Table 6-5: Overview of IFC Performance Standards of Social and Environmental Sustainability

IFC Performance Standard	Key Points Relevant to the Project
PS1: Assessment and Management of Environmental and Social Risks and Impacts	PS1 underscores the importance of managing social and environmental performance throughout the life of a project by using a dynamic social and environmental management system. Specific objectives of this Performance Standard are: ▪ To identify and assess social and environment impacts, both adverse and beneficial, in the project's area of influence; ▪ To avoid, or where avoidance is not possible, minimize, mitigate, or compensate for adverse impacts on workers, affected communities, and the environment; ▪ To ensure that affected communities are appropriately engaged on issues that could potentially affect them; and ▪ To promote improved social and environment performance of companies through the effective use of management systems.

IFC Performance Standard	Key Points Relevant to the Project
PS2: Labour and Working Conditions	The requirements set out in this PS have been in part guided by a number of international conventions negotiated through the International Labour Organization (ILO) and the United Nations (UN). Specific objectives of this Performance Standard are: ▪ To establish, maintain and improve the worker-management relationship; ▪ To promote the fair treatment, non-discrimination and equal opportunity of workers and compliance with national labour and employment laws; ▪ To protect the workforce by addressing child labour and forced labour; and ▪ To promote safe and healthy working conditions, and to protect and promote the health of workers.
PS 3: Resource Efficiency and Pollution Prevention	This Performance Standard outlines a project approach to pollution prevention and abatement in line with international available technologies and practices. It promotes the private sector's ability to integrate such technologies and practices as far as their use is technically and financially feasible and cost-effective in the context of a project that relies on commercially available skills and resources. Specific objectives of this Performance Standard are: ▪ To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities; and ▪ To promote the reduction of emissions that contribute to climate change.
PS 4: Community Health, Safety and Security	This PS recognizes that project activities, equipment, and infrastructure often bring benefits to communities including employment, services, and opportunities for economic development. However, projects can also increase risks arising from accidents, releases of hazardous materials, exposure to diseases, and the use of security personnel. While acknowledging the public authorities' role in promoting the health, safety and security of the public, this PS addresses the project sponsor's responsibility in respect of community health, safety and security.
PS 5: Land Acquisition and Involuntary Resettlement	Involuntary resettlement refers both to physical and economic displacement as a result of project-related land acquisition. Where involuntary resettlement is unavoidable, appropriate measures to mitigate adverse impacts on displaced persons and host communities should be carefully planned and implemented.
PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	This Performance Standard reflects the objectives of the Convention on Biological Diversity to conserve biological diversity and promote the use of renewable natural resources in a sustainable manner. This Performance Standard addresses how project sponsors can avoid or mitigate threats to biodiversity arising from their operations as well as sustainably manage renewable natural resources. Specific objectives of this Performance Standard are: ▪ To protect and conserve biodiversity; and ▪ To promote the sustainable management and use of natural resources through the adoption of practices that integrate conservation needs and development priorities.
PS 8: Cultural Heritage	Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to protect irreplaceable cultural heritage and to guide project sponsors on protecting cultural heritage in the course of their business operations.

In addition, IFC has produced a comprehensive range of Environment, Health & Safety (EHS) Guidelines. Not only is there a General EHS Guideline document, but there are also sector-specific EHS guideline document for Wind Energy.

This EHS guidance document provides detailed management and technical recommendations with regards to Industry-Specific Impacts and Management (Environmental performance; Occupational health and safety; and Community health and safety) and Performance Indicators and Monitoring (Environmental performance; and Occupational health and safety). A summary of the relevant guidelines to this project include the following:

- *General EHS Guidelines (IFC, 2007)*: Provide common guidance's and information to users on EHS issues that are potentially applicable to all industry sectors; and
- *EHS Guidelines for Wind Energy (IFC, 2015):* Provide guidance's and information to users on EHS issues related to onshore and offshore wind energy facilities. The Guideline provides a summary of EHS impacts associated with wind energy facilities along with recommendations for their management as well as performance indicators and monitoring programs for environmental, occupational health and safety and community health and safety. Where relevant, the requirements of this guideline are reiterated clearly in

subsequent chapters that discuss the environmental attributes they relate to where national legislations are not available.

- *EHS Guidelines for Electric Power Transmission and Distribution (2007):* Provides information relevant to power transmission between a generation facility (Wind Farm in this case) 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 Guideline provides a summary of EHS impacts associated with the OHTL connecting the Wind farm with the closest substation and recommendations for their management as well as performance indicators and monitoring programs for environmental, occupational health and safety and community health and safety. Where relevant, the requirements of this guideline are reiterated clearly in subsequent chapters that discuss the environmental attributes they relate to where national legislations are not available.

Where the IFC are investors in a project, as part of their review of environmental and social risks and impacts of a proposed investment, they use a process of environmental and social categorisation. The same categorisation is also applied under Equator Principles (EP) III (June 2013) by Equator Principle Financial Institutions (EPFIs). The category also specifies IFC's institutional requirements for disclosure in accordance with IFC's Access to Information Policy. The main applicable categories are:

- Category A: Business activities with potential significant adverse environmental or social risks and/or impacts that are diverse, irreversible, or unprecedented;
- Category B: Business activities with potential limited adverse environmental or social risks and/or impacts that are few in number, generally site-specific, largely reversible, and readily addressed through mitigation measures; and
- Category C: Business activities with minimal or no adverse environmental or social risks and/or impacts.

It is considered that the Project is likely to be categorised as a Category B project.

7 ANALYSIS OF ALTERNATIVES

7.1 Site Selection Alternatives

The GoE has allocated to the NREA through Prime Ministerial Decree No. (37/4/15/14) of 2015 land for development of renewable energy projects through usufruct rights.

The area was proposed by the National Centre for Land-use Planning and was approved by the Council of Ministers. In line with the decree, the government assigned about 7,600km^2 in the GoS, east and west of the Nile, Benban and Kom Ombo regions, of which about 5,700km^2 are for wind projects (75% share) and about 1,900 km^2 for solar energy projects (25% share), This includes an area of 1,220 km^2 in the GoS with a total capacity of 3,550 MW for wind power projects (IRENA, 2018).

Of the 1,220 km^2 area in the GoS, currently an area of around 284km^2 is being developed for multiple wind farm projects as noted in the figure below. The key factors taken into account for selection of this area include the following:

- The land area is under governmental ownership and therefore does not require any land acquisition measures
- The area is mostly free from competing uses;
- The area is presumed to be one of the areas in Egypt with the highest wind power potential;
- The area mostly consists of vast desert grounds with only sparse vegetation being considered to be of limited ecological relevance;
- The geomorphology of the area is favourable for wind power development requiring limited construction and landscape modification measures;
- The access to the area can be considered to be easy requiring only limited road construction measures

Based on the above, NREA has granted the Developer full access rights to the specific Project for the development of a 500MW Wind Farm Project. Therefore, taking the above into account, there are no site alternatives that were considered by the Developer in this case.

Figure 7-1: Project Site (Red) as Part of the 284km2 Area Allocated for Wind Farm Developments (Consultant, 2019)

7.2 Technology Alternatives

This section discusses several alternatives besides the development of a wind farm project. This mainly includes other renewable energy alternatives suitable for Egypt, as well as other technological alternatives for power generation such conventional thermal power plants.

7.2.1 Renewable Energy Development Projects

As discussed earlier, the GoE has taken bold steps to adopt an energy diversification strategy with increased development of renewable energy and implementation of energy efficiency, including assertive rehabilitation and maintenance programs in the power sector (IRENA, 2018).

To this extent, in 2013, the Arab Republic of Egypt (through the Ministry of Electricity and Renewable Energy) had developed and adopted the ISES 2015 – 2035, which provides an ambitious plan to increase the contribution of renewable energy to 20% of the electricity generated by the year 2020, through hydro, wind, and solar.

Egypt enjoys favourable solar radiation intensity and it is considered one of the most appropriate regions for exploiting solar energy both for electricity generation and thermal heating applications. Similar to the wind power development process, the GoE is developing many solar development projects (to include solar Photovoltaic (PV) and concentrated solar power) through the BOO mechanism and other (such as the Feed-In Tariff mechanism). Such development projects have been identified within key areas that provide the most favourable potential and conditions for solar development – this includes but not limited to Kom Ombo, West Nile, Hurghada, Zaafarana, Benban and other.

With regards to hydropower, the main hydro resource in Egypt is the River Nile, with the highest potential in Aswan where a series of power stations are located. Within this context, several projects have been realised and several other hydroelectric plants are being developed.

Taking the above into account, with regards to the Project site in specific it is best utilised for wind power projects. According to Egypt's Wind Atlas (Wind Atlas for Egypt Measurement and Modelling 1991-2005), the country is endowed with abundant wind energy resources, particularly in the GoS area. This is one of the best locations in the world for harnessing wind energy due to its high stable wind speeds that reach on average between 8 and 10 m/s at a height of 100m, along with the availability of large uninhabited desert areas. Check figure below.

Therefore, as discussed earlier, the GoE has allocated to the NREA through Prime Ministerial Decree No. (37/4/15/14) of 2015 an area of 1,220km^2 in the GoS for wind development projects.

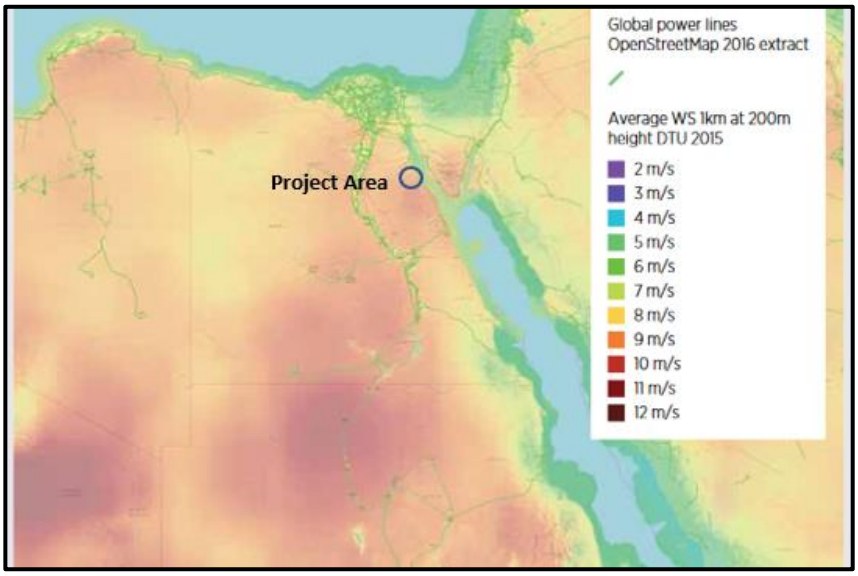

Figure 7-2: Egypt's Wind Atlas (Source: IRENA, 2018)

7.2.2 Thermal Power Plants

Other energy generation alternatives suitable to be built in Egypt include conventional thermal power plants, similar to others already existent in the country. Despite the advantages that a solution of this kind would entail - such as a potential bigger energy generation capacity or the creation of more jobs during both construction and operation - the disadvantages would be significant; especially those related to environmental impacts. Conventional thermal power plans are well known for their environmental impacts when compared to this Project and could include significantly higher water consumption, generation of air pollutants and greenhouse gas emissions, etc.

More importantly, as noted earlier such developments would not be in line with the Government's ISES 2015 – 2035" which in broad terms advocates for the diversification of energy resources and increasing the share of renewable energy to 20% in 2020.

7.3 Design Alternatives

As discussed earlier, currently an area of around 284km^2 in the GoS is being developed for multiple wind farm projects. NREA has granted the Developer full access rights to the specific Project for the development of a 500MW Wind Farm Project.

A Strategic and Cumulative Environmental and Social Assessment (SESA) was undertaken for the 284km^2 area (was carried out by the RCREEE on behalf of NREA) and the Wind Energy Developers approved by the EEAA in July 2018.

One of the objectives of the SESA was to investigate the cumulative impacts of the wind farm developments and identify constraints to be taken into account by the various developers.

The SESA investigated key E&S attributes to include biodiversity, birds, bats, land use, archaeology and cultural heritage, etc. In summary, the SESA does not identify any constraints for the Project area with the exception of recommendation for birds as discussed in further details below.

The SESA recommends that to efficiently reduce potential barrier effects of multiple wind farms in the 284km^2 area, sufficient space is maintained between wind farms to enable large soaring birds to safely migrate over the coastal desert plains and continue migration during spring and autumn time and seasons. Therefore, within

the Project site, the SESA recommends avoiding installing turbines within the allocated areas presented in red in the figure below (where a buffer distance of at least 1.6km is maintained between each plot) and also requires that at least a 1km buffer is maintained between the rows of turbines within each plot.

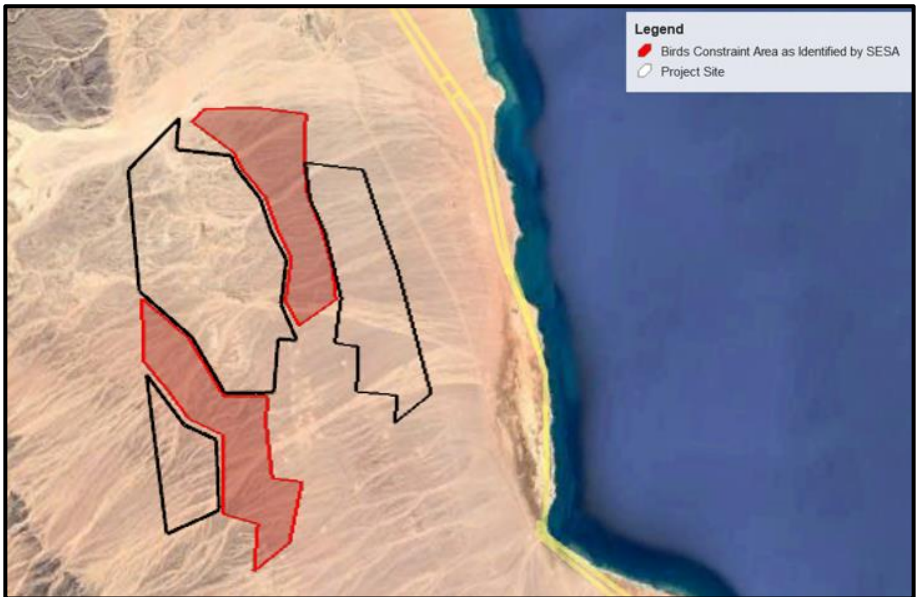

Figure 7-3: Bird Constraint Areas as Identified in the SESA (Consultant, 2019)

A preliminary layout was prepared by the Developer which took into account such buffer distance requirements and in which no turbines were placed within the red area as presented in the figure below. Apart from the E&S factors discussed above, the preliminary layout has been based on technical factors to include wind resources onsite. As noted in the figure below, the preliminary layout has avoided placement of turbines within the most south western plot due to the low wind speed in this area in specific based on the wind resources assessment.

Figure 7-4: Initial Preliminary Design for the Project (Consultant, 2019)

However, throughout the public disclosure session (as discussed previously in 'Section 5.5.2'), EEAA raised a concern on the layout stating that the turbines are not following straight lines and are not always laid out in parallel lines (check turbine S1, Q3, and P7 as an example). This issue is believed to provides challenges which could raise the risk of collision of migratory soaring birds with turbines. Firstly, this could cause confusion for on-site observers who apply the shutdown-on-demand and could cause delays or even mistakes in shutdown orders which could eventually lead to shutdown of the wrong turbines and therefore could cause collisions of birds with operating turbines. Secondly, it could cause a higher rate of collision for migratory soaring birds as some of the turbines in the layout that are not located in the parallel lines could provide a physical barrier for the birds. Therefore, EEAA required that the layout be revised to take such challenges into account.

Based on the above, the Developer prepared the final layout which takes such considerations into account. The layout meets the SESA recommendations of: (i) avoiding installation of turbines within the allocated red areas and maintaining a buffer distance of at least 1.6km between each plot (where based on the final layout the closest and minimal distane between the turbines in such buffer areas is 2km as provided in the figure below); and (ii) avoiding a buffer distance of 1km between the rows of turbines within each plot (where based on the final layout the closest and minimal distance between the row of turbines is 1.3km as provided in the figure below). In addition, the layout also ensures that all turbines are following straight lines.

However, to accommodate the above, the Developer had to add a small triangular area when compared to the initial preliminary layout presented earlier (check triangle in yellow in figure below). The area still lies within and is considered part of the SESA 284km^2 area and this was agreed and approved by NREA and EETC. It is important to note that this area in specific was also included in all E&S baseline studies undertaken as noted earlier in "Section 4.3". The figure that follows presents the final layout along with the small area that was added which now presents the final project and turbine layout as presented earlier in "Chapter 3".

No additional site-specific constraints have been identified in the SESA. In addition, one of the objectives of this ESIA is to build on the outcomes of the SESA and investigate/identify any further site-specific E&S constraints to be taken into account by the Project developer throughout the planning and design phase of the Project. However, as presented throughout the ESIA, no further site-specific constraints have been identified in relation to the Project site. Therefore, there are no additional design alternatives to be considered in relation to E&S issues. However, the ESIA identifies additional E&S requirements which must be taken into account as presented throughout the document.

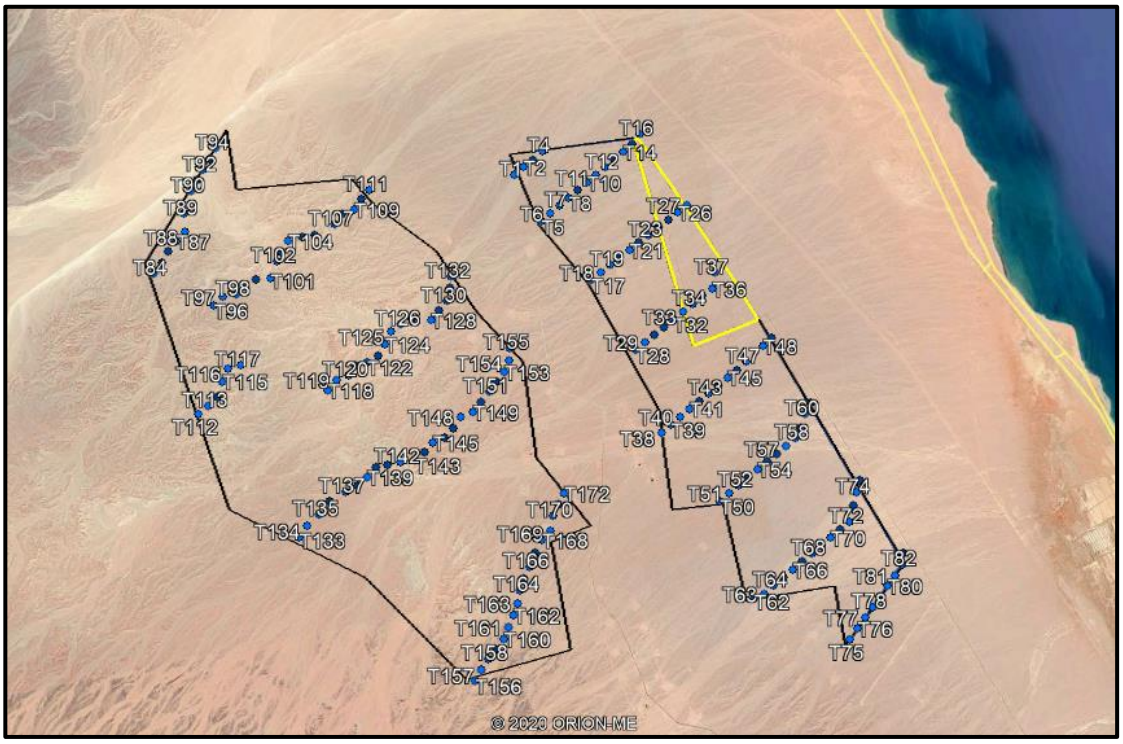

Figure 7-5: Final Project Layout

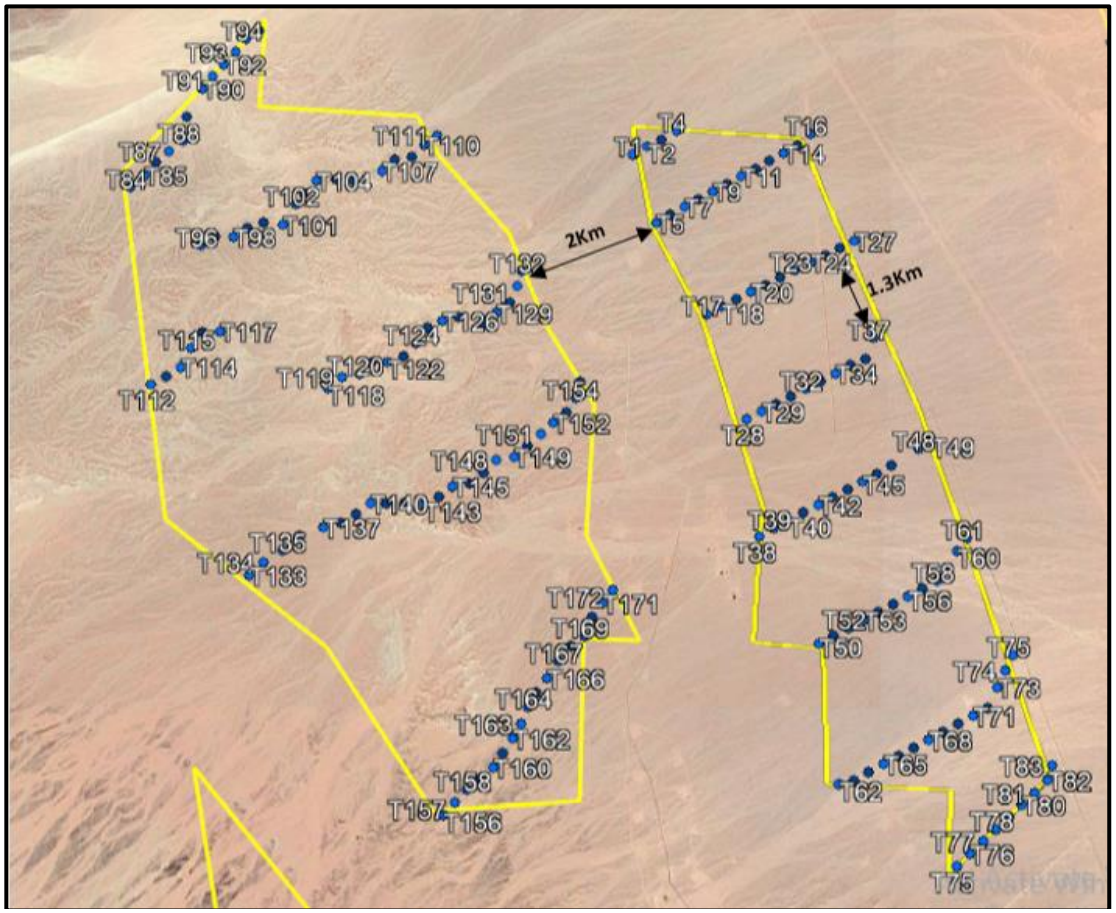

Figure 7-6: Project Layout and SESA Requirements

7.4 No-Project Alternative

The 'no project' alternative assumes that the 500MW Project will not be developed. Should this be the case, then the Project site area would remain the same. The land area would remain with its current characteristics – a vast desert grounds with sparse vegetation.

Should the Project not move forward, then the Project-related negative environmental impacts discussed throughout this ESIA would be averted. However, as noted throughout the ESIA, generally such impacts do not pose any key issues of concern and can be adequately controlled and mitigated through the implementation of the ESMP discussed in "Chapter 10". Nevertheless, should the Project not move forward; the significant and crucial positive economic and environmental benefits would not be realised. Such benefits include the following:

- This development allows for more sustainable development and shows the commitment of the GoE to realising the energy strategy;
- Contribute to increasing energy security through development of local energy resources and reducing dependency on external energy sources;
- The clean energy produced from renewable energy resources is expected to reduce consumption of alternative fuels for electricity generation, and will thus help in reducing greenhouse gas emissions, as well as air pollutant emissions; and
- Project is expected during the construction and operation phase to generate local employment and commit to other social responsibilities. As such, this is expected, to a certain extent, to subsequently enhance the socio-economic conditions and standards of living of the local communities.

In conclusion, an ESIA must investigate all potential positive and negative impacts from a project development. In the case of this Project, it is important to weigh the significant positive economic and environmental impacts incurred from the Project development, against the negative environment impacts anticipated at the site-specific level – in which generally this ESIA concludes to be minor in nature and can be adequately controlled. The comparison in this chapter clearly concludes that the 'no project' alternative is not a preferable option.

8 EXISTING PHYSICAL, BIOLOGICAL, AND SOCIAL ENVIRONMENT

8.1 Landscape and Visual

This section provides an assessment of baseline conditions within the Project site and surrounds in relation to landscape and visual.

8.1.1 Baseline Assessment Methodology

A site assessment was undertaken to characterize the general landscape and topography characteristics of the Project site. In addition, the site assessment also focused on identifying any key critical visual receptors within the Project site and a 2km radius from the area. Moreover, based on desktop review and consultations with relevant stakeholders (to include Ras Ghareb Local Governmental Unit and Red Sea Governorate), any current plans in the area as well as key visual receptors within a 15km radius from the Project site were identified.

Such distance (15km radius) was taken into account, given that based on several European guidelines and regulations, four zones of potential visual impact are identified which can be distinguished as noted in the table below (SESA, 2018). At distances greater than 10km visibility impacts are not relevant and can only be seen as minor elements in the landscape (if seen at all).

Table 8-1: Classification of Different Zones of Potential Visual Impact

Distance	Perception of tall, man-made structures	Impact
Up to 2 km	perceptible, likely to be a prominent feature in the landscape	high impact
2 to 5 km	regularly perceptible, relatively prominent	moderate impact
5 to 10 km	only perceptible in clear visibility, seen as part of the wider landscape	low impact
> 10 km	only occasionally seen in very clear visibility, only minor element in the landscape (if at all)	no relevant impact

8.1.2 Results

Landscape and Topography

Based on the site assessment, in terms of landscape and topography characteristics, the Project site can be divided into three (3) distinctive zones as presented in the figure below.

Zone 1 is can be classified as a desert area with soil that is formed from sand and rocks. In addition, this area is characterised of being composed of relatively small hills. Zone 2 can be classified as a desert area with higher rock coverage, larger flat areas, and larger Wadi systems and in addition hills located are also considered much bigger than those in Zone 1. Finally, Zone 3 is classified as a flat desert area with very small elevation differences.

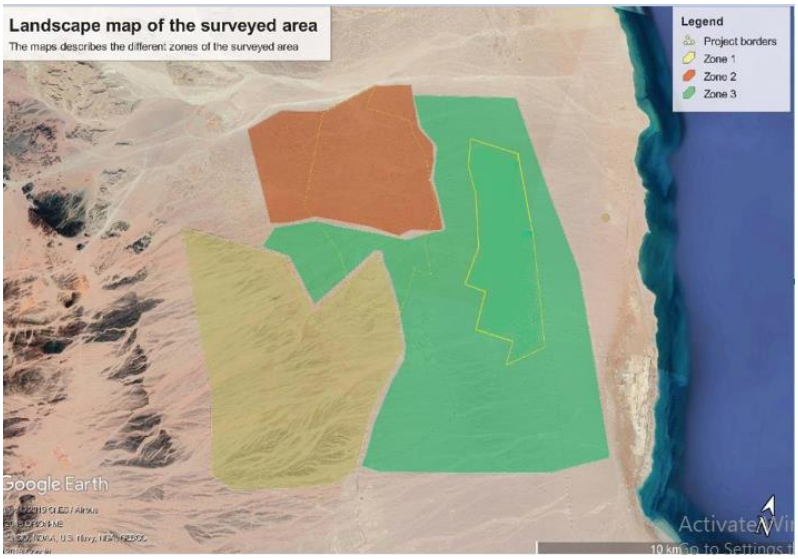

Figure 8-1: Landscape Characteristics of the Project Site (Consultant, 2019)

Figure 8-2: Typical Landscape of Zone 1 (Consultant, 2019)

Figure 8-3: Typical Landscape of Zone 2 (Consultant, 2019)

Figure 8-4: Typical Landscape of Zone 3 (Consultant, 2019)

Visual

Critical visual receptors are identified as those normally seen as valuable by the human perception and include recreational activities, environmental reserves, local community settlements, remarkable historical or cultural sites, and other.

Based on the site visit undertaken for the Project area and the 2km radius, no critical visual receptors were identified. The only facilities located include a petroleum storage facility as well as several oil rigs as discussed in further details in "Section 8.2.3" below.

In addition, based on the literature review and consultations, no critical visual receptors were identified within the 15km radius. There are several receptors located within the 15km radius as identified further in "Section 8.2.3" however those do not classify as key visual receptors. This includes an Air Force Defence Unit, several petroleum facilities and oil rig stations, other wind farm development projects, etc.

Other key critical visual receptors are located at a distance from the Project area. This includes for example: (i) closest community settlement (Ras Ghareb town located 40km to the southeast and Zaafarana village located 45km to the north); (ii) closest key archaeology/cultural heritage site (Monastery of Paul located around 20km to north), (iii) key biodiversity areas (Gabal El Zeit Important Bird Area located 20 km to south); and (iv) a touristic resort located 17km to the north.

8.2 Land Use

This section provides an assessment of baseline conditions within the Project site and surrounds in relation to land use.

8.2.1 Baseline Assessment Methodology

The baseline assessment of the 'formal' land use was based on collection of secondary data and plans available from the relevant governmental entities – this includes in particular as related to the ESIA (i) formal land use planning for Ras Ghareb; and (ii) area of critical environmental concern planning.

Understanding and characterising the informal or 'actual' land use of the Project site was mainly based on a detailed land use survey for the Project site and a 2km radius to document and understand any informal land use activities undertaken such as physical activities (houses, structures, etc.) or economical activities (such as grazing, agricultural, petroleum activities, etc.). In addition, consultations were undertaken with relevant stakeholders to further understand any informal or 'actual' land use practices as identified throughout this Chapter.

8.2.2 Formal Land Use

(i) Formal Land Use Plan for Ras Ghareb

Consultations were undertaken with the Ras Ghareb Local Unit to understand the formal land use plan set for the Project area. According to such consultations, the specified area for the project is not in the City's plan and based on current planning it has been allocated to NREA for the development of wind farm projects (as discussed earlier in "Section 7.1").

A land use plan has been prepared for the area based on available information through secondary data review. As noted in the figure below, the clusters (1-5) represent the wind farm plots that are being allocated to various developers by NREA (with Cluster 1 representing the Project site in specific). In addition, as noted there are petroleum mining blocks (represented in yellow) that are operated mostly by the General Petroleum Company. As discussed in further details below, there has been a

"Work Coordination Agreement" signed between NREA and the General Petroleum Company for the area.

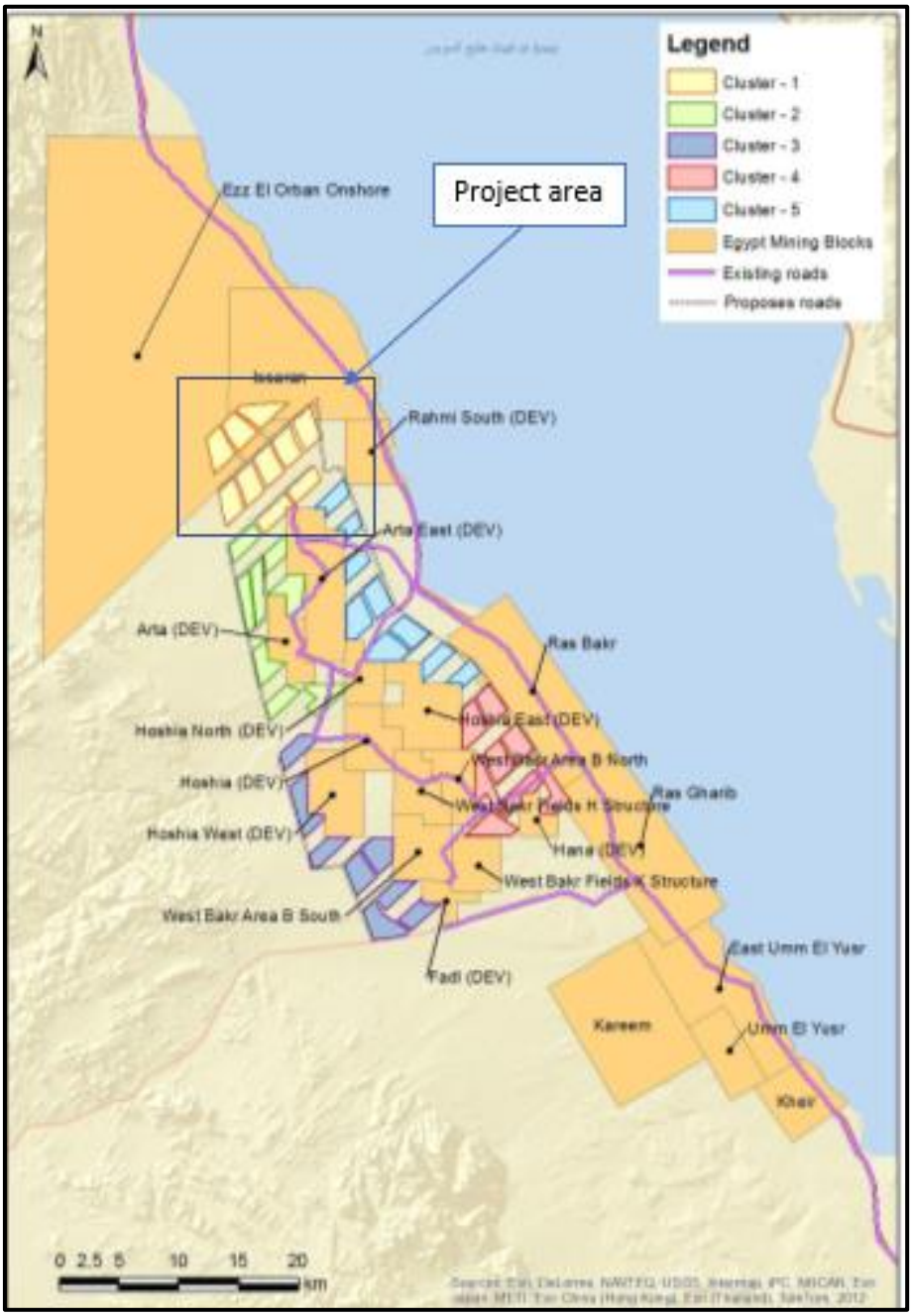

Figure 8-5: Land Use Plan Set for the Project Area (Consultant, 2019)

(ii) Areas of Critical Environmental Concern

Planning for areas of critical environmental concern is under the responsibility of the EEAA and this includes Important Bird Areas (IBAs) and natural protectorates.

The Project site is not located within or near any IBAs. Egypt has 34 IBAs and the closest IBA to the Project site is Gabal El Zeit, covering a 100-km strip along the shoreline starting 21 km north of Ras Ghareb reaching its end 50 km north of Hurghada. The Gabal El Zeit IBA is approximately 20 km away from the southernmost part of the site as presented in the figure below.

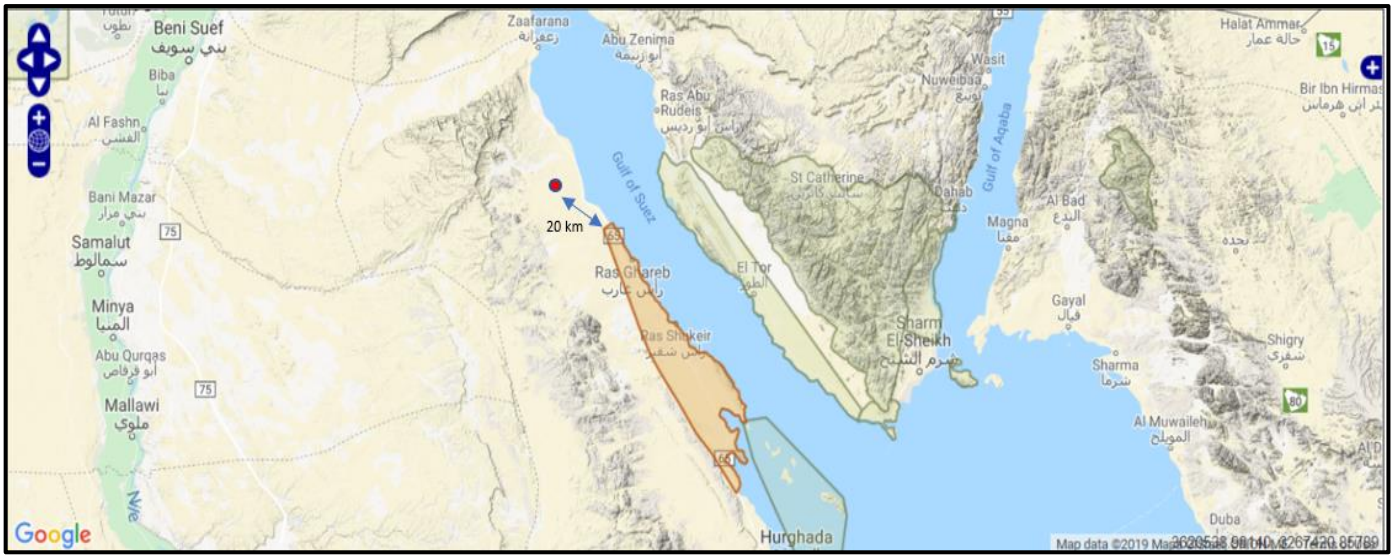

Figure 8-6: Gabal El Zeit IBA (Consultant, 2019)

In addition, the EEAA's nature protection team published in 2013 the map for all current and future natural protectorates, which is presented below. As noted, the Project location is not located within any existing or planned natural protectorates, where the closest is 80km away to include the planned natural protectorate at Ras Shukeir.

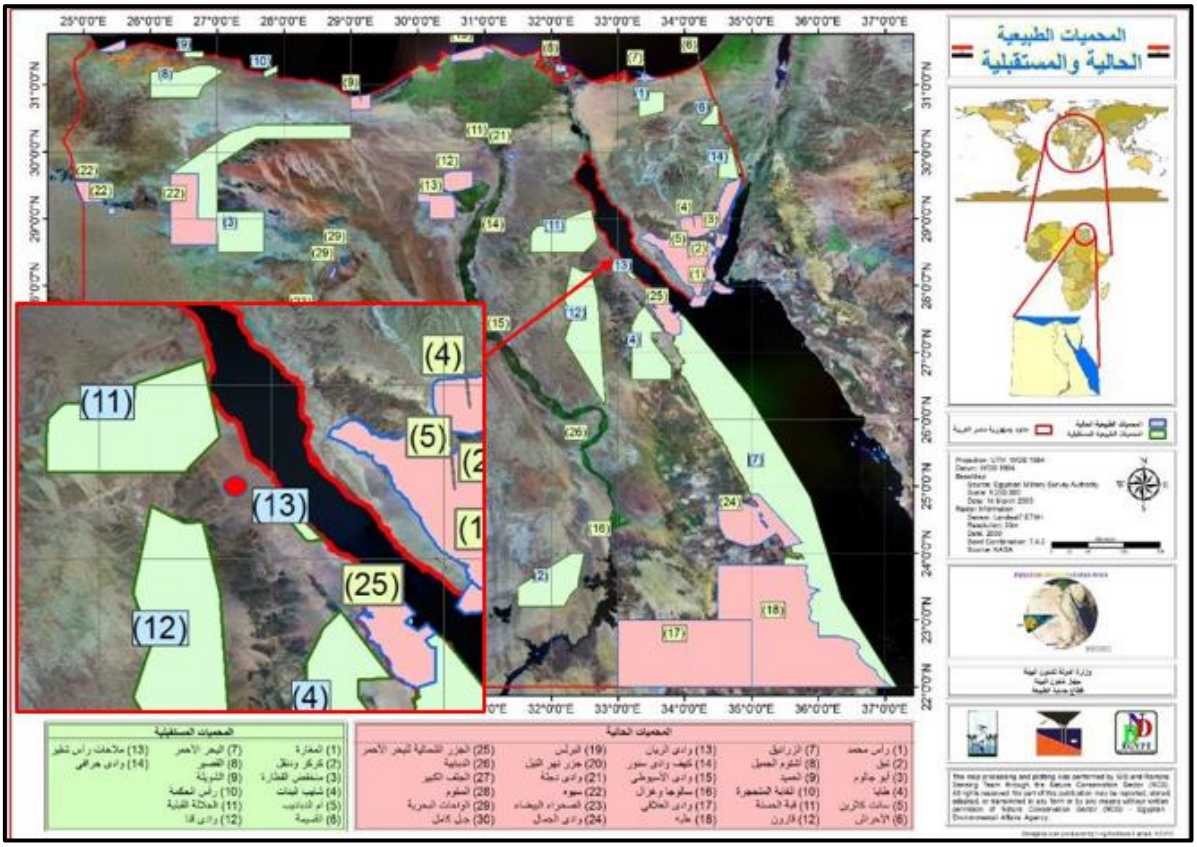

Figure 8-7: Map of EEAA Current and Future Natural Protectorates (Consultant, 2019)

8.2.3 Actual Land Use

As discussed earlier, a detailed land use survey was undertaken for the Project site and a 2km radius to document and understand any informal land use activities undertaken such as physical activities

(houses, structures, etc.) or economical activities (such as grazing, agricultural, petroleum activities, etc.).

Based on the above, the only land use activity noted within the Project site and 2km radius include the following which are also presented in the figure that follows:

- An existing petroleum storage facility located within the eastern part of the western plot of the Project site (refer to figure below). This facility includes: (i) 3 open and lined lagoons for petroleum and a pumping station; (ii) the pumping station supplies the petroleum to 5 storage tanks; (iii) tankers transport the petroleum to refineries located further away on the coast; and (iv) 1 caravan that is used when needed for rest by 4-6 workers that are onsite to fill up the tankers and monitor the storage tanks. The facility does not include any housing or accommodation structures. Another petroleum storage facility is also located around 2km south of the western plot of the Project site.
- 1 oil rig located within the eastern part of the western plot of the Project site (refer to figure below). In addition, there are around 4 oil rig stations that are located outside of the Project boundary between the western and eastern Project plots. These facilities do not include any offices or housing/accommodation structures and are mainly involved in pumping of petroleum.

Figure 8-8: Petroleum Storage Facility (Consultant, 2019)

Figure 8-9: Oil Rig (Consultant, 2019)

Apart from those receptors identified above, the area in general is uninhabited and vacant with no indication or evidence of any physical or economical land use activities throughout the Project site and its 2km radius.

In addition, land use activities in the area in general were also investigated based on review of secondary data available. Key activities noted include the following as presented in the figure below:

- Air Force Defence Unit located around 3.4km to the east. Based on available information this Air Force Defence Unit includes offices, training grounds, radar systems, mosque, and barracks for accommodation of soldiers that is likely on a rotational basis.
- Several existing petroleum activities mainly located to the north and east, closest of which is around 4.6km to the north. These activities include oil storage, transportation and oil rigs.
- Other oil rig stations (around 5) located around 3.5km to the south.
- Touristic resort located at around 17km to the north
- Sand quarry sites located around 20km from the Project site to the west
- Other wind farm projects.

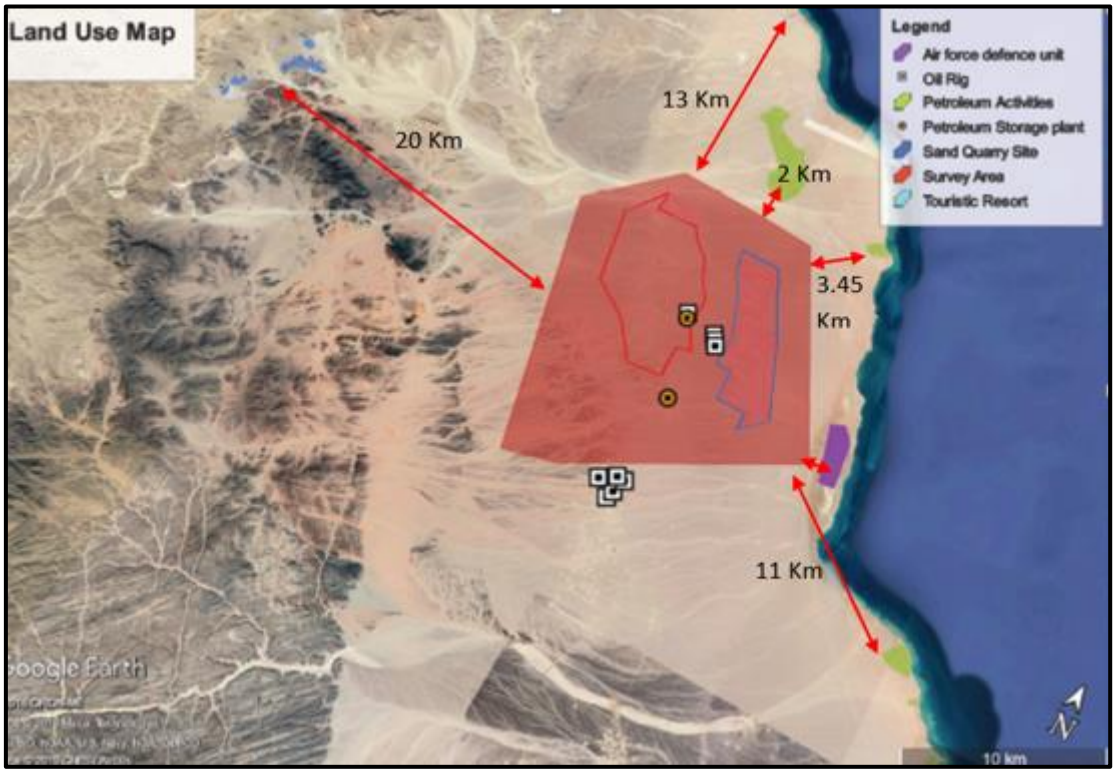

Figure 8-10: Land Use Activities within the Project Area and Surroundings (Consultant, 2019)

In addition, consultations were undertaken with key target groups and review of available secondary data to verify and further investigate any land use activities onsite.

Land Ownership

As discussed earlier, the GoE has allocated to the NREA through Prime Ministerial Decree No. (37/4/15/14) of 2015 land for development of renewable energy projects through usufruct rights. The area was proposed by the National Centre for Land-use Planning and was approved by the Council of Ministers. In line with the decree, this includes an area of 1,220 km^2 in the GoS with a total capacity of 3,550 MW for wind power projects. Of the 1,220 km^2 area in the GoS, currently an area of around 284km^2 is being developed for multiple wind farm projects.

Based on the above, NREA has granted the Developer full access rights to the specific Project for the development of a 500MW Wind Farm Project. Therefore, the land is currently under the ownership of NREA.

Ras Ghareb Local Unit and Red Sea Governorate

Based discussed earlier, consultations were undertaken with Ras Ghareb Local Unit and the Red Sea Governorate. Consultations indicated that as discussed earlier, the formal land use planning for the area includes wind farm developments through lands that have been allocated to NREA as well as oil exploration and production activities undertaken mostly by the General Petroleum Company. Based on such consultations there are no other formal or informal land use rights or activities in the Project area.

Consultation activities were conducted with the head of Ras Ghareb City Council, PR, and the Director of the Information Center at the Ras Ghareb Local Unit and with the Director of the Investment Department, the General Secretary of the Governorate and the Director of the Engineering Department.

Bedouin Groups

The key Bedouin group known in the area is the Ma'aza tribe, a tribe of Arabs that used to live in the mountain range to the west of the site as well as within the local governmental unit in Ras Ghareb. Currently, the Ma'aza tribe settle permanently in Ras Gharib town, Zaafarana and Wadi Dara. Such Bedouin groups generally engage in traditional economical activities such as agriculture and animal husbandry and in addition, they are also employed in the Development projects in the area (mainly the petroleum companies) either as guides, security guards, or contractors.

In general, local Bedouin tribes (to include Ma'aza tribe) do not abide to the legal process required to own land. Therefore, Bedouins apply a type of customary ownership which is considered illegal and which is known as Urfi Contracts and Ghafra System.

Bedouin tribes claim rights of these lands based on their knowledge of the area and the alleged history of their family living there for generations, even though they do not have official documents to support such claims. This practice is followed up by "**Urfi**" contracts however such documents are not considered by the GoE as official documents and are not considered to be supported legally. Furthermore, aiming at declaring their possession of the lands, separate houses are built and scattered in such lands. The residents construct the houses with no legal license (EcoConServ Environmental Solutions, October 2018).

In order to avoid conflicts with Bedouins, companies involved in developmental projects over lands claimed by Bedouins always try to get into certain arrangements with the tribes. Therefore, they will need to be compensated by the project owner to satisfy their custom "**Ghafra system**" which involves paying an amount of money to the Bedouins in exchange for their support in implementing their projects and providing security and protection. They can also work on various tasks related to the project (such as becoming security guards, provision of raw materials, provision of food supplies and water to the workers, etc.). In terms of engagement and information disclosure, the most important person to engage will be their community leader (i.e. the male head of the family) (EcoConServ Environmental Solutions, October 2018).

Consultations were undertaken with the head and elders of such Bedouin families. Key outcomes are summarised below:

- Currently, there are no Bedouin families currently residing at or near the Project site. Such Bedouin families currently settle in Ras Gharib town, Zaafarana, Wadi Dara. In the past there were some Bedouin communities in the area that have left since the beginning of the oil exploration activities in the area since 1938.
- There are no economic activities undertaken by Bedouin families in or near the Project site such as agricultural activities, grazing, etc.
- Bedouin families undertake security and guarding practices for existing projects and projects under construction located in the areas in which they exist based on agreements signed between the Developer or EPC Contractors and a representative of these Bedouin families.

- Bedouin tribes follow *Al-Ghafra* system when it comes to land ownership. Therefore, the positive or negative position of the Bedouin families depends on how aware the Project owner is of *Al-Ghafra* system, and other aspects of Bedouin culture. The project owner's understanding of Bedouin culture plays a major role in regulating the relationship between them and the tribes in the region.

General Petroleum Company

A Work Coordination Agreement has been signed between NREA and the General Petroleum Company in 2005 for an area of 700km^2 in which wind farm developments will take place (including the Project site). The Agreement includes several articles for the development projects to include for example:

- The General Petroleum Company has agreements for oil exploration and utilisation within concession areas located within the agreed 700km^2 area.
- Wind turbines will be allocated in rows with a distance of 1km between each row and the next
- A distance of 260m will be respected between each wind turbine
- The agreement provides the allowed specifications and depths for foundations, cables, substation, roads, etc.
- General Petroleum Company has the right to undertake surveys, measurements or any other exploration activities along with any other company associated with it. The following provisions will be ensured and met for any well drilling or survey activities: (i) ensure appropriate areas are available within the wind farms for installation of equipment and machinery to undertake required surveys; (ii) turn off turbines when required for security reasons or reduce noise impacts on survey results; (iii) provide the General Petroleum Company with final, detailed and accurate info for all infrastructure elements above and underground (e.g. cables, roads, etc.)
- Identifies areas where no wind farm development projects are allowed
- NREA will inform the General Petroleum Company before commencement of any activity of any wind farm development in the area

8.3 Geology, Hydrology and Hydrogeology

This section provides an assessment of baseline conditions within the Project site and surrounds in relation to geology, hydrology, and hydrogeology.

8.3.1 Baseline Assessment Methodology

The assessment was based on review of secondary data to include literature review of previous publications and studies related to geology, hydrology and hydrogeology. In addition, a site assessment was undertaken to confirm and verify the outcomes of the literature review and document conditions on the ground.

8.3.2 Geology

The figure below presents the geological formation within the Project site and surrounding areas which are represented by various lithologic associations ranging in age from Late Paleozoic to Quaternary.

As shown in the figure below, the rock units that could be exposed in the Project location are mainly Quaternary deposits. The Quaternary deposits cover almost all the area of the project site. These

deposits are formed of sand, gravel, clay, aeolian sand sheets and sand accumulations. They are mainly composed of clastic sediments of different textures ranging from silt to boulder size. The composition of the Quaternary deposits is mainly the weathering products of the surrounding exposed rocks. The colour of the soil cover (Quaternary deposits) reflects the source of the sediments. As the exposed rocks in the north and north-west directions (the southern part of north Galala plateau) are sedimentary and mainly of carbonates rich in chert bands (Eocene limestone) and evaporates, their withered products are light in colour rich in lime mud, chert nodules, limestone and dolomite fragments. But in the southern direction with the occurrence of the igneous rocks of the Red Sea mountain range in the far west, which consists mainly of granitic rocks rich in feldspars reddish in colour. The soil cover in this region is predominantly reddish as it consists of the weathered products of and fragments of granites.

The Quaternary sediments are the main cover of the project area on which all construction works will be built. During the field survey, with the help of geological maps and aerial photographs, the different types of soil, characteristics and their location in the project area were investigated.

The soil covering most of the area of the project site is in the form of chains of alluvium terraces. The terraces differ in their height from the floor of the wadi in addition to the type and size of their components. The terraces near the highlands in the north and west are located at higher altitudes, and the components are very close to those in the source and are large in size.

In terms of subsurface geological formations, the subsurface layers covering the Project site consists of varying thickness of depositional cycles of conglomerates, sand, silts and clay. The size of the components determines the intensity of the sediment carrier (water flow) where the thickness of the layer indicates the period of the depositional storm. The subsurface layers are described as follows:

- Valley deposits: a layer of reddish brown, silty, sandy clay with some carbonate fragments and chert gravelly size. The layer extends from the ground surface down to a depth ranging between 0.5 and 2 m below the ground surface.
- Claystone: a reddish-brown claystone or claystone and sandstone layer with hard silty clay intercalations. The claystone contained a lens of silty sand with cemented sand pieces.
- Sandstone: a brown to reddish-brown or brown sandstone layer with cemented sand pieces and/or silty clay intercalations. The sandstone layer was encountered at a depth varying between 1.00 and 3.5 m below the ground surface.
- Conglomerate: this layer is almost present at the base of each cycle. It is composed of a mixture of coarse-grained gravels to bolder size fragments of the country rocks with chert nodules impeded in a matrix of fine grain sand and clay. These layers vary in thickness from 0.5 m to more than 3 m especially at the west.

Finally, there are no active faults in the area of the project. However, some faults with a North-West to South-East trend appear in the area between Quseir and Ras Ghareb.

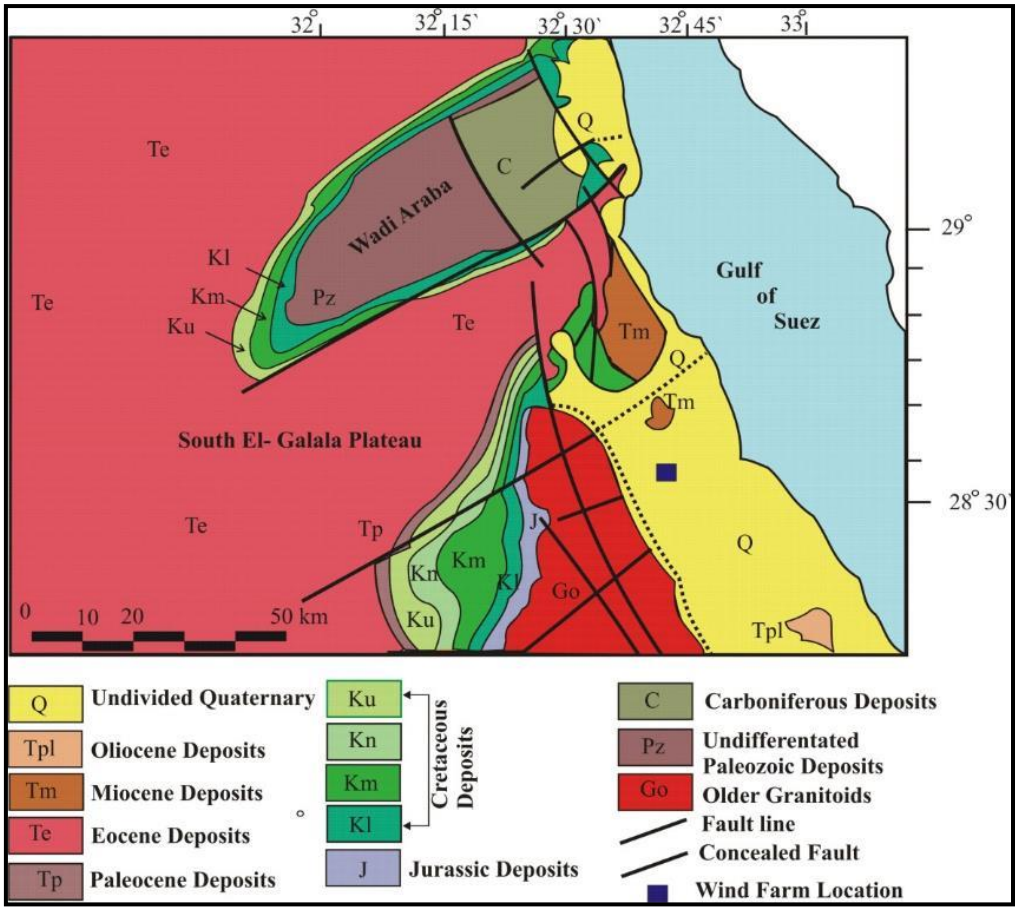

Figure 8-11: Regional Geologic Map of the Area (Modified from the Egyptian Geological Survey and Mining Authority, 1981)

8.3.3 Hydrology

The key major Wadi systems in the area include Wadi Aldahal located around 3km to the Project site and Wadi Hawashiya located around 12 km to the south of the Project site. The physiographic features of the area that includes the location of the wind farm and the surroundings could be differentiated into high, medium and low relief units as noted in the figure and described further below.

- Low Relief Unit (in which Project site is located). This unit consists of thick loose deposits and extends parallel to the shore line of the GoS. Elevation ranges from shoreline to about 350m above sea level (A.S.L) and extends from the hillslope towards the GoS at the east by a distance of about 30 km. This unit is characterised by gentle or very gentle slope toward the GoS with an average slope of about 1% traversed by numerous wide and shallow drainage lines.

  There are many different geomorphic features that characterize this coastal plain such as, numerous wide and shallow drainage lines, vague alluvial fans, sabkhas and beaches. The tidal channels are very shallow and have a straight pattern. The sabkhas lies in the low land area near the GoS and completely out of the Project site. The most important notes in this unit are the numerous traversed drainage lines with very wide and shallow courses with limited extension and malformation of the tributaries alluvial fans. This means that the quantity of rain water drained toward south and southeast is too limited. This is because the regional slope of the south Galala plateau is towards the east-southeast, so the main direction of surface flow is toward Wadi Aldahal to the north of the site, which means that no strong surface flow and low elevation of the western and north-western highs leads to accumulation of big quantity of sediments downhill forming alluvial fans.

- Medium relief unit; this unit extends from the scarp of the plateau toward the Gulf in the east and southeast direction with a distance of about 10 km and a surface ranging from 350 to 800 m A.S.L. The unit is gently curving, or straight (rectilinear) part of a hillslope, possibly interrupted or replaced by cliffs, composed of cretaceous rocks. This unit is characterized by the presence of many small, shallow and wide tributaries that drain the plateau scarp towards Wadi Aldahal and wadi Hawashiya to the north and south of the Project location, respectively. This unit is located away from the site borders by a distance from 10 to 15 km in the north, North-West and west directions. This unit is characterized by the presence of simple heights (low elevated hills) which are spaced from each other through dry and shallow wadies. The average slope gradient of this unit is about 2% toward the Gulf of Suez.
- High relief unit: is located in the northwest at a highly elevated plateau with slightly rough topography of resistant Eocene limestone (south Galala Plateau) and its southern scarp is facing the project from the northwest direction. The surface elevation of this unit is above 800 A.S.L. The average slope gradient of this unit is about 7.5%. This unit is located at a distance of more than 30 km from the northern and western borders of the site.

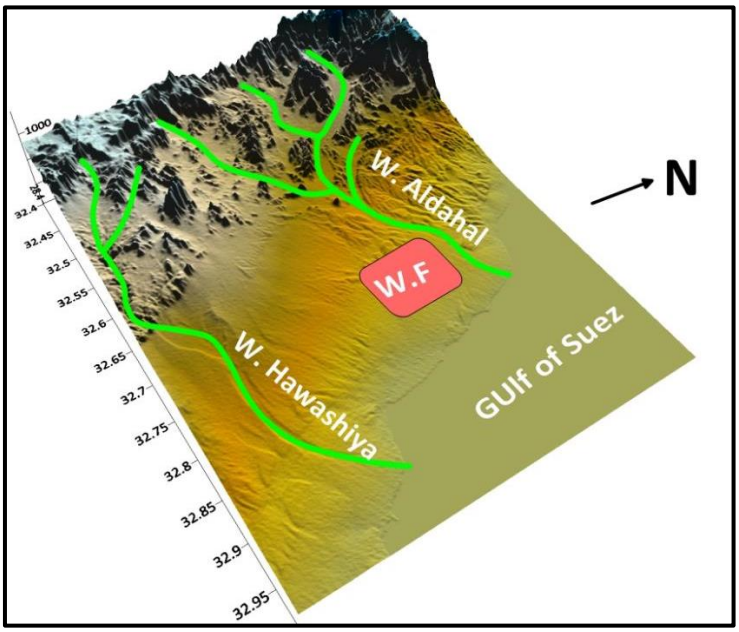

Figure 8-12: Key and Major Wadi Systems in the Area (Consultant, 2019)

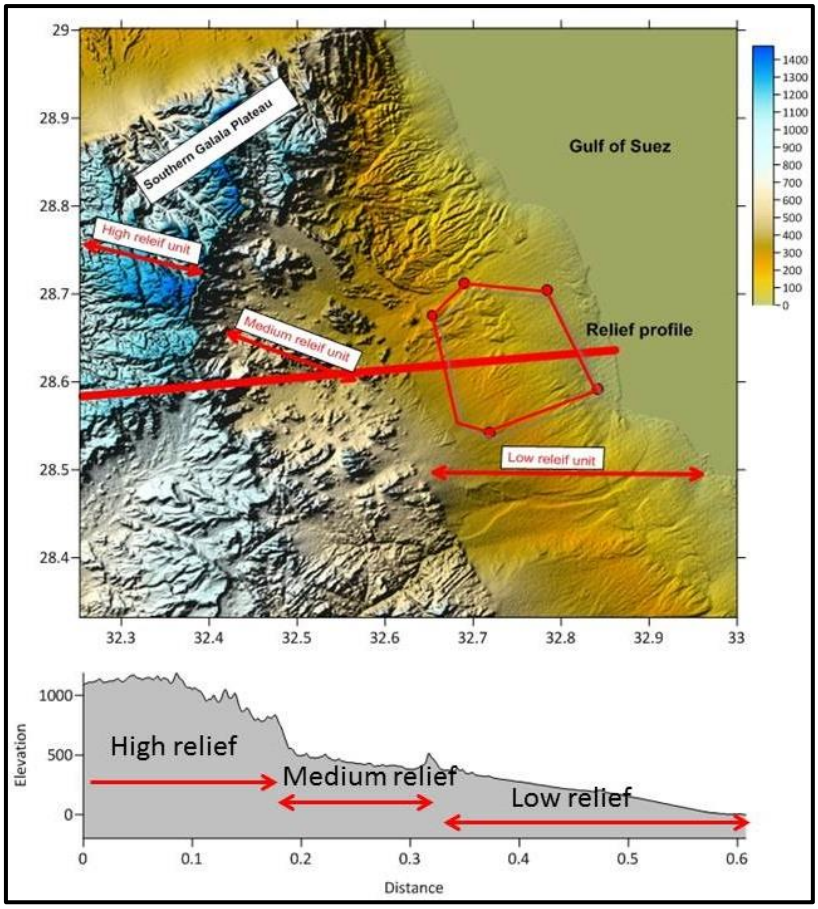

Figure 8-13: Relief Units of the Project Site and Surrounding Areas (Consultant, 2019)

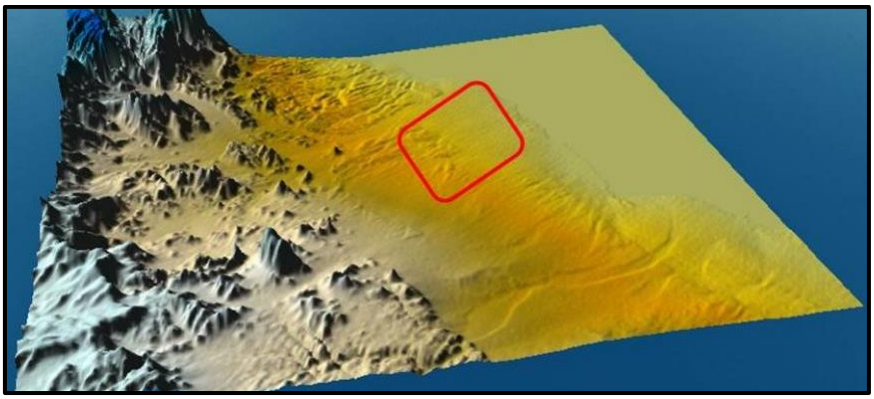

Figure 8-14: 3D Elevation Model of the Project Area and its Surrounding (Consultant, 2019)

Based on the above and investigating the Project site further through series of site visits, indicates that the area can be characterized as follows:

- Simple relief wide plain area with a very gentle slope towards Gulf of Suez.
- Complete absence of any deep drainage lines and or well-developed alluvial fans.
- No drainage lines or tributaries originating from the south Galala plateau are crossing the Project site where the closest is Wadi Aldahal that runs completely out of the site at the north. In addition, the Project site is located outside of the other key drainage lines – Wadi Hawashiye located around 12km to the south

- The main drainage lines traversing the project site are very weak, shallow and the surface signs of their existence disappears towards the GoS (as presented in the figure below)
- A complete absence of strong and well-developed geomorphic features like deep wadis, depressions, steep slope scarps, conspicuous hill heights.

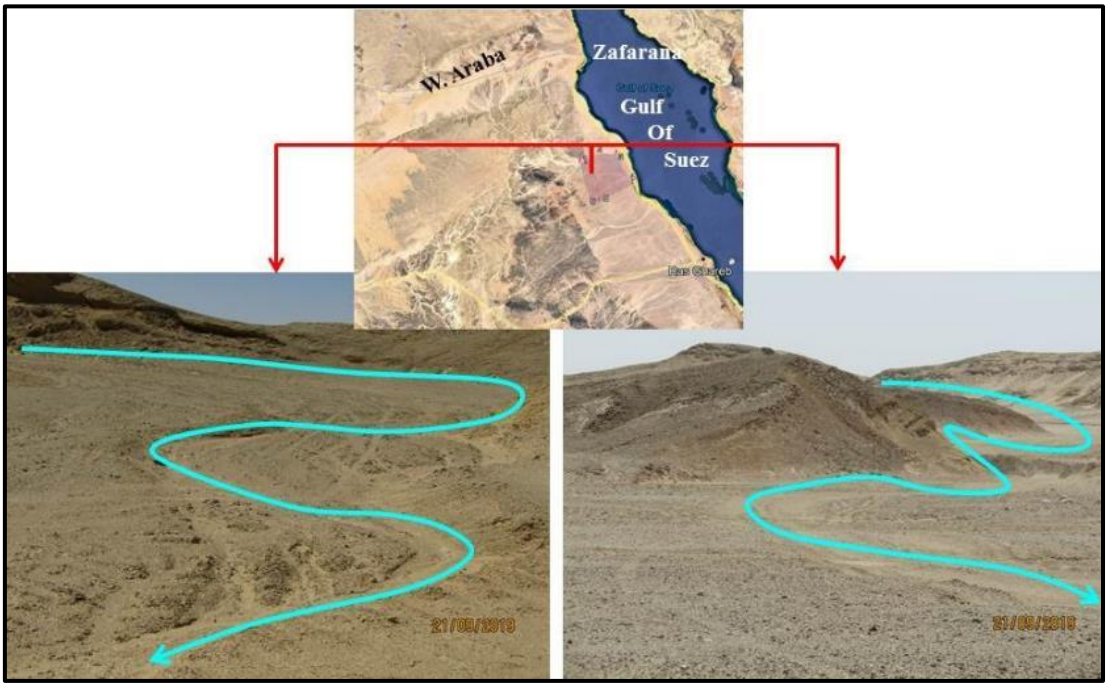

Figure 8-15: Shallow and gentle slope of drainage lines Typical in Project Site (Consultant, 2019)

8.3.4 Hydrogeology

The figure below presents the hydrogeological conditions of the Project site and surrounding areas, based on the hydrogeological map of Egypt of 1999. As noted, the Project site is located in an area of wadi deposits with moderate to low productive aquifers with insignificant surface recharge and limited sub-surface recharge. This entails that there are no shallow groundwater aquifers with a continuous source of fresh water recharge, and this is due to the lack of rain and large drainage basins to collect rainwater.

There is no utilization of groundwater in the Project site, even with the petroleum and oil companies operating in the region.

In the wide area surrounding the site, the recent well inventory and available literature show that groundwater wells are concentrated within Wadi Araba, located about 50 km north of Project site. Wadi Araba was considered as a wadi with high groundwater possibility (Aggour, 1990). Rocks belonging to Carboniferous and Lower Cretaceous sandstone represent the main source of water in the Wadi Araba Depression (Fig. 36). The water is tapped from springs, shallow wells and occasionally deep wells. The collected information from shallow groundwater wells and springs in Wadi Araba reveals that the water salinity varies between 1025 to parts per million (ppm) and 50,233 ppm.

In the GoS, groundwater is used mainly for touristic and industrial purposes. According to the rates of groundwater withdrawal with respect to water requirements, the Gulf province includes areas into which the groundwater represents 10-40% of the utilized water supplies. The daily discharge ranges from 260 to 3000 m^3/day at Wadi Araba and El Sukhna-Zafrana localities respectively *(Sewidan and Misak, 1992).* The continuous use of such water potentially stresses its quantity and quality.

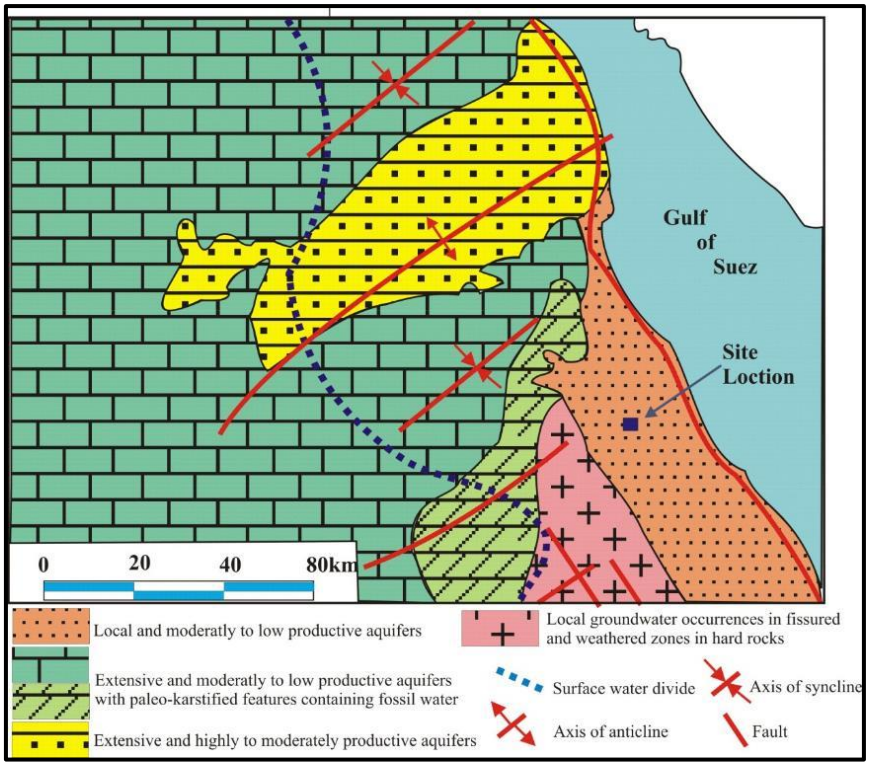

Figure 8-16: Hydrogeological Map of the Project Site and Surrounding Areas (Modified from Hydrogeological Map of Egypt of 1999, Research Institute for Groundwater (RIGW))

8.4 Biodiversity

This section provides an assessment of baseline conditions within the Project site and its surroundings in relation to biodiversity

It is important to note that biodiversity assessed in this section excludes birds (avi-fauna) and bats, which are discussed separately in "Section 8.5" and "Section 8.6" respectively.

8.4.1 Baseline Assessment Methodology

The baseline assessment of the Project site was based on a literature review and a field survey, each of which is discussed in detail below.

(i) Literature Review

This was based on previous studies, data, surveys, and records available in published scientific papers, books, and journals on flora and fauna species recorded within the study region in general. It is important to note that since the available literature on the Project site and its vicinity is relatively limited, the literature reviewed included a wide spectrum of references including international references that have a wider focus than the region of the Project. Additionally, a special consideration was given to the Strategic and Cumulative Environmental and Social Assessment for an Area of 284 km^2 at the Gulf of Suez (SESA) (2018).

(ii) Field Survey

A field survey was undertaken at the Project site during the autumn of 2019 and was followed by another assessment in spring 2020. Since the autumn season is not the most favourable season for

assessing habitats and floral and faunal elements (as opposed to spring), the focus of the field survey was mainly to identify key habitats and identify any outstanding biodiversity taxa and/or elements that could require specific focus. During the spring survey, more focus was given on identifying additional floral species other than the ones already identified during the autumn survey. The field survey mainly included the following methods:

- Field observations: the site was examined carefully for the presence of active animals, animal signs and tracts, active burrows, remains or any other vital signs that indicate the activity of animals. Due to the large size of the project site, the research team focused on areas of high priorities; mainly wadis since they are believed to be the main corridors that animals would use in moving around the site. The team carried out route-transects along the wadis searching for any of the above mentioned signs of animal presence. Similar approach was followed for the flora survey where the survey focused on sides of wadis and any areas where vegetation was noticed. However, since the survey was carried out in autumn, it was not expected to record many annual species and the survey focused on identifying perennials. In addition, the site was surveyed for occurring plant species which were noted and recorded to include number of species, coverage interception per species, etc.;
- Interviews with local people: local people of the area were interviewed and asked questions regarding well known fauna species that are likely to be present within the site.

(iii) Fauna and Flora Species status

All species recorded as part of the literature review or on-site during the field survey had their conservation status identified according to International Union for Conservation of Nature (IUCN) Red List of Threatened Species (IUCN, 2019), which provides the global conservation status of evaluated species. Since Egypt does not have national Red Lists for most taxon, the regional assessments of the Mediterranean region and North African region were reviewed for any species that could be of conservation value on the regional level.

8.4.2 Results

In accordance with the methodology discussed above, the results below discuss the findings and outcomes for flora and fauna based on the literature review and field survey.

(i) Flora

According to Olson et al (2001), the project area is located in the Desert and Xeric Shrublands Biome and more specifically in the Ecoregion of Red Sea Coastal Desert. Applying the classification elaborated by Harhash et al. (2015) to the habitats found in the project area during site visits and field surveys the whole project area must be attributed to the main habitat system “Desert”. The vast majority of the project area can be classified as “Hamada Desert” (Sub-System: “Plain Land”) that is crossed by “Valleys and Canyons” (i.e. wadis) which belong to the Sub-System “Low Land”.

According to SESA (RCREEE, 2018), the project area consists mainly of flat pebble desert cut by shallow drainage lines; wadis. As typically for desert regions, habitats are limited in diversity and coverage. Wadis, which have a relatively high level of diversity, are marked with fine sand and clay sediments deposited by old, slow surface flows. Vegetation cover in the project area was found to be extremely sparse and restricted to single drainage channels. Vegetation within the project area generally has a low species composition, density and a very patchy distribution. The wadis tend to support the most vegetation due to generally higher soil moisture levels.

According to Abd El-Ghani et al. (2014), the project site is located in what is defined as the Eastern Desert of Egypt. More specifically, the project area is located in the Red Sea Coastal Land. Climatically, the project area lies within the hyper-arid provinces (Ayyad et al., 1993). Generally, the desert

vegetation in the project area is characterised by openness and composed of a permanent framework of perennials, the interspaces of which may be occupied by ephemerals after winter rains. The appearance of ephemerals and their duration depend on the irregular rainfall. The modification of the plant cover proceeds in coincidence with the modification of the soil thickness. A thin soil will be moistened during the rainy season but will be dried in a short time. Deep soils allow the storage of some water in the subsoil providing a continuous supply of moisture for the deeply seated roots of perennials.

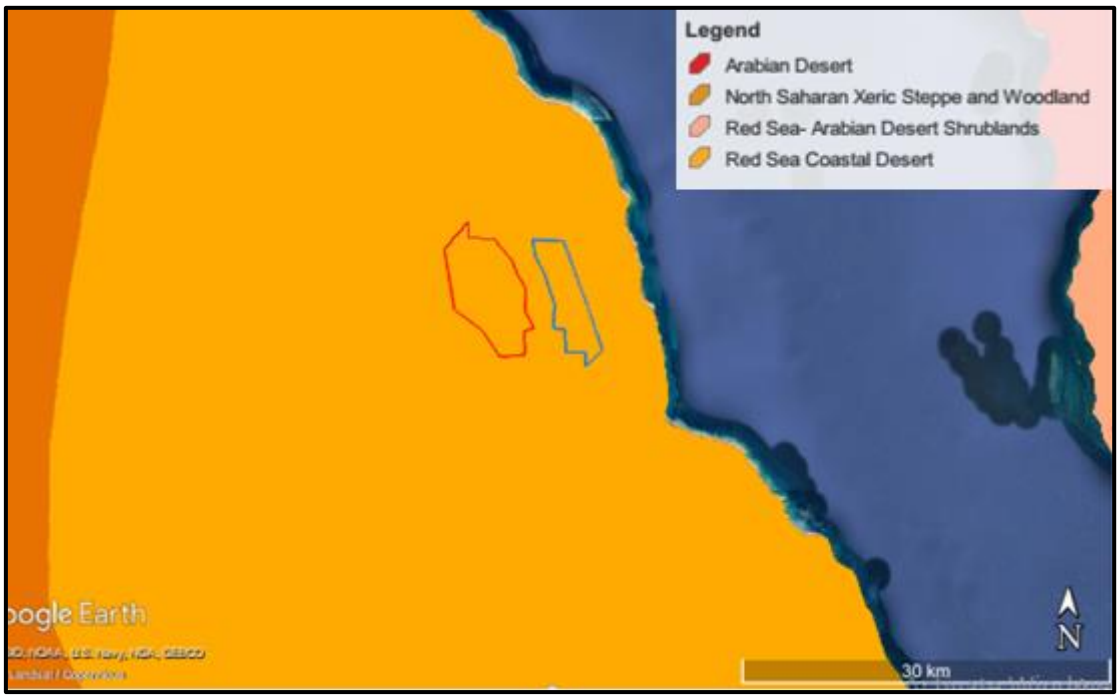

Figure 8-17: Location of Project in reference to Ecoregions of the world (TEOW) (Olson et al, 2001)

According to literature review of the flora recorded along the coastal desert of the Red Sea, a total of 68 species were recorded in the project site and its vicinity (Abd El-Ghani et al, 2014), see Table 8-2. During the autumn survey survey, which is not the most suitable season to undertake a floral survey, only seven perennial species were recorded during that survey (ECO Consult, 2019). As for the spring survey, 32 species were recorded.

Out of the 68 species documented to be recorded in the project area and its vicinity from the fieldwork and the literature review, , only five were found to be evaluated on the global level of IUCN's Red List of Threatened Species (IUCN, 2019), all of which are evaluated as Least Concern.

Table 8-2: List of Plant Species Recorded during Field Visit and Literature Review (Consultant, 2019)

Family	Scientific name	IUCN Red List of Threatened Species (2019)	Notes
Ephedraceae	*Ephedra aphylla* Forssk.	Least Concern	Literature and field survey
Amaranthaceae	*Aerva javanica* (Burm. f.) Juss. ex Schult.	Not Evaluated	Literature
	Amaranthus viridis L.	Not Evaluated	Literature
Apocynaceae	*Calotropis procera* (Aiton) W.T. Aiton	Not Evaluated	Literature
	Leptadenia pyrotechnica (Forssk.) Decne.	Not Evaluated	Literature
	Pergularia tomentosa L.	Not Evaluated	Literature and field survey
Asteraceae	*Artemisia judaica* L.	Not Evaluated	Literature
	Centaurea calcitrapa L.	Not Evaluated	Literature

Family	Scientific name	IUCN Red List of Threatened Species (2019)	Notes
	Centaurea scoparia Sieber ex Spreng.	Not Evaluated	Literature and field survey
	Cotula cinerea Delile	Not Evaluated	Literature
	Echinops spinosus L.	Not Evaluated	Literature and field survey
	Ifloga spicata (Forssk.) Sch. Bip.	Not Evaluated	Literature and field survey
	Iphiona mucronata (Forssk.) Asch. et Schweinf.	Not Evaluated	Literature and field survey
	Launaea spinosa (Forssk.) Sch. Bip. ex Kuntze	Not Evaluated	Literature and field survey
	Limbarda crithmoides (L.) Dumort.	Not Evaluated	Literature
	Pluchea dioscoridis (L.) DC.	Least Concern	Literature
	Pulicaria incisa (Lam.) DC.	Not Evaluated	Literature
	Pulicaria undulata (L.) C.A. Mey.	Not Evaluated	Literature
	Reichardia tingitana (L.) Roth	Not Evaluated	Literature and field survey
	Senecio glaucus L.	Not Evaluated	Literature and field survey
	Sonchus oleraceus L.	Not Evaluated	Literature
Boraginaceae	*Heliotropium bacciferum* Forssk.	Not Evaluated	Literature
	Trichodesma africanum (L.) R. Br.	Not Evaluated	Literature
Brassicaceae	*Diplotaxis harra* (Forssk.) Boiss.	Least Concern (Europe)	Literature and field survey
	Farsetia aegyptia Turra	Not Evaluated	Literature and field survey
	Matthiola longipetala (Vent.) DC.	Not Evaluated	Literature and field survey
	Zilla spinosa (L.) Prantl	Not Evaluated	Literature and field survey
Capparaceae	*Capparis spinosa* L.	Not Evaluated	Literature and field survey
Caryophyllaceae	*Polycarpaea robbairea* (Kuntze) Greuter & Burdet	Not Evaluated	Literature and field survey
Chenopodiaceae	*Anabasis articulata* (Forssk.) Moq.	Not Evaluated	Literature and field survey
	Arthrocnemum macrostachyum (Moric.) K. Koch	Not Evaluated	Literature and field survey
	Atriplex halimus L.	Not Evaluated	Literature
	Chenopodium album L.	Not Evaluated	Literature
	Halocnemum strobilaceum (Pall.) M.Bieb.	Not Evaluated	Literature and field survey
	Halopeplis perfoliata (Forssk.) Bunge ex Asch.	Not Evaluated	Literature
	Haloxylon salicornicum (Moq.) Bunge ex Boiss.	Not Evaluated	Literature
	Salsola imbricata Forssk.	Not Evaluated	Literature
	Suaeda monoica Forssk. ex J.F. Gmel.	Not Evaluated	Literature and field survey
Cleomaceae	*Cleome amblyocarpa* Barratte &Murb.	Not Evaluated	Literature
	Cleome droserifolia (Forssk.)Delile	Not Evaluated	Literature
Convolvulaceae	*Convolvulus hystrix* Vahl	Not Evaluated	Literature
Euphorbiaceae	*Ricinus communis* L.	Not Evaluated	Literature
Fabaceae	*Acacia seyal* Delile	Not Evaluated	Literature
	Acacia tortilis (Forssk.) Hayne	Not Evaluated	Literature and field survey
	Alhagi graecorum Boiss.	Not Evaluated	Literature and field survey

Family	Scientific name	IUCN Red List of Threatened Species (2019)	Notes
	Lotus hebranicus Hochst. ex Brand	Not Evaluated	Literature and field survey
Fabaceae (cont.)	*Taverniera aegyptiaca* Boiss.	Not Evaluated	Literature
Frankeniaceae	*Frankenia hirsuta* L.	Not Evaluated	Literature and field survey
Geraniaceae	*Erodium glaucophyllum* (L.) L'Hér.	Not Evaluated	Literature and field survey
Nitrariaceae	*Nitraria retusa* (Forssk.) Asch.	Not Evaluated	Literature
Orobanchaceae	*Cistanche phelypaea* (L.) Cout.	Not Evaluated	Literature
Polygonaceae	*Calligonum polygonoides* L.	Not Evaluated	Literature
Resedaceae	*Ochradenus baccatus* Delile	Not Evaluated	Literature
	Reseda pruinosa Delile	Not Evaluated	Literature
Solanaceae	*Hyoscyamus muticus* L.	Not Evaluated	Literature and field survey
Tamaricaceae	*Reaumuria hirtella* Jaub. & Spach	Not Evaluated	Literature and field survey
	Tamarix nilotica (Ehrenb.) Bunge	Least Concern	Literature and field survey
	Tamarix tetragyna Ehrenb.	Not Evaluated	Literature
Urticaceae	*Forsskaolea tenacissima* L.	Not Evaluated	Literature
Zygophyllaceae	*Fagonia arabica* L.	Not Evaluated	Literature and field survey
	Fagonia bruguieri DC.	Not Evaluated	Literature
	Fagonia mollis Delile	Not Evaluated	Literature and field survey
	Zygophyllum album L.f.	Not Evaluated	Literature and field survey
	Zygophyllum coccineum L.	Not Evaluated	Literature
	Zygophyllum simplex L.	Not Evaluated	Literature and field survey
Juncaceae	*Juncus rigidus* Desf.	Not Evaluated	Literature
Poaceae	*Pennisetum setaceum* (Forssk.) Chiov.	Least Concern	Literature and field survey
	Phragmites australis (Cav.) Trin. ex Steud.	Least Concern	Literature

(ii) Fauna

The specific outcomes of the field survey in relation to faunal species are discussed below and which includes mammals and reptiles & amphibians.

a. Mammals

The study site in particular was not studied in detail in previous faunal studies. According to SESA (RCREEE, 2018), mammals distribution is associated with the distribution and abundance of vegetation cover and therefore most species are found in vegetated wadis, rocky hillsides or mountain slopes.

However, literature review has shown that 23 species occur in the project site and its vicinity (Hoath, 2004), see Table 8-3. It should be mentioned that some of the species are listed since their distribution range maps have shown that they are present in the general area of the project site although no specific studies have confirmed that. Additionally, some of the species listed are known to be present in the highlands to the east of the project site and therefore are considered to be present in the vicinity of the project site, even if small numbers.

Out of the 23 species listed, twenty are listed as Least Concern according to IUCN's Red List of Threatened Species while two are evaluated as Threatened (both Vulnerable); *Capra nubiana* and *Gazella dorcas,* while the remaining species is evaluated as Near Threatened; *Hyaena hyaena*. The

Capra nubiana and *Gazella dorcas* have the area of the project site as part of their distribution range. Regarding the *Capra nubiana*, the species typical habitats include mountainous areas and is expected to be present, if at all, to the west of the project site in the mountains. As for *Gazella dorcas*, considering the degraded habitats in the general area of the project site and the high level of human disturbance, especially accessibility of the site, it is highly unlikely that the species could be present in the general area of the project site. Finally, regarding the globally threatened Striped Hyaena (vulnerable), the species is known to have a very wide home range reaching up to 60km. Although it could still be present in the project site, its numbers are believed to be extremely low and would be generally confined to areas with very low human presence.

In addition, it is important to note that no mammals were recorded onsite during the field survey undertaken.

Table 8-3: Mammal species (excluding bats) Recorded in Project Site and its Vicinity (Consultant, 2019)

Family	Scientific name	Common name	Global IUCN status
Erinaceidae	*Hemiechinus auritus*	Long-eared Hedgehog	Least Concern
Leporidae	*Lepus capensis*	Cape Hare	Least Concern
Muridae	*Jaculus jaculus*	Lesser Egyptian Jerboa	Least Concern
	Gerbillus gerbillus	Lesser Egyptian Gerbil	Least Concern
	Gerbillus henleyi	Pygmy Gerbil	Least Concern
	Gerbillus dasyurus	Wagner's Gerbil	Least Concern
	Gerbillus pyramidum	Greater Egyptian Gerbil	Least Concern
	Gerbillus floweri	Flower's Gerbil	Least Concern
Muridae (cont.)	*Sekeetamys calurus*	Bushy-tailed Jird	Least Concern
	Acomys russatus	Golden Spiny Mouse	Least Concern
	Acomys cahirinus	Cairo Spiny Mouse	Least Concern
	Meriones crassus	Sundevall's Jird	Least Concern
Herpestidae	*Herpestes ichneumon*	Egyptian Mongoose	Least Concern
Canidae	*Felis silvestris*	Wild Cat	Least Concern
	Vulpes rueppellii	Ruppell's Fox	Least Concern
	Vulpes zerda	Fennec Fox	Least Concern
	Canis lupaster / Canis aureus	African Wolf / Golden Jackal	Least Concern
	Hyaena hyaena	Striped Hyena	Near Threatened
Procaviidae	*Procavia capensis*	Rock Hyrax	Least Concern
Bovidae	*Capra nubiana*	Nubian Ibex	Vulnerable
	Gazella dorcas	Dorcas Gazelle	Vulnerable

b. Reptiles and Amphibians

Virtually no previous specific studies on the reptiles and amphibians were conducted within the boundaries of the project site. According to SESA (RCREEE, 2018), Reptiles are the most diverse vertebrate group in the desert habitats like the project area, and consist entirely of typical desert species. This herpetofauna is composed of lizards and snakes that are adapted to rocky and sandy desert habitats. Additionally, according to Baha El Din (2006), there are 34 species that are documented, or at least expected, to be present in the project area and its vicinity (check table below). Due to the aridity of the area, no amphibian species are known to be present in the project area. On the other hand, the 34 species listed belong to eight families. Out of all those species, twelve are assessed on the global level of the IUCN Red List of Threatened Species. Eleven of these species are evaluated as Least Concern while one species is evaluated as threatened (Vulnerable); *Uromastyx aegyptia*.

In addition, it is important to note that no mammals were recorded onsite during the field survey undertaken.

Table 8-4: Reptilian Species Known to Occur within Study Area (Consultant, 2019)

Family	Scientific name	Common name	IUCN Red List of Threatened Species (2019)
Gekkonidae	*Cyrtopodion scabrum*	Keeled Rock Gecko Rough Bent-toed Gecko	Least Concern
	Hemidactylus flaviviridis	Yellow-bellied Gecko	Not Evaluated
	Hemidactylus turcicus	Turkish Gecko	Least Concern
	Ptyodactylus guttatus	Spotted Fan-toed Gecko	Not Evaluated
	Ptyodactylus hasselquistii	Egyptian Fan-toed Gecko	Not Evaluated
	Ptyodactylus siphonorhina	Saharan Fan-toed Gecko	Not Evaluated
	Stenodactylus petrii	Sand Gecko	Not Evaluated
	Stenodactylus stenodactylus	Elegant Gecko	Not Evaluated
	Tropiocolotes steudneri	Steudner's Pigmy Gecko	Not Evaluated
Agamidae	*Agama spinosa*	Spiny Agama	Least Concern
	Pseudotrapelus sinaitus	Sinai Agama	Not Evaluated
	Trapelus mutabilis	Changeable Agama	Not Evaluated
	Trapelus pallidus	Pallid Agama	Not Evaluated
	Uromastyx aegyptia	Egyptian Dabb Lizard	Vulnerable
Lacertidae	*Acanthodactylus boskianus*	Bosc's Lizard	Not Evaluated
Lacertidae (cont.)	*Acanthodactylus scutellatus*	Nidua Lizard	Not Evaluated
	Mesalina guttulata	Small-spotted Lizard	Not Evaluated
	Mesalina olivieri	Olivier's Lizard	Least Concern
	Mesalina rubropunctata	Red-spotted Lizard	Not Evaluated
Varanidae	*Varanus griseus*	Desert Monitor	Not Evaluated
Scnincidae	*Chalcides ocellatus*	Ocellated Skink	Least Concern
	Scincus scincus	Sandfish	Not Evaluated
	Sphenops sepsoides	Audouin's Sand-skink	Least Concern
Colubridae	*Lytorhynchus diadema*	Diademed Sand Snake	Least Concern
	Malpolon moilensis	Moila Snake	Not Evaluated
	Platyceps rogersi	Spotted Racer	Least Concern
	Platyceps saharicus	Saharan Cliff Racer	Not Evaluated
	Psammophis aegyptius	Saharan Sand Snake	Not Evaluated
	Psammophis schokari	Schokari Sand Snake	Not Evaluated
	Spalerosophis diadema	Diadem Snake	Not Evaluated
Elapidae	*Walterinnesia aegyptia*	Black Desert Cobra	Least Concern
Viperidae	*Cerastes cerastes*	Horned Viper	Least Concern
	Cerastes vipera	Sand Viper	Least Concern
	Echis coloratus	Burton's Carpet Viper	Not Evaluated

(iii) <u>Summary</u>

In summary, based on the survey and literature review undertaken to date, it can be concluded that the Project site in general is considered of low ecological significance due to its natural setting that is characterized by having low vegetation cover in an arid environment with low level of diversity. In addition, no key or sensitive habitats were noted within the Project site, and all floral and faunal species recorded where in general considered common and typical to such habitats and of least concern. Although three species that are believed to be present in the project site are evaluated as globally threatened (Vulnerable), none of them are believed to be present in globally significant number. However special consideration should be given to the globally threatened Egyptian Dabb Lizard *Uromastyx aegyptia* since the project site provides a typical habitat for the species, although it is believed not to be present in high numbers due to the low vegetation cover of perennial plants which normally provide major refuge for the species. Finally, as discussed earlier in Section 8.2 (land use section), the Project site is not located within any current or planned natural protectorates.

8.5 Birds (Avi-Fauna)

This section provides an assessment of baseline conditions within the Project site and surroundings in relation to birds (avi-fauna).

8.5.1 Baseline Assessment Methodology

According to the methodology outlined in the EEAA's Environmental Impact Assessment Guidelines and Monitoring Protocols for Wind Energy Development Projects along the Rift Valley/Red Sea Flyway with a particular reference to wind energy in support of the conservation of Migratory Soaring Birds (MSB) Project (2013) and the methodology applied in the Strategic and Cumulative Environmental and Social Assessment Active Turbine Management Program for Wind Power Projects in the Gulf of Suez (2019), the assessments used specific pre-assigned observation points (OPs) that is used throughout the seasons in order to achieve the objectives of the monitoring.

The survey focuses only on assessing the status of birds using the space of the Project site where the wind turbines are planned to be erected. Therefore, the objective of the survey is to provide an assessment of the use of the migratory and resident soaring birds in the Project site, in relation to wind turbines and their collision risk area, while providing a detailed analysis of the durations that these species use at the Project site and the elevations at which they are present, which would eventually provide an in-depth understanding of the predicted impact of the Project on bird species. This monitoring also highlighted any globally or regionally threatened species that are present in the Project site and the frequency of their use of the site. These observation points provided a comprehensive coverage of rotor-swept area of all turbines present in the layout.

Following a view-shed analysis for the topography of the Project area, it was decided that eight observation points are needed to cover the Project area. The locations of these observation points were defined based on the fact that they would provide the most comprehensive coverage for the Project area.

A rotation system was applied where four observation points, out of the overall eight observation points, were monitored every day of all migration seasons. Since the observation points, as shown in the figure below, are overlapping, the four observation points that are covered on the same day were selected in a manner to avoid any points that are overlapping so as to minimise the chances of double-counting as much as possible.

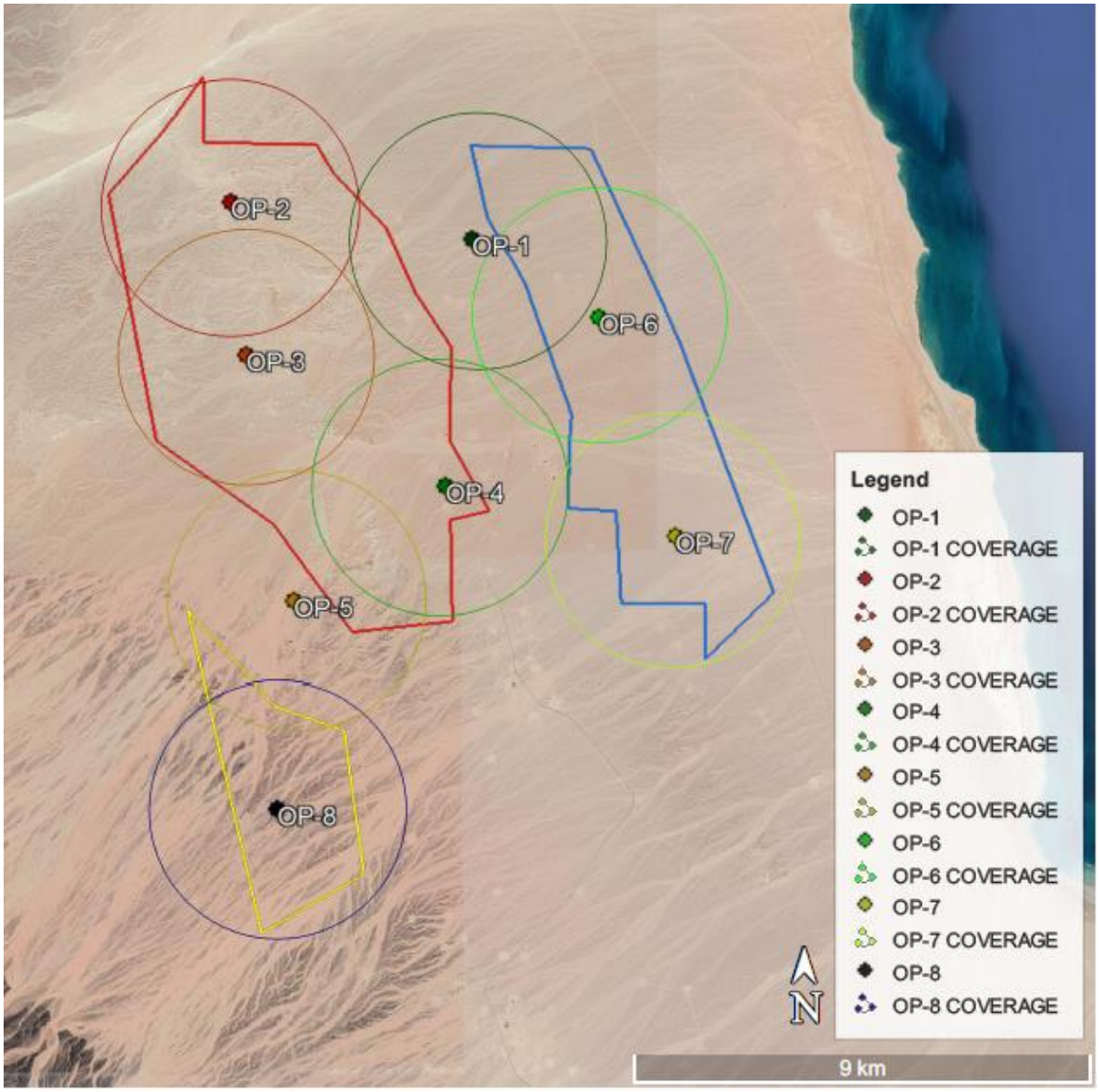

Figure 8-18: Location of Observation Points in the Project Area (Consultant, 2019)

Each observation point covered a view of 360 degrees extending for a maximum of 2.5km as required. Also, this distance should be sufficient for a qualified bird observer to identify the bird into the species level in good visibility conditions.

The field assessment team was composed of four qualified observers with previous experience in avifaunal in-flight monitoring for wind power projects. Each observation point was covered by a single observer over observation periods that would cover the predicted peaks of migration, based on previous assessments as outlined in the EIA Guidelines and the SESA. Junior observers joined the senior observers regularly to build their capacity in undertaking in-flight monitoring survey methods.

Monitoring from observation points was carried out daily during the set migration season periods following a rotation system to ensure that the eight observation points are covered regularly throughout the migration seasons of autumn, while also covering the various periods of daylight of mornings and afternoons.

Observation periods from each observation point extended for a maximum of four hours in order to ensure that the quality of monitoring does not get affected by the observers' exhaustion. A one-hour

break was provided between each two observation periods. In total, a maximum of four observation points were covered every day, where each observation period covers a minimum of eight hours per day; four hours in the morning followed by a one-hour break and then four observation hours in the afternoon. The start and end of observation periods varied depending on the following conditions:

- The season covered: during the autumn migration season and since the daylight hours are relatively limited, observation would generally start one hour after sunrise and would end a maximum of one hour before sunset in order to document any migratory birds that could be roosting at the Project site and its vicinity. As for the spring migration season, monitoring started later in the day in order to coincide with the warmer hours where birds are expected to be migrating.
- Weather conditions: the main weather condition that could impact undertaking in-flight monitoring is visibility. Therefore, in case visibility was judged to be poor due to dust or mist, observation monitoring could be put on hold, delayed or extended.
- The records of the previous observation sessions: For instance, if roosting birds were recorded during the late afternoon of the previous day, it would be recommended to start the monitoring the following day early in order to document of the movement of the birds when they leave their roosting site.

Observers were equipped with binoculars and field scopes. On average, each observation point was covered for a total of 360 hours during each season, making up a total of around 2,800 hours of observation in autumn and around 2,900 hours in spring seasons, from the eight observation points, see table below. Overall, the level of effort covering all observation points for four seasons reached up to 11,424 hours. All observation points are covered with the same level of effort so that collected from the various observation points could be compared statistically.

Table 8-5: Level of Effort during Avifaunal Assessments in Autumn 2019 and Spring 2020 (Consultant, 2019)

Season	VP	Morning	Afternoon	Total VP/season
Autumn 2019 88 days (17 Aug.–10 Nov. 2019)	OP-1	176	176	**352**
	OP-2	176	176	**352**
	OP-3	176	176	**352**
	OP-4	176	176	**352**
	OP-5	176	176	**352**
	OP-6	176	176	**352**
	OP-7	176	176	**352**
	OP-8	176	176	**352**
Total		**1408**	**1408**	**2816**
Spring 2020 91 days (20 Feb.–20 May 2020)	OP-1	180	180	**352**
	OP-2	184	184	**352**
	OP-3	180	180	**352**
	OP-4	184	184	**352**
	OP-5	180	180	**352**
	OP-6	184	184	**352**
	OP-7	180	180	**352**
	OP-8	184	184	**352**
Total		**1456**	**1456**	**2912**

For all individuals of pre-defined priority key species, including globally and regionally threatened species and large migratory soaring birds that are known to migrate in large numbers over the Project area and its vicinity along the Rift Valley / Red Sea Flyway, the following data was collected:

- The time the target bird was detected and the flight duration are recorded to the nearest 15-second interval.
- The flight route is plotted in the field onto 1:25,000 scale maps.

- The bird's flight height above ground level is estimated at the point of first detection and thereafter at 15-second intervals.
- Flight heights are classified as <10m, 10-120m, 120-200m and >200m above ground level taking into account the turbines specifications of the EPC Contractors.
- Direction of the bird and/or flock of birds is documented to the closest 1/8 direction; N, NE, E, SE, S, SW, W and NW.

By the start of the autumn migration season in August 2019, and since the final turbine layout was not available prior to the start of the survey, the locations of the observation points that were set during the survey design are based on the assumption that these observation points covered the whole Project area and are not based on the turbine layout. Additionally, since the turbine specifications were not provided prior to the start of the survey, it was agreed that any birds passing through the Project site a height lower than 120m above the ground would be considered as flying at collision risk height. This approach was decided to be followed throughout the surveys, including spring migration of 2020, in order to unify the approach and allow for comparison between seasons of different years.

In addition to the survey that was undertaken as part of the ESIA, additional analysis was carried out on the data that was collected as part of the SESA. It was decided to carry out comparisons between the results of both assessments but with caution; due to several factors which can be summarised below:

- The location and number of observation points used during the assessments are not the same. A total of eight observation points were used during the current assessment while there were nine observation points that were part of the observation points that covered the Project site. Therefore, the area covered in both surveys is not the same. Also, the locations of the observation points are different and this due to the fact that the observation points selected in the current survey were selected to specifically cover the Project site while the ones selected in the previous survey were selected to cover a much larger study area and therefore they are more widespread and do not comprehensively cover the Project site.
- Regarding the autumn migration season, the period covered in the current survey could be considered to have comprehensively the whole autumn migration season from August 17th until November 10th, while the previous survey of autumn 2016 covered the period from September 10th until November 10th. Temporal data analysis is still comparable and will be presented in the respective section below. The same applies for spring migration seasons since during the current survey, the period covered spanned from the February 20th until May 20th while during spring 2016, the period was only from April 15th until May 25th. As for spring 2017 survey, it covered the same period of the current survey but using different observation points as mentioned earlier and covering a larger study area making the level of effort in the project site lower than the site-specific spring season survey.
- The methods applied in both surveys, although generally similar, but have different details that could make comparing the data not accurate enough. For instance, the SESA survey applied a rotation system where the observers would be moving between observation points during the day covering different time periods of the day while during the current survey the rotation system was applied where the observer .would rotate between observation points on daily basis and not during the same day.

Based on the above, and taking into consideration the higher level of effort that was undertaken during the current both surveys; 5728 hours compared to 2826 hours that were undertaken over three seasons, since it is a site-specific survey rather than being part of a strategic assessment, analysis of data and comparisons between both surveys were undertaken with caution in order not to build solid conclusions on data that was collected differently.

Spring survey effort modification during the COVID-19 pandemic

The spring season survey has coincided with the COVID-19 pandemic, which has affected almost all activities in the whole world. The survey team has ensured to cover the level of effort required during the survey, taking into consideration all required health and safety procedures required while also abiding by the national regulations of curfew hours that were enforced nationwide across Egypt. During the spring survey, the nationwide curfew started at 18:00 until 06:00 in the morning of the next day. In order to abide by this, the team would head to the project site as soon as the curfew is lifted by 6:00. All observers would be expected to be starting their monitoring maximum by 8:00. In order to cover the required hours, the observer who started monitoring the earliest would end his observation while the last observer would stop the observation maximum by 16:00. By this, the team would ensure that the required hours have been covered while also ensuring that the team would be back to the town of Ras Gharib before the curfew is imposed again.

8.5.2 Results

Baseline Assessment for in-flight movement of soaring birds during the autumn season of 2019

Species records and individuals

During the autumn season of 2019 from 17 August until 10 November, 21 species were recorded with a total of 10,088 individual birds whose movement in the Project site were confirmed through a total of 461 observation records, see Table 8-6. Overall, 4,343 individuals of all species were recorded, even if partially flying at risk height with a percentage of 43.1% of all individual birds recorded throughout the reporting period.

During the autumn season of 2016, which was covered as part of the SESA, 21 species were recorded with a total of 2,180 individual birds recorded through 237 observation records. Overall, 683 individuals of all species recorded, even if partially flying at risk height with a percentage of 22.5% of all individual birds recorded, see Table 8-6.

Table 8-6: A Summary of the Bird Observation Records During the Reporting Period (Consultant, 2019)

Species Name	Status according to IUCN Red List of Threatened Species (2019)	National Status	ESIA – autumn 2019			SESA – autumn 2016		
			# records	# individuals	% of individuals flying at risk height	# records	# individuals	% of individuals flying at risk height
Black Kite *Milvus migrans*	Least Concern	Passage migrant	37	84	53.6	23	29	58.6
Black-winged Kite *Elanus caerulus*	Least Concern	Resident	-	-	-	1	2	100
Osprey *Pandion heliaetus*	Least Concern	Passage migrant	2	2	0.0	-	-	-
European Honey-buzzard *Pernis apivorus*	Least Concern	Passage migrant	184	4,694	12.3	110	999	36.1
Booted Eagle *Hieraaetus pennatus*	Least Concern	Passage migrant	5	5	40.0	2	2	0.0
Steppe Eagle *Aquila nipalensis*	Endangered	Passage migrant / Winter visitor	5	6	60.0	2	2	50.0
Western Marsh-harrier *Circus aeruginosus*	Least Concern	Passage migrant	45	60	71.7	17	19	63.2
Montagu's Harrier *Circus pygargus*	Least Concern	Passage migrant	9	16	31.3	7	8	75.0
Pallid Harrier *Circus macrourus*	Near Threatened	Passage migrant / winter visitor	11	12	66.7	10	10	80.0
Short-toed Snake-eagle *Circaetus gallicus*	Least Concern	Passage migrant / summer breeder	3	3	0.0	1	1	100.0
Eurasian Sparrowhawk *Accipiter nisus*	Least Concern	Passage migrant	6	6	66.7	1	1	100.0
Levant Sparrowhawk *Accipiter brevipes*	Least Concern	Passage migrant	-	-	-	2	6	0.0
Long-legged Buzzard *Buteo rufinus*	Least Concern	Passage migrant / Winter visitor	1	1	0.0	2	3	33.3
Steppe Buzzard *Buteo buteo vulpinus*	Least Concern	Passage migrant	10	11	10.0	6	11	72.7
Lanner Falcon *Falco biarmicus*	Least Concern	Passage migrant	3	3	66.7	2	2	100.0
Saker Falcon *Falco cherrug*	Endangered	Passage migrant	-	-	-	1	2	0.0
Lesser Kestrel	Least Concern	Passage migrant	5	8	50.0	2	2	100.0

Species Name	Status according to IUCN Red List of Threatened Species (2019)	National Status	ESIA – autumn 2019			SESA – autumn 2016		
			# records	# individuals	% of individuals flying at risk height	# records	# individuals	% of individuals flying at risk height
Falco naumanni								
Eurasian Hobby *Falco Subbuteo*	Least Concern	Passage migrant	-	-	-	1	1	100.0
Eleonora's Falcon *Falco eleonorae*	Least Concern	Passage migrant	2	2	50.0	1	1	100.0
Sooty Falcon *Falco concolor*	Vulnerable	Passage migrant / summer breeder	4	4	75.0	13	19	100.0
Red-footed Falcon *Falco vespertinus*	Near Threatened	Passage migrant	1	1	100.0	2	4	0.0
Crane *Grus grus*	Least Concern	Passage migrant	1	6	0.0	1	100	0.0
White Pelican *Pelecanus onocorotalus*	Least Concern	Passage migrant	6	296	49.7	3	244	0.0
Black Stork *Ciconia nigra*	Least Concern	Passage migrant	5	40	2.5	-	-	-
White Stork *Ciconia ciconia*	Least Concern	Passage migrant	11	4766	72.8	5	688	0.7
Eagle species *Aquila sp.*	N/A	N/A	1	4	0.0	-	-	-
Buzzard species *Buteo sp.*	N/A	N/A	6	12	66.7	1	1	100.0
Harrier species *Circus sp.*	N/A	N/A	4	5	0.0	4	4	50.0
Falcon species *Falco sp.*	N/A	N/A	15	15	66.7	5	5	0.0
Raptor species	N/A	N/A	12	18	27.8	14	16	56.3

Spatial distribution of birds flying at risk height over observation points

Looking at a summary of the results of the observations in regard to the species recorded in each observation point detailing the number of records and individuals for each species, it can be clearly noticed that a higher number of birds was observed from the observation points of 1, 4, 6 and 7, which are located along the eastern part of the Project site representing the flatter part of the Project area in comparison to the more hilly western side, see Table 8-7.

Table 8-7: Distribution of Records and Individual Birds Recorded across the Observation Points (Consultant, 2019)

Observation Point #	Number of Species recorded	Number of records	Number of individual birds recorded
1	11	57	2509
2	9	21	155
3	10	48	560
4	10	51	1582
5	8	35	674
6	15	98	2039
7	14	54	1843
8	10	37	726

Looking at the spatial distribution of the number of birds on passage over the Project site as a whole and building on the collective numbers of birds on passage as recorded from the observation points, it can be clearly seen that the eastern part of the Project site has the highest number of passage while the numbers continue to decrease heading southwest while the north-western part of the Project site had the lowest numbers of birds passage which barely exceeded 1% of the total birds recorded during the survey all over the Project site, see Figure 8-19. Follow-up surveys in spring and autumn 2020 and spring 2021 will provide more details about the spatial distribution.

Applying the same analysis on the data from the autumn survey of 2016 from the SESA, while focusing on the observation points that covered parts of the Project site, a similar observation could be confirmed that generally the eastern part of the Project site has the highest number of passage while the numbers decreased while heading west, see Figure 8-19.

Table 8-8: Distribution of Record s and Individual Birds Recorded across the SESA Observation Points (Consultant, 2019)

Observation Point #	Number of Species recorded	Number of records	Number of individual birds recorded
1	6	15	115
2	4	21	81
3	11	32	153
4	5	17	174
5	7	32	581
6F	10	33	219
7	8	18	168
8F	11	61	671
9	6	15	25

Looking at birds flying at risk height, and taking into consideration all bird individuals, including the ones that were not identified on the species level, it can be noticed that the north-easternmost OP-1 has the highest percentage of birds flying at risk height while being the observation point with the highest number of birds counted. In general, based on the overall results of birds flight heights, the northern part of the Project site have the highest percentage of birds flying at collision risk height. Moving southward, birds were recorded to be gaining height and consequently to be recorded above collision risk height. Following the same approach of analysis for the data from the SESA does not seem to show any clear pattern of birds' passage at collision risk height. The highest percentage of birds flying at collision risk height is in the north-eastern corner of the Project site with 6.7% flying at risk height. All other parts of the Project site do not show high collision risk height where it is even marginal, not exceeding 5% of the birds recorded in the north-western and central parts of the Project site. The remaining parts of the Project site in the south, west and south-east had moderate

percentages of birds flying at risk height ranging between 25% and 44% of the total birds recorded in the respective observation point.

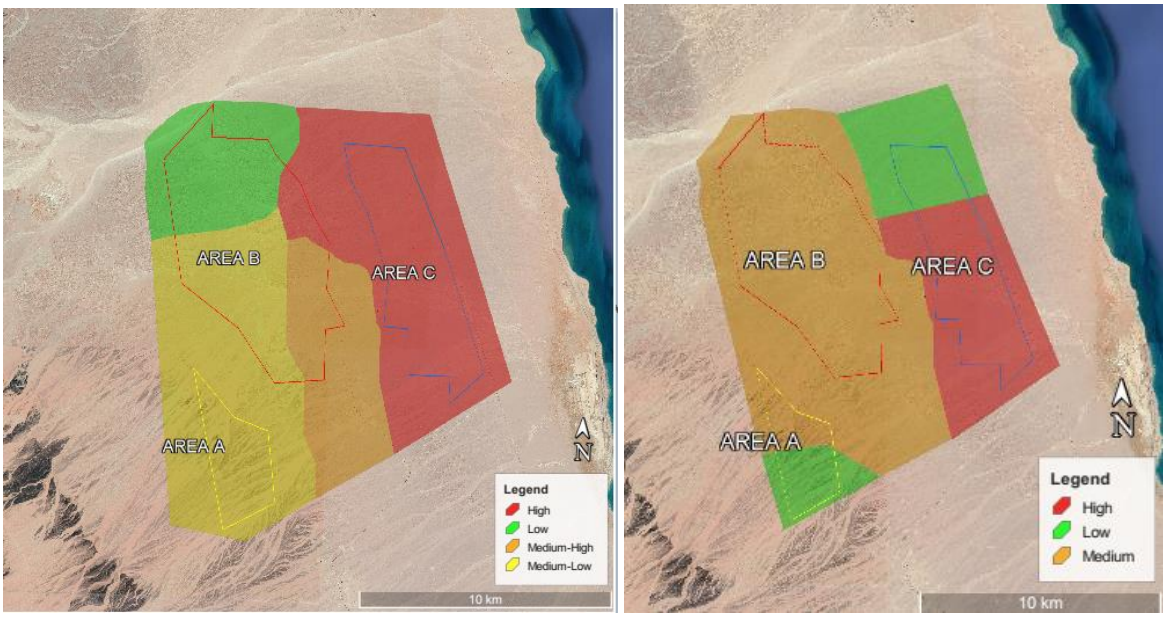

Figure 8-19: Left: Areas of bird passage based on the overall number of birds recorded across the Project site, right: areas of bird passage based on the overall number of birds recorded across the Project site during the SESA autumn migration monitoring of 2016

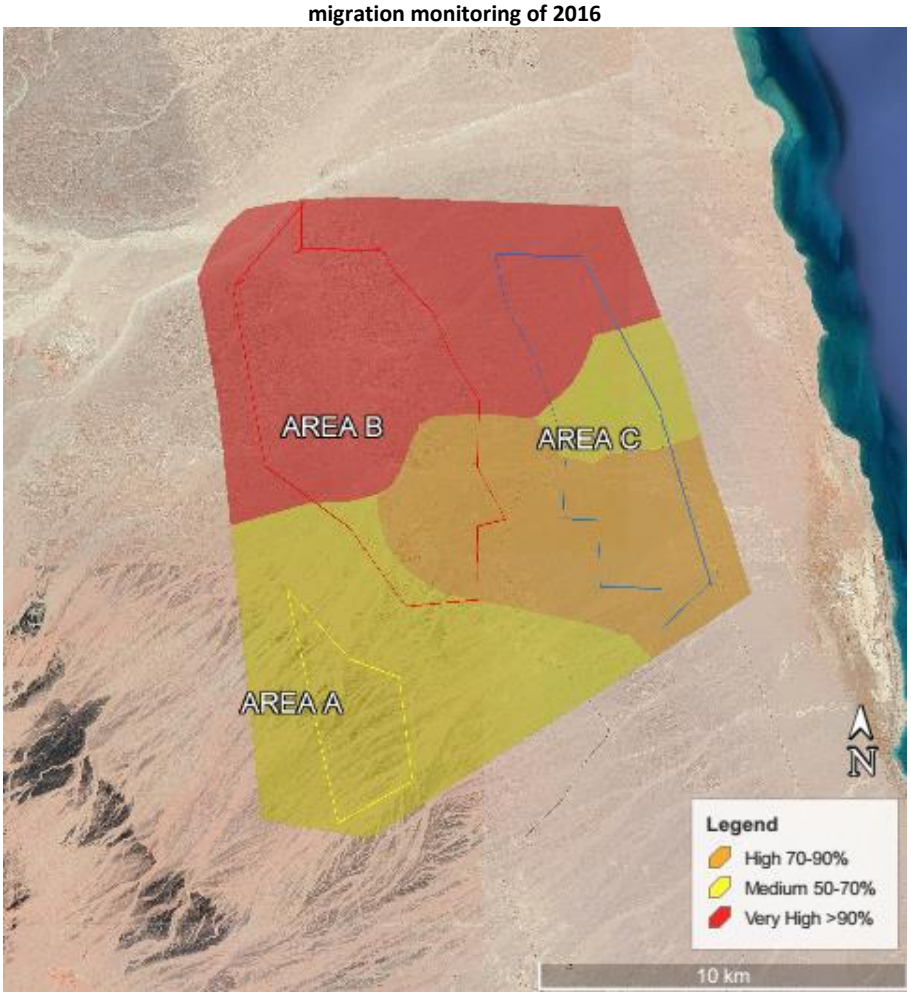

Figure 8-20: Areas of bird passage based on overall number of birds flying at risk height across the Project site

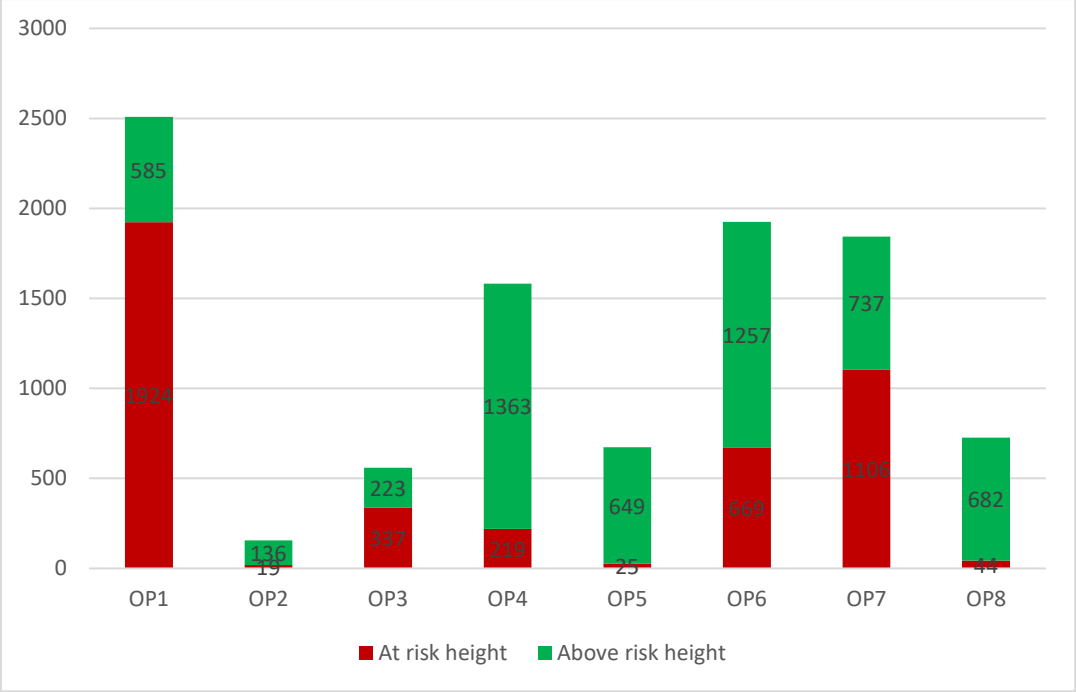

Figure 8-21: Birds Flying at Risk Height at the Different Observation Points (Consultant, 2019)

Dividing the Project site into eastern (OP-1, OP-4, OP-6 and OP-7) and western divisions (OP-2, OP-3, OP-5 and OP-8), as mentioned earlier the eastern side of the Project site has the largest number of birds recorded, also has a higher number of birds of flying at risk height (7,973 birds) in comparison to the western side (2,115 birds) and a higher percentage of birds flying at risk height (49.1%) in comparison to the western side (20.1%).

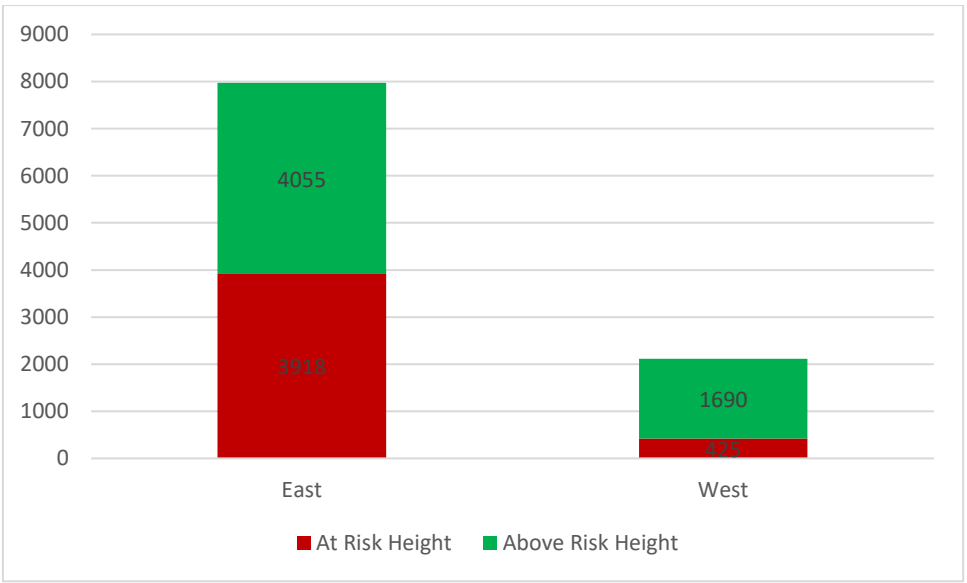

Figure 8-22: Birds Flying at Risk Height in the Eastern and Western Side of the Project Site (Consultant, 2019)

By dividing the Project site into northern (OP-1, OP-2, OP3 and OP-6) and southern parts (OP-4, OP-5, OP-7 and OP-8), it can be noticed that the difference in total birds recorded is relatively marginal since 52.2% of the birds were recorded in the northern part of the Project site while the remaining 47.8% were recorded in the southern part of the Project site. As for birds flying at risk height, a higher percentage of the birds recorded in the northern part of the Project site were flying at risk height

(56.0%) in comparison to the birds recorded flying at risk height in the southern part of the Project site (28.9%).

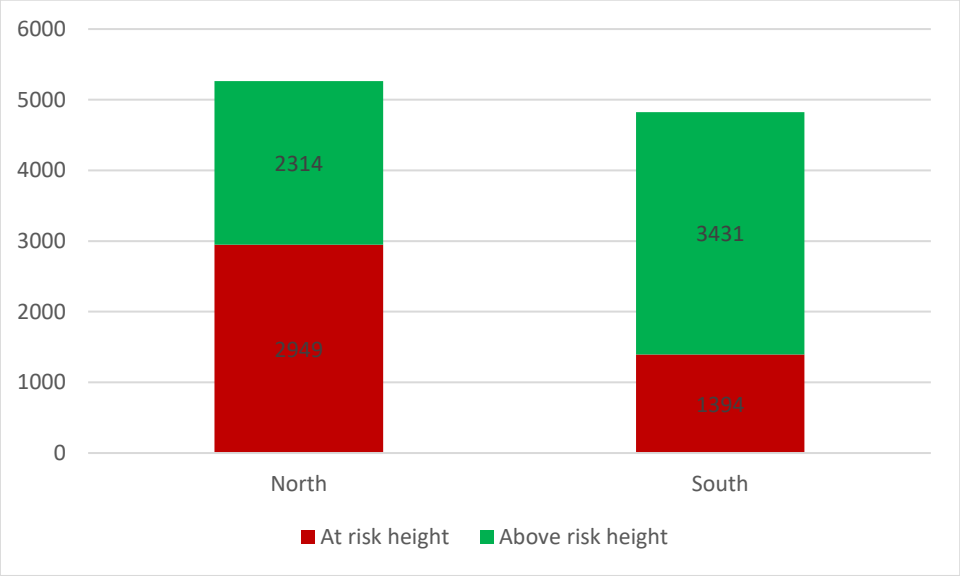

Figure 8-23: Birds Flying at Risk Height in the Northern and Southern Parts of the Project Site (Consultant, 2019)

Spatial distribution of species flying at risk height

As provided in the Table 8-9, there are TWO species that make up almost 95% of the birds recorded during the survey. The species with the highest number of individuals recorded is White Stork *Ciconia ciconia* with a total of 4,766 birds, making up 47.2% of the total birds counted during the survey. A total of 4,981 birds of the species were recorded by the eastern part of the Project site (93.0%). Out of those birds, a total of 3,161 birds were flying at risk height (66.3%). On the other hand, the remaining birds that were recorded by the western part of the Project site (335 birds) had a percentage of 91.9% of the birds flying at risk height. In total 72.8% of the white storks recorded at the Project site were flying at risk height, see Figure 8-24.

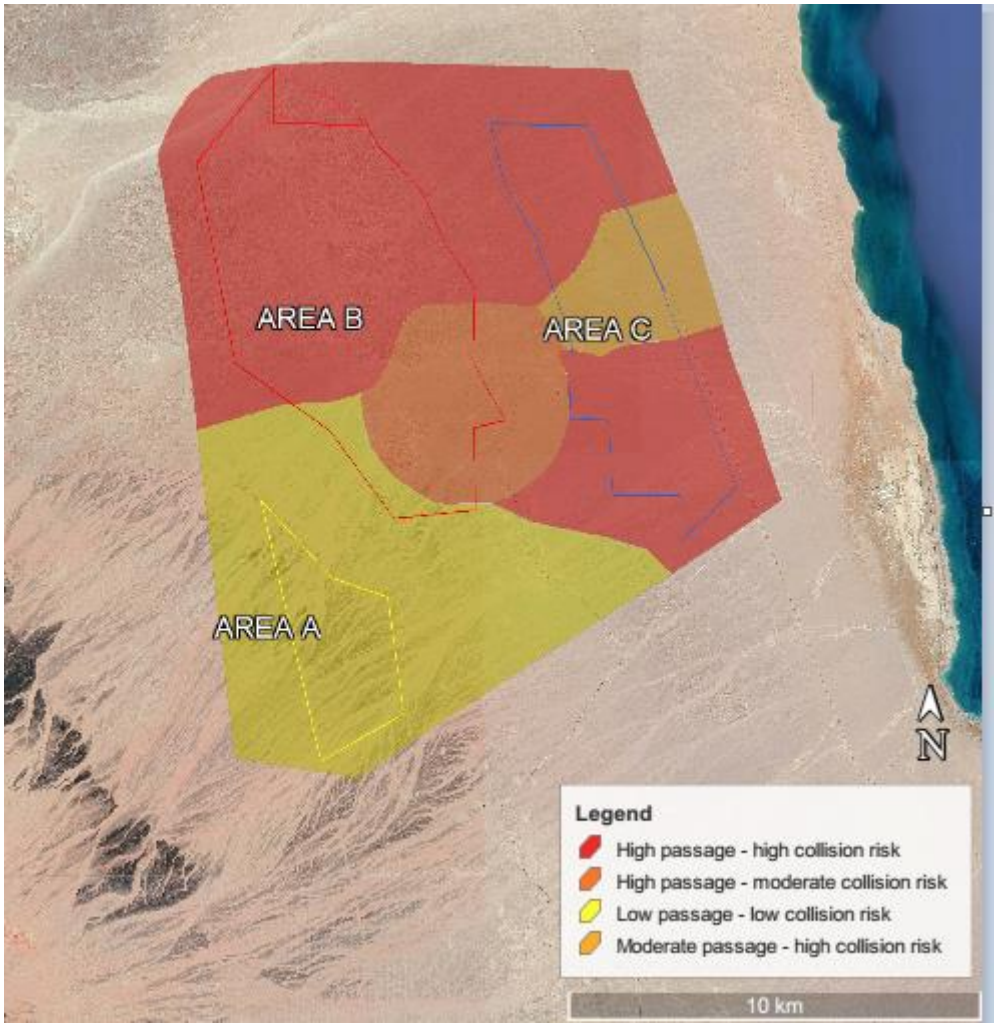

Figure 8-24: Passage of White Stork *Ciconia ciconia* in regard to collision risk

The second most commonly species recorded is the European Honey-buzzard *Pernis apivorus* with a total of 4,694 birds (46.5% of the total birds recorded). A total of 3,020 birds (64.3% of the total of the species) were recorded in the eastern side of the Project site where 199 were recorded to be flying at risk height (6.6% of the total birds recorded in the eastern part of the Project site). The western part of the Project area seemed to have the lowest number of passage with the lowest collision risk while the south western part had a relatively moderate passage with low to medium collision risk, Figure 8-25.

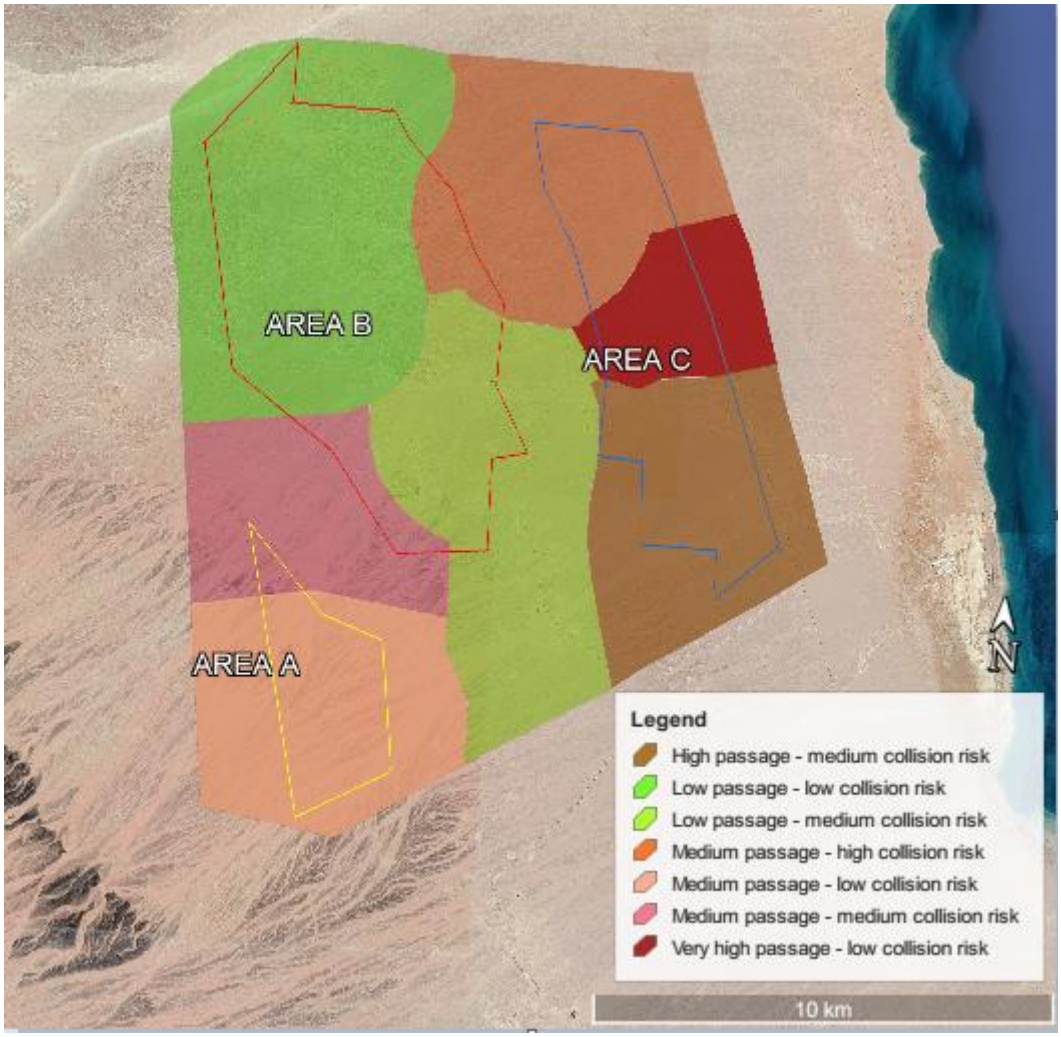

Figure 8-25: Passage of European Honey-buzzard *Pernis apivorus* in regard to collision risk

Considering the coverage of the observation points, the results shown above can only to the autumn migration which was covered over the season and it can represent the sensitivity in the autumn season at the Project site.

Table 8-9: Species Numbers and Percentages of Total Numbers at Collision Risk Height at the Different Vantage Points (Consultant, 2019)

Species	OP1		OP2		OP3		OP4		OP5		OP6		OP7		OP8		Total	
	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)
Black Kite *Milvus migrans*	20	15 (75.0)	1	1 (100)	3	1 (33.3)	7	5 (71.4)	4	2 (50.0)	17	7 (41.2)	20	9 (45.0)	12	5 (41.7)	**84**	**45 (53.6)**
Osprey *Pandion heliaetus*	-	-	-	-	1	0 (0)	-	-	-	-	1	0 (0)	-	-	-	-	**2**	**0 (0)**
European Honey-buzzard *Pernis apivorus*	686	397 (57.9)	130	1 (0.8)	235	23 (9.8)	344	1 (0.3)	642	0 (0)	1332	97 (7.3)	658	30 (4.6)	667	29 (4.3)	**4694**	**578 (12.3)**
Booted Eagle *Hieraaetus pennatus*	1	1 (100)	-	-	-	-	1	0 (0)	-	-	2	0 (0)	-	-	1	1 (100)	**5**	**2 (40.0)**
Steppe Eagle *Aquila nipalensis*	1	1 (100)	-	-	2	0 (0)	1	1 (100)	1	1 (100)	-	-	-	-	1	1 (100)	**6**	**4 (66.7)**
Western Marsh-harrier *Circus aeruginosus*	5	4 (80.0)	1	1 (100)	4	4 (100)	16	11 (68.8)	9	9 (100)	12	8 (66.7)	9	8 (88.9)	4	3 (75.0)	**60**	**48 (80.0)**
Montagu's Harrier *Circus pygargus*	2	1 (50.0)	3	1 (33.3)	1	0 (0)	-	-	-	-	8	1 (12.5)	1	1 (100)	1	1 (100)	**16**	**5 (31.3)**
Pallid Harrier *Circus macrourus*	2	2 (100)	-	-	-	-	1	1 (100)	-	-	5	1 (20.0)	4	4 (100)	-	-	**12**	**8 (66.7)**
Short-toed Snake-eagle *Circaetus gallicus*	-	-	-	-	-	-	-	-	1	0 (0)	2	0 (0)	-	-	-	-	**3**	**0 (0)**
Eurasian Sparrowhawk *Accipiter nisus*	3	2 (66.7)	-	-	-	-	1	0 (0)	1	1 (100)	-	-	1	1 (100)	-	-	**6**	**4 (66.7)**

Species	OP1		OP2		OP3		OP4		OP5		OP6		OP7		OP8		Total	
	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)
Long-legged Buzzard *Buteo rufinus*	-	-	-	-	-	-	1	0 (0)	-	-	-	-	-	-	-	-	**1**	**0 (0)**
Steppe Buzzard *Buteo buteo vulpinus*	1	0 (0)	4	0 (0)	1	0 (0)	1	0 (0)	2	1 (50.0)	2	0 (0)	-	-	-	-	**11**	**1 (9.1)**
Lanner Falcon *Falco biarmicus*	-	-	-	-	-	-	-	-	-	-	1	1 (100)	1	1 (100)	1	0 (0)	**3**	**2 (66.7)**
Lesser Kestrel *Falco naumanni*	-	-	1	0 (0)	1	1 (100)	-	-	-	-	1	1 (100)	3	0 (0)	2	2 (100)	**8**	**4 (80.0)**
Eleonora's Falcon *Falco eleonorae*	-	-	-	-	1	1 (100)	-	-	-	-	-	-	1	0 (0)	-	-	**2**	**1 (50.0)**
Sooty Falcon *Falco concolor*	-	-	1	1 (100)	-	-	-	-	2	1 (50.0)	-	-	1	1 (100)	-	-	**4**	**3 (75.0)**
Red-footed Falcon *Falco vespertinus*	-	-	-	-	-	-	-	-	-	-	1	1 (100)	-	-	-	-	**1**	**1 (100)**
Crane *Grus grus*	-	-	-	-	-	-	-	-	-	-	-	-	6	0 (0)	-	-	**6**	**0 (0)**
White Pelican *Pelecanus onocorotalus*	12	0 (0)	6	6 (100)	-	-	-	-	-	-	143	86 (60.1)	135	55 (40.7)	-	-	**296**	**147 (49.7)**
Black Stork *Ciconia nigra*	-	-	-	-	-	-	1	0 (0)	-	-	36	0 (0)	1	1 (100)	2	0 (0)	**40**	**1 (2.5)**
White Stork *Ciconia ciconia*	1770	1500 (84.7)	8	8 (100)	300	300 (100)	1200	200 (16.7)	-	-	461	461 (100)	1000	1000 (100)	27	0 (0)	**4766**	**3469 (72.8)**
Eagle Species *Auila sp.*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0 (0)	**4**	**0 (0)**
Buzzard species	-	-	-	-	2	1 (50.0)	8	7 (87.5)	-	-	1	0 (0)	1	0 (0)	-	-	**12**	**8 (66.7)**

Species	OP1		OP2		OP3		OP4		OP5		OP6		OP7		OP8		Total	
	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)
Buteo sp.																		
Harrier species *Circus sp.*	1	0 (0)	-	-	-	-	1	0 (0)	-	-	3	0 (0)	-	-	-	-	**5**	**0 (0)**
Falcon species *Falco sp.*	1	1 (100)	-	-	2	2 (100)	1	1 (100)	4	3 (75.0)	3	0 (0)	-	-	4	2 (50.0)	**15**	**9 (60.0)**
Raptor species	4	0 (0)	-	-	6	3 (50.0)	4	0 (0)	-	-	3	2 (66.7)	1	0 (0)	-	-	**18**	**5 (27.8)**

Temporal distribution of records and individuals

The highest number of records and individuals were observed during the first month of the survey period with 80.3% of the birds recorded in that period. No peaks were observed during the second month of the survey from mid-September until mid-October while two minor peaks were observed on 26-27 October and 4-5 November.

The early influx of migration during the first month of the survey was due to the passage of White Storks and European Honey-buzzard while the two minor peaks in late October and early November was due to the passage of several flocks of Great Cormorant.

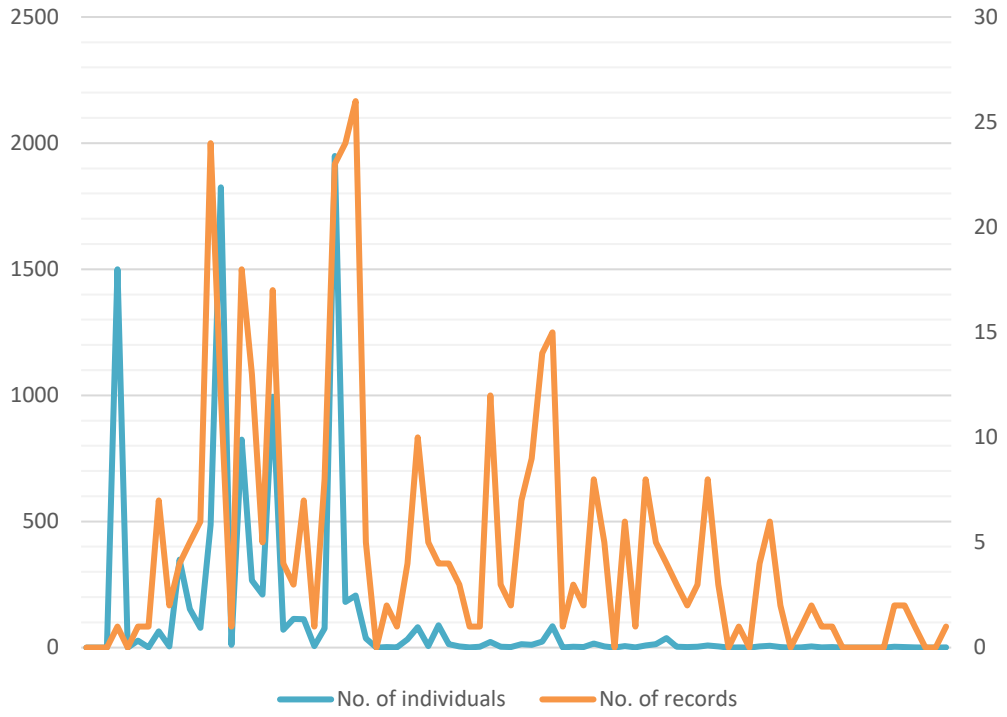

Figure 8-26: Number of Records and Bird Individuals Recorded over the Survey Period (Consultant, 2019)

Considering the diversity of species over the survey period, it can be noticed that the diversity was not always relative to the number of records and individuals. The first survey period of records was represented by only seven species while the second period from early to mid-September had the highest number of individuals and records but the second highest number of species. The highest number of species over a survey period was during the period from early to mid-October, which showed a record of sixteen although no peaks of individuals or records were noticed during that period. The latest peak of the survey was in late October and early November which was represented by a very low number of species reaching down to only three species by the end of the survey when the migration season was coming to end.

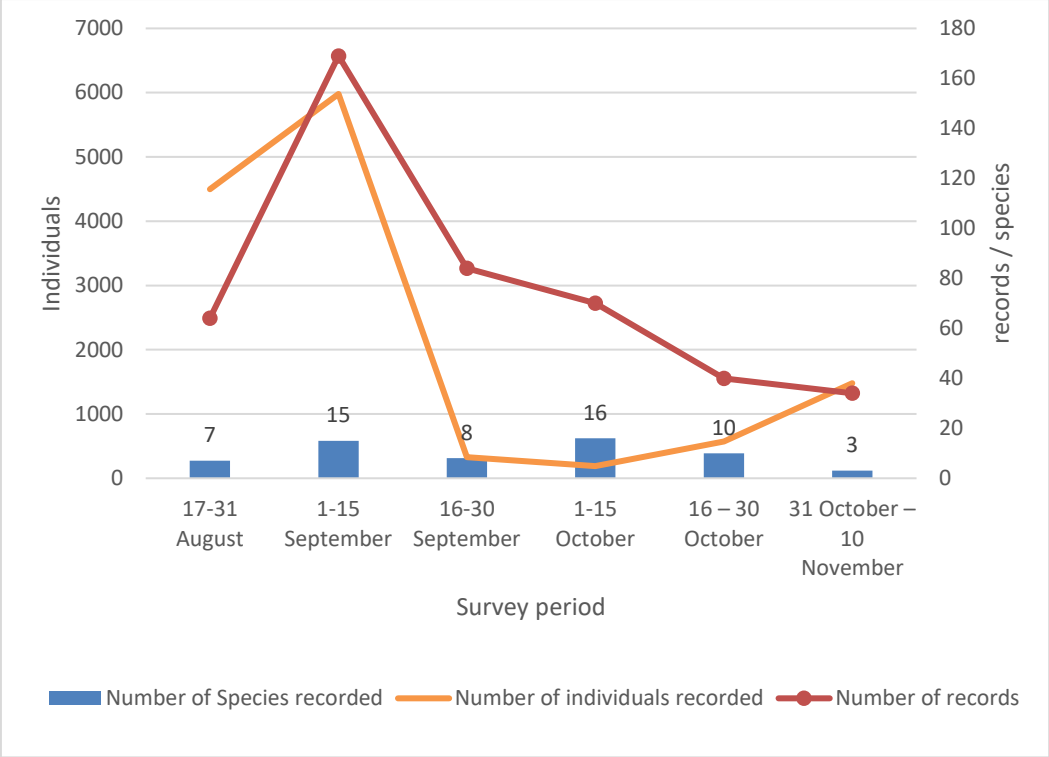

Figure 8-27: Distribution of Species, Records and Individuals over Survey Period (Consultant, 2019)

Analysing the distribution of records and individuals over the hours of the day shows that apart from the early influx of birds coming from the north in the early morning, birds in general were recorded in relatively in low numbers in the morning and the number of records and individuals continued to increase as the day went on reaching to the highest records of individuals during the last hour of surveying between 16:00 and 17:00 see Figure 8-28.

During the first hour of monitoring, which is roughly between 08:00 and 09:00, around 900 birds were recorded coming through into the site from the northwest and flying towards south, southeast and southwest. The same applies for the birds and records at the last hour of surveying between 16:00 and 17:00 where the birds were recorded flying from the northeast and northwest, heading to the southwest. No birds were recorded roosting on site during the survey and this was confirmed during early hours of monitoring where no birds were noticed on the ground and the same applies for the late afternoon hours where no birds were no birds were noticed coming to roost to the site. On the other hand, it was noticed that large flocks were recorded roosting to the southwest hills outside the Project site.

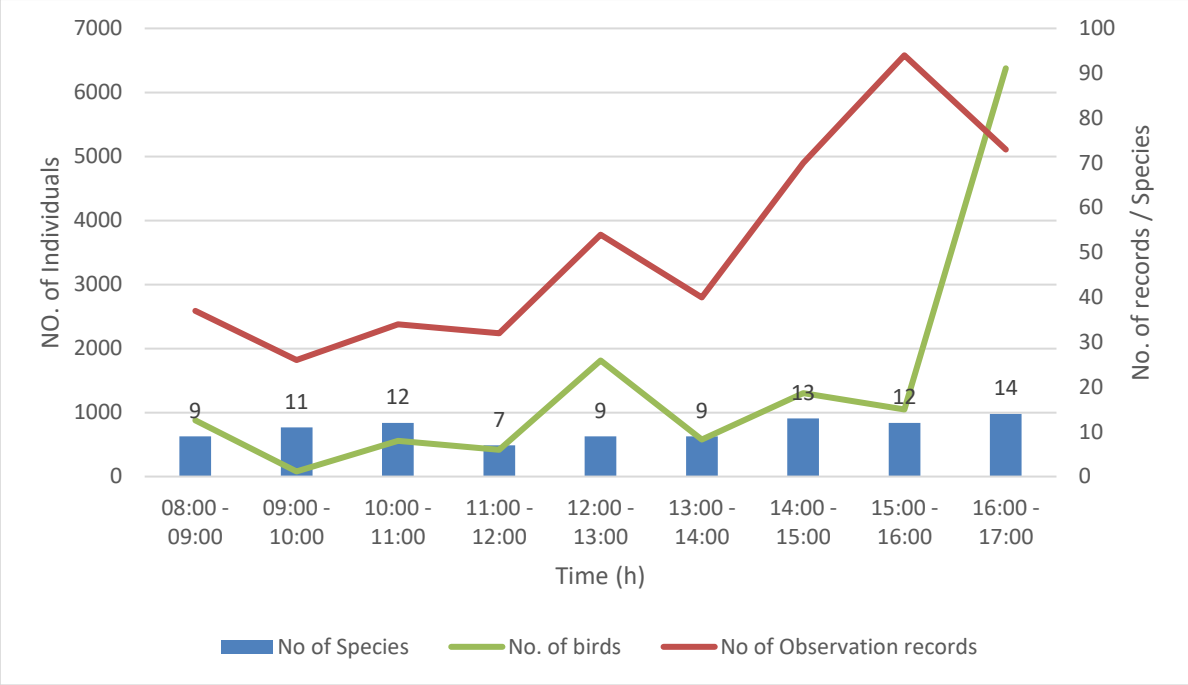

Figure 8-28: Distribution of Species, Records and Individuals over Time (hours) (Consultant, 2019)

Flight direction for bird individuals

As expected in an autumn migration survey, the general direction of birds recorded was generally southward. More than 52% of the birds recorded were flying southwest while almost 30% were flying southeast.

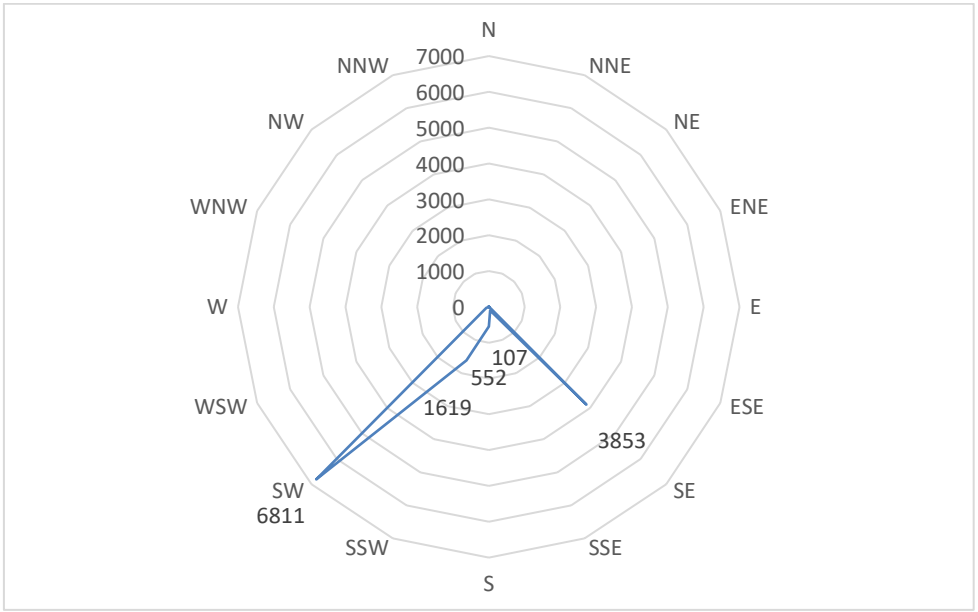

Figure 8-29: Flight Direction of Birds Recorded during the Survey (Consultant, 2019)

Looking at the direction of birds from the different observation points, it can be seen the average direction of birds was between South and Southeast throughout the Project site, see Figure 8-19.

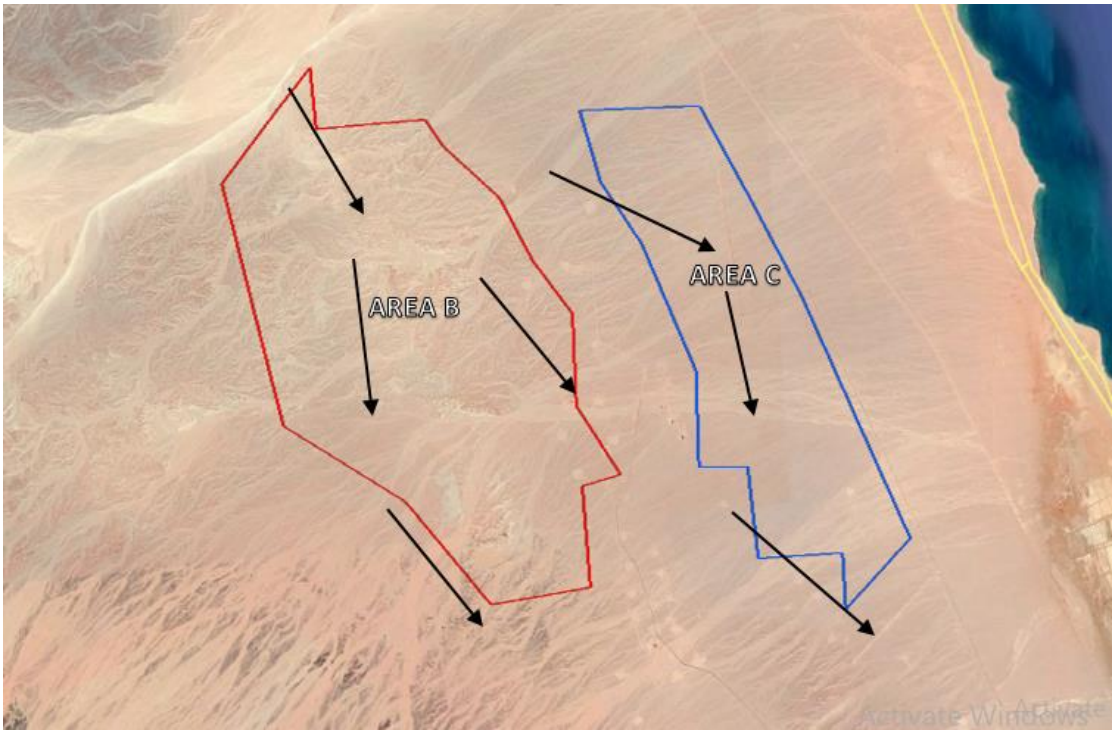

Figure 8-30: Average directions of birds over the Project site

Birds Behaviour

Documenting the behaviour of birds during in-flight monitoring would normally provide figures that far exceed the total number of the birds recorded. This is due to the fact that birds could be recorded displaying more than one behaviour while flying across the field of observation. The largest number of birds showing a single behaviour were 8084 birds soaring followed by 7186 gliding, see **Error! R eference source not found.**. It should be noticed that 5280 birds were showing the combined behaviour of soaring and gliding while passing through the Project site. What is significant to notice is that only two records with a total of 87 birds were recorded landing at the Project site but none of them were confirmed to be roosting on site since they all took off and continued flying southeast.

Table 8-10: Number of Birds Recorded According to Behaviour

Behaviour	Number of Records	No. of Individuals
Active Flight	119	948
Gliding	223	7186
Soaring	288	8084
Resting / Landing	2	87
Foraging	3	3

Baseline Assessment for in-flight movement of soaring birds during the spring season of 2020

Species records and individuals

During the spring season of 2020 from 20 February until 20 May, 30 species were recorded with a total of 325,882 individual birds whose movement in the Project site and its vicinity were confirmed through a total of 8,701 observation records, see Table 8-6. Overall, 114,029 individuals of all species were recorded, even if partially flying at risk height with a percentage of 35.0% of all individual birds recorded throughout the reporting period.

During the spring season of 2016, which was covered as part of the SESA covering the period from April 15th until May 25th, 25 species were recorded with a total of 64,605 individual birds recorded

through 1,004 observation records. Overall, 24,070 individuals of all species recorded, even if partially flying at risk height with a percentage of 37.3% of all individual birds recorded see Table 8-6.

During the spring season of 2017, which was covered as part of the SESA covering the same period of the current survey, 25 species were recorded with a total of 131,399 individual birds recorded through 2,356 observation records. Overall, 28,739 individuals of all species recorded, even if partially flying at risk height with a percentage of 21.9% of all individual birds recorded see Table 8-6.

Table 8-11: A Summary of the Bird Observation Records During the Reporting Period of spring season 2020(Consultant, 2019)

Species Name	Status according to IUCN Red List of Threatened Species (2019)	National Status	ESIA – spring 2020			SESA – spring 2016			SESA – spring 2017		
			# records	# individuals	% of individuals flying at risk height	# records	# individuals	% of individuals flying at risk height	# records	# individuals	% of individuals flying at risk height
Girffon Vulture *Gyps fulvus*	Least Concern	Passage migrant	8	8	37.5	-	-	-	-	-	-
Egyptian Vulture *Neophron percnopterus*	Endangered	Passage migrant	213	395	13.9	34	52	23.1	27	32	37.5
Black Kite *Milvus migrans*	Least Concern	Passage migrant	1190	16229	13.1	134	640	15.2	271	3381	17.2
Osprey *Pandion heliaetus*	Least Concern	Passage migrant	5	5	20.0	6	10	100	17	19	89.5
European Honey-buzzard *Pernis apivorus*	Least Concern	Passage migrant	259	21626	38.1	181	11926	50.3	225	5010	38.0
Booted Eagle *Hieraaetus pennatus*	Least Concern	Passage migrant	431	858	12.1	53	59	30.5	69	108	56.5
Steppe Eagle *Aquila nipalensis*	Endangered	Passage migrant/ winter visitor	1746	17152	15.6	46	94	45.7	519	3363	26.6
Eastern Imperial Eagle *Aquila heliaca*	Vulnerable	Passage migrant	42	44	15.9	5	6	83.3	9	11	27.3
Tawny Eagle *Aquila rapax*	Vulnerable	Vagrant	1	1	0	-	-	-	-	-	-
Greater Spotted Eagle *Clanga clanga*	Vulnerable	Passage migrant	121	341	5.0	2	2	0	5	5	0
Lesser Spotted Eagle *Clanga pomarina*	Least Concern	Passage migrant	329	1705	5.9	52	137	13.1	20	35	42.9
Western Marsh-harrier *Circus aeruginosus*	Least Concern	Passage migrant	59	67	45.1	10	11	72.7	21	24	87.5
Montagu's Harrier *Circus pygargus*	Least Concern	Passage migrant	22	23	90.9	1	1	0.0	17	19	84.2
Pallid Harrier *Circus macrourus*	Near Threatened	Passage migrant/ winter visitor	24	24	76.9	3	3	33.3	10	10	90.0
Short-toed Snake-eagle *Circaetus gallicus*	Least Concern	Passage migrant/ summer breeder	732	1563	14.0	48	67	54.2	188	275	42.2

Species Name	Status according to IUCN Red List of Threatened Species (2019)	National Status	ESIA – spring 2020			SESA – spring 2016			SESA – spring 2017		
			# records	# individuals	% of individuals flying at risk height	# records	# individuals	% of individuals flying at risk height	# records	# individuals	% of individuals flying at risk height
Eurasian Sparrowhawk *Accipiter nisus*	Least Concern	Passage migrant	63	108	17.4	16	21	23.8	10	12	75..0
Levant Sparrowhawk *Accipiter brevipes*	Least Concern	Passage migrant	15	4230	52.1	9	239	0.4	9	15	93.3
Long-legged Buzzard *Buteo rufinus*	Least Concern	Passage migrant/ winter visitor	298	548	14.0	2	2	0.0	19	19	52.6
Steppe Buzzard *Buteo buteo vulpinus*	Least Concern	Passage migrant	2140	86740	11.9	209	4777	54.4	669	29699	23.1
Lanner Falcon *Falco biarmicus*	Least Concern	Passage migrant	2	2	100	2	2	100.0	2	2	100.0
Barbary Falcon *Falco pelegrinoides*	Least Concern	Resident	-	-	-	-	-	-	1	1	100
Lesser Kestrel *Falco naumanni*	Least Concern	Passage migrant	10	10	20.0	2	3	0.0	1	1	100.0
Merlin *Falco columbarius*	Least Concern	Passage migrant	1	1	100	-	-	-	-	-	-
Eurasian Hobby *Falco subbuteo*	Least Concern	Passage migrant	-	-	-	4	5	75.0	1	1	100.0
Eleonora's Falcon *Falco eleonorae*	Least Concern	Passage migrant	1	1	100	2	2	50.0	1	1	100.0
Sooty Falcon *Falco concolor*	Vulnerable	Passage migrant/ summer breeder	2	2	100	2	2	100	1	1	100
Red-footed Falcon *Falco vespertinus*	Near Threatened	Passage migrant	1	1	100	-	-	-	-	-	-
Crane *Grus grus*	Least Concern	Passage migrant	3	8	0	100	0.0	100.0	8	1191	33.0
White Pelican *Pelecanus onocorotalus*	Least Concern	Passage migrant	12	936	15.1	11	1465	87.2	7	938	95.4
Pink-backed Pelican *Pelecanus rufescens*	Least Concern	Vagrant	1	1	0.0	-	-	-	-	-	-
Black Stork *Ciconia nigra*	Least Concern	Passage migrant	108	2156	18.4	18	174	44.8	31	186	57.0

Species Name	Status according to IUCN Red List of Threatened Species (2019)	National Status	ESIA – spring 2020			SESA – spring 2016			SESA – spring 2017		
			# records	# individuals	% of individuals flying at risk height	# records	# individuals	% of individuals flying at risk height	# records	# individuals	% of individuals flying at risk height
White Stork *Ciconia ciconia*	Least Concern	Passage migrant	261	154545	55.9	94	44183	38.9	111	86470	55.1
Eagle species *Aquila sp.*	N/A	N/A	285	3361	1.7	18	36	47.2	14	64	34.4
Buzzard species *Buteo sp.*	N/A	N/A	146	7166	5.4	3	18	27.8	22	239	6.7
Harrier species *Circus sp.*	N/A	N/A	18	20	75.0	3	3	33.3	6	6	83.3
Falcon species *Falco sp.*	N/A	N/A	20	21	33.3	6	7	71.4	5	5	60.0
Sparrowhawk species *Accipiter sp.*	N/A	N/A	-	-	-	1	2	100	2	5	20.0
Raptor species	N/A	N/A	132	5984	4.7	29	657	33.9	41	192	58.9

Spatial distribution of birds flying at risk height over observation points

Looking at a summary of the results of the observations in regard to the species recorded in each observation point detailing the number of records and individuals for each species, it can be noticed that a higher number of birds was observed from the observation points of 2, 3, 7 and 8, where observation points 2, 3, and 8 are located along the western part of the Project site representing the higher-altitiude part of the Project area while observation point 7 is located in the southeastern corner of the project site, seeTable 8-12. It should be highlighted that the other parts of the project site still had relatively high numbers passing through. The lowest number of birds recorded at an observation point was from OP-4 with a total of 19,575, which is not a low number in any way. Still in general, it can be concluded that the western part of the project site had the highest numbers of birds.

Table 8-12: Distribution of Records and Individual Birds Recorded across the Observation Points (Consultant, 2019)

Observation Point #	Number of Species recorded	Number of records	Number of individual birds recorded
1	19	1240	41297
2	24	1672	55949
3	25	1298	46530
4	21	944	19575
5	22	1028	40841
6	20	768	23292
7	19	618	51088
8	24	1133	47310

Opposite to what was recorded during the autumn survey, looking at the spatial distribution of the number of birds on passage over the Project site as a whole and building on the collective numbers of birds on passage as recorded from the observation points, it can be clearly seen that the western part of the Project site has the highest number of passage while the numbers continue to decrease heading northeast see Figure 8-19. Follow-up surveys in autumn 2020 and spring 2021 will provide more details about the spatial distribution of passage.

Applying the same analysis on the data from the spring surveys of 2016 and 2017 from the SESA, while focusing on the observation points that covered parts of the Project site, a similar observation could be confirmed that generally the western part of the Project site has the highest number of passage while the numbers were the lowest in the central part of the project site and they were relatively higher to the east, see Figure 8-19.

Table 8-13: Distribution of Record s and Individual Birds Recorded across the SESA Observation Points (Consultant, 2019)

Observation Point #	2016	2017	2016	2017	2016	2017
	Number of Species recorded		Number of records		Number of individual birds recorded	
1	13	16	68	246	10,225	3,863
2	3	15	9	131	302	11,992
3	7	18	28	308	950	34,417
4	15	11	82	140	5,297	3,631
5	14	13	51	91	1,820	12,604
6F	19	20	358	578	13,771	42,464
7	13	18	58	234	11,779	6,880
8F	17	21	263	368	19,329	8,796
9	15	16	87	260	1,132	6,692

Looking at birds flying at risk height, and taking into consideration all bird individuals, including the ones that were not identified on the species level, it can be noticed that the eastern sideof the project site has the highest percentage of birds flying at risk height. So, based on the numbers of birds recorded, the western part which has the highest number of birds recorded had relatively medium to low percentages of birds flying at risk height. Following the same approach of analysis for the data from the SESA shows somehow a similar pattern although the difference in the number of birds recorded is massive. The highest numbers of birds passing at collision risk heigh is in the northeastern

part of the project site and in the central part. In general though, the percentage of birds recorded flying at collision risk heigh during the SESA assessment of spring 2017 is lower than the ones recorded during the current spring season survey of 2020.

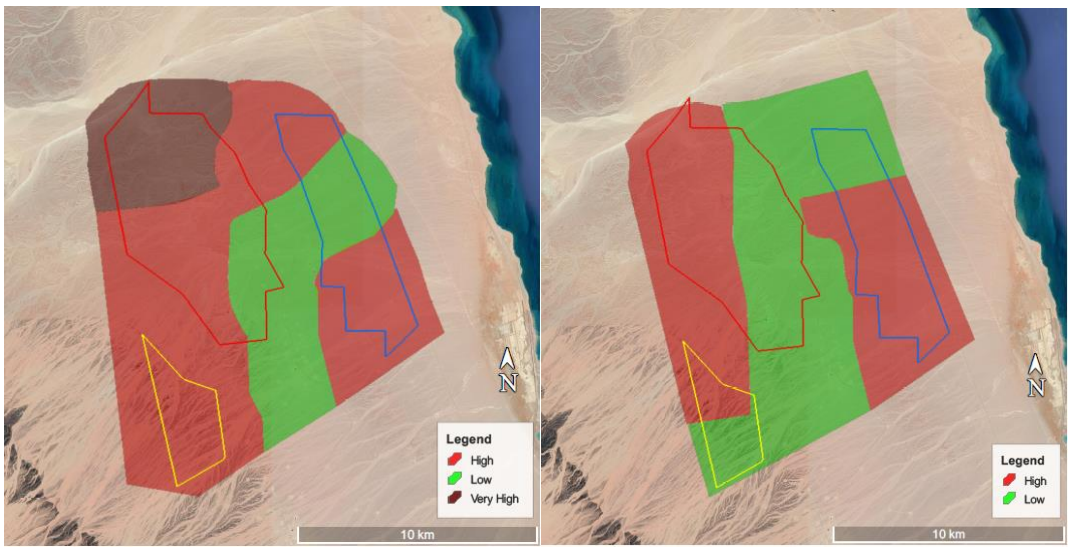

Figure 8-31: Left: Areas of bird passage based on the overall number of birds recorded across the Project site, right: areas of bird passage based on the overall number of birds recorded across the Project site during the SESA spring migration monitoring of 2017

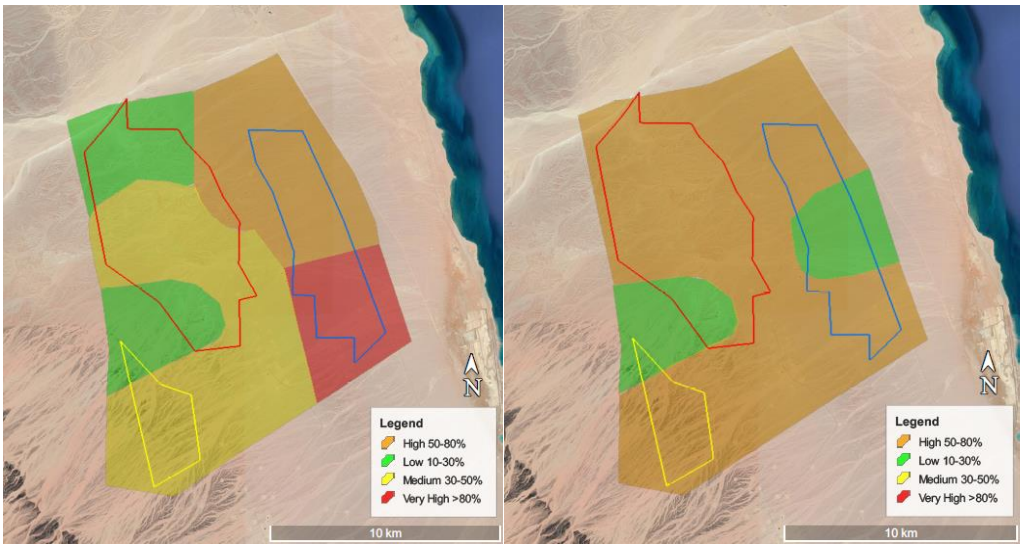

Figure 8-32: Left: Areas of bird passage based on the overall number of birds recorded flying at risk height across the Project site during the spring season of 2020, right: areas of bird passage based on the overall number of birds recorded flying at risk heigh across the project site during the SESA spring migration monitoring of 2017

The highest percentage of birds flying at collision risk height is in the south-eastern corner of the Project site with 81.3%, which is considered to be a very high percentage. The eastern part of the project site had high percentages of birds flying at risk height reaching to half the birds recorded. Although the western part had very high numbers of birds passing through, none of the observation points recorded more than 27.3% of the birds to be flying at risk height with the lowest percentage being at OP-2 with 7.8%.

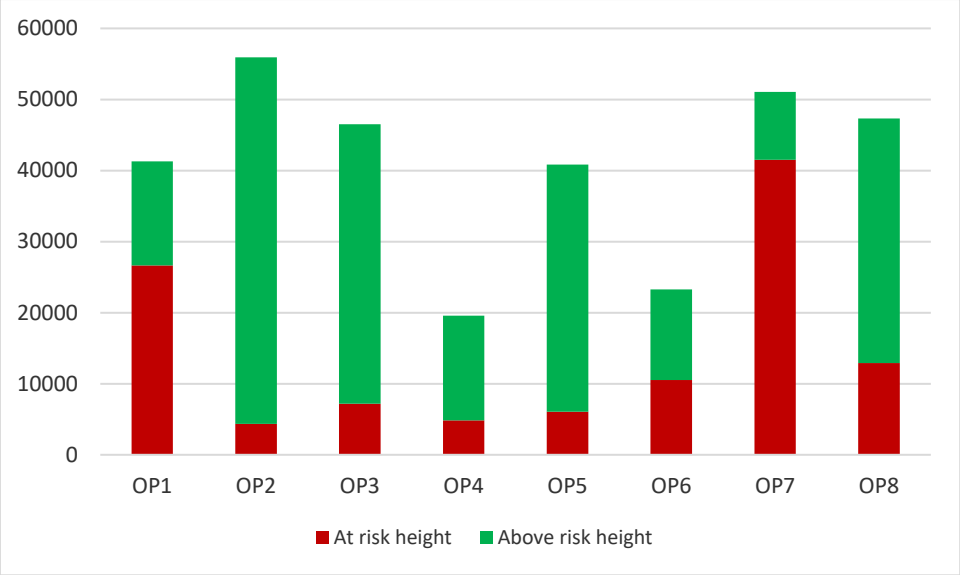

Figure 8-33: Birds Flying at Risk Height at the Different Observation Points (Consultant, 2019)

Dividing the Project site into eastern (OP-1, OP-4, OP-6 and OP-7) and western divisions (OP-2, OP-3, OP-5 and OP-8), as mentioned earlier the western side of the Project site had the largest number of birds recorded, but has a lower number of birds of flying at risk height (30,462 birds) in comparison to the eastern side, which although had a lower number of birds flying across the area, had a higher number of birds flying at collision risk height (83,564 birds).

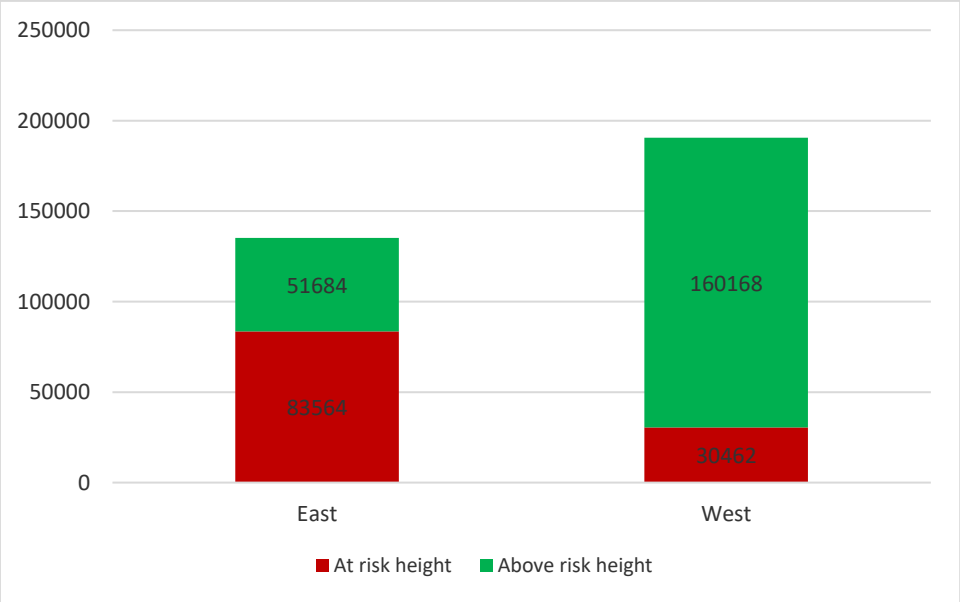

Figure 8-34: Birds Flying at Risk Height in the Eastern and Western Side of the Project Site (Consultant, 2019)

By dividing the Project site into northern (OP-1, OP-2, OP3 and OP-6) and southern parts (OP-4, OP-5, OP-7 and OP-8), it can be noticed that the northern part of the project site had a higher number of birds passing through. As for birds flying at risk height, a higher percentage of the birds recorded in the southern part of the Project site were flying at risk height (41.1%) in comparison to the birds recorded flying at risk height in the southern part of the Project site (29.1%).

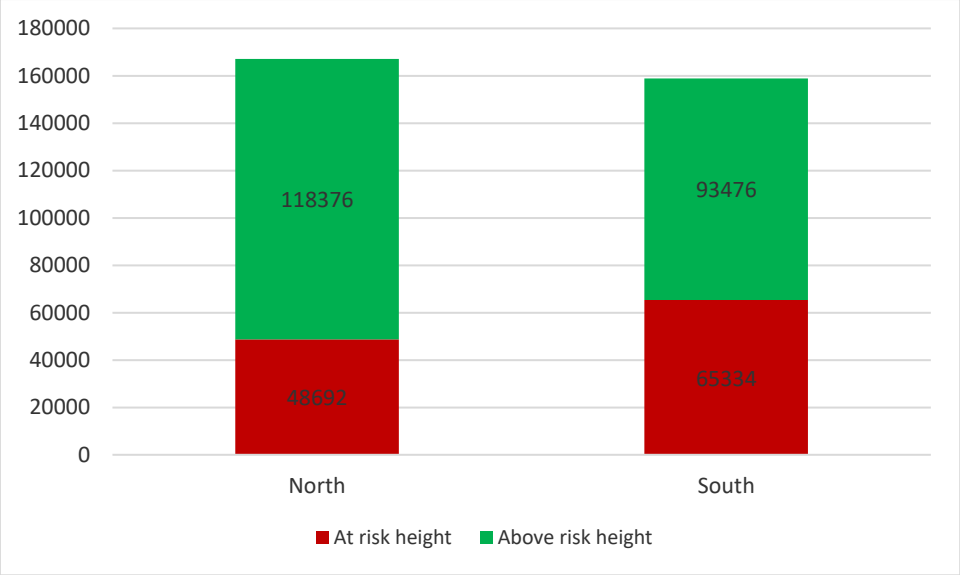

Figure 8-35: Birds Flying at Risk Height in the Northern and Southern Parts of the Project Site (Consultant, 2019)

Spatial distribution of species flying at risk height

As provided in the Table 8-914, there are two species that make up almost 74% of the birds recorded during the survey. The species with the highest number of individuals recorded is White Stork *Ciconia ciconia* with a total of 154,545 birds, making up 47.4% of the total birds counted during the survey, while the second most recorded species is Steppe Buzzard *Buteo buteo vulpinus* wuth a total of 86,740, making up almost 26.6% of the birds counted. Other species that worth mentioning include European Honey-buzzard *Pernis apivorus* with a total of 21,626 birds making up 6.6%, the globally threatened Steppe Eagle *Aquila nipalensis* with a total of 17,152 birds making up 5.3% and finally Balck Kite *Milvus migrans* with a total of 16,229 making up 5.0% of all birds recorded.

Regarding White Stork *Ciconia ciconia,* a total of 71,995 birds of the species were recorded by the western part of the Project site (46.6%). Out of those birds, a total of 20,347 birds were flying at risk height (28.3%). On the other hand, the remaining birds that were recorded by the eastern part of the Project site (82,550 birds, 53.4%) had 66,067 birds flying at risk height (80.0% of birds recorded in this part of the project site). In total 55.9% of the white storks recorded at the Project site were flying at risk height, see Figure 8-24. In summary, the southeastern part of the project site has the highest collision risk with the highest passage of white storks. Generally, the collision risk is moderate to high in the north and southwest while collision risk and passage is at its lowest along the central part of the project site.

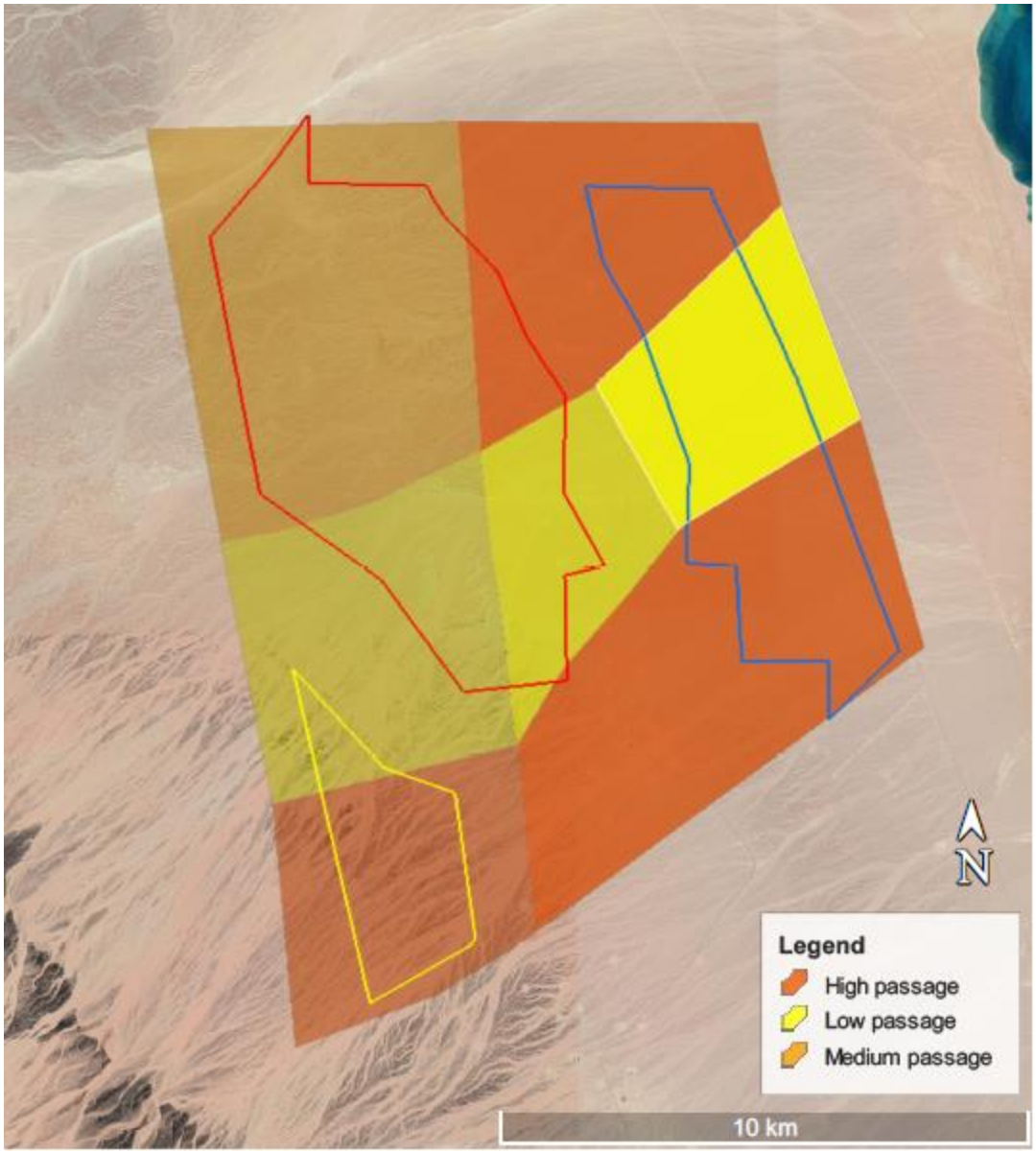

Figure 8-36: Passage of White Stork *Ciconia ciconia* in regard to collision risk

The second most commonly species recorded is the Steppe Buzzard *Buteo buteo vulpinus* with a total of 86,740 birds (26.6% of the total birds recorded). A total of 61,692 birds (71.1% of the total of the species) were recorded in the western side of the Project site with only around 6.5% of the birds flying at collision risk height. The eastern part of the Project area had lower numbers of birds passing through (25,048 birds making up 28.9% of total birds) but with a higher number passing at collision risk height (25.4%). In summary, the western part had the highest numbers of passage but with marginal numbers passing at collision risk height while the eastern part had lower number of birds passing but with a higher number passing at collision risk height, Figure 8-25.

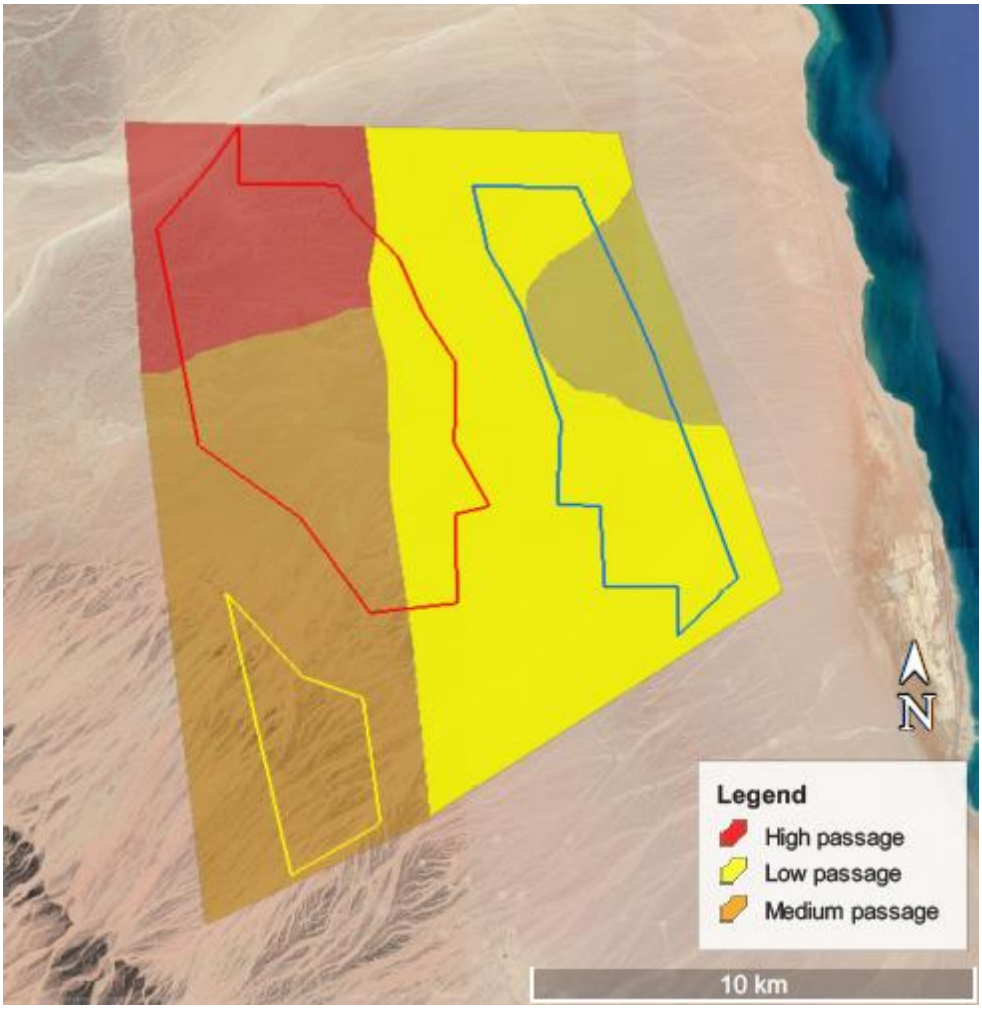

Figure 8-37: Passage of Steppe Buzzard *Buteo buteo vulpinus* in regard to collision risk

The third most commonly recorded species was the European Honey-buzzard *Pernis apivorus* with a total of 21,626 birds (5.4% of the total birds recorded). A total of 12,495 of these birds were recorded by the western part of the Project site (57.8% of the total birds recorded). Only 1.9% of these birds, (240 birds) were flying at risk height. As for the birds recorded at the eastern part of the Project site, 8,008 birds out of the 9,131 birds recorded at this part of the Project site were flying at risk height (87.7%). The species pattern regarding passage numbers and numbers flying at collision risk height is almost exactly the same as the Steppe Buzzard *Buteo buteo vulpinus*, Figure 8-38.

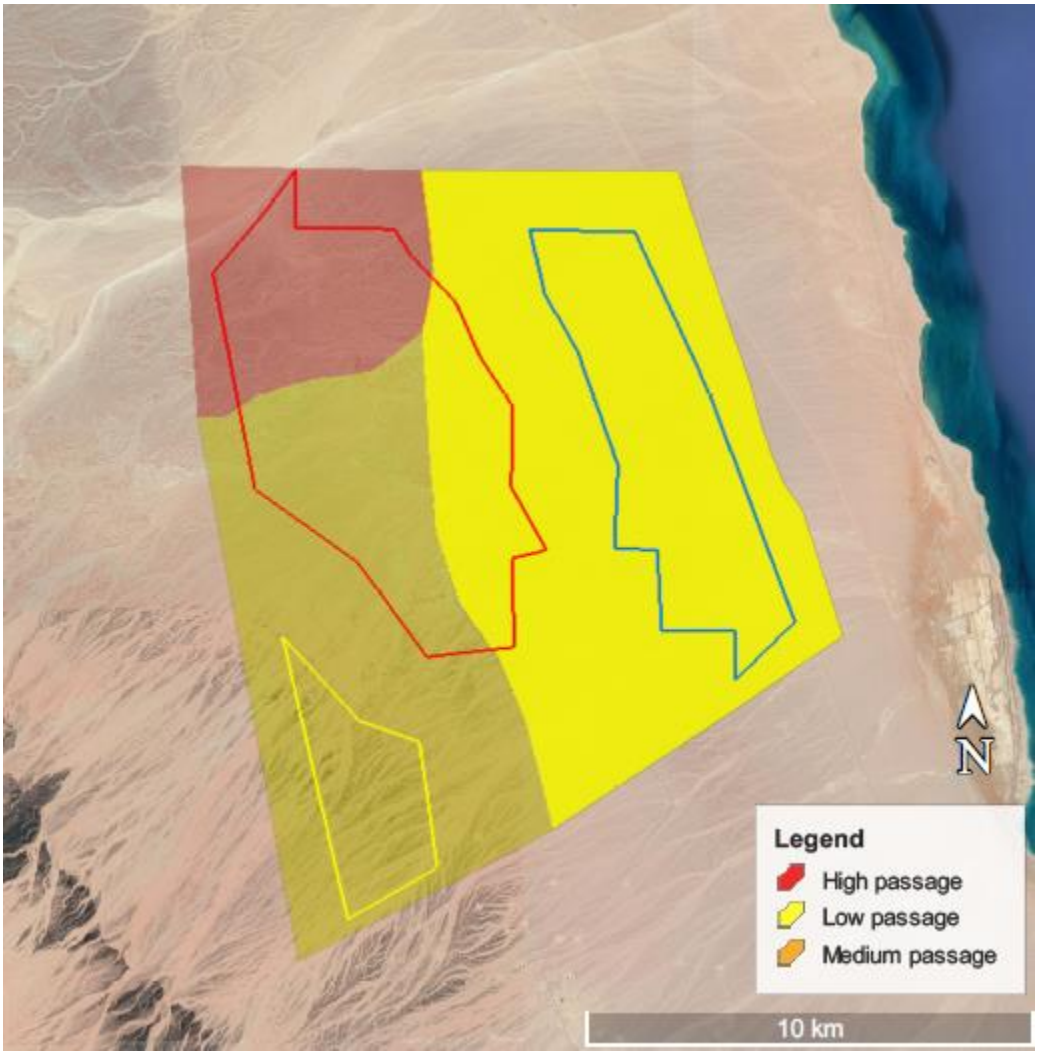

Figure 8-38: Passage of European Honey-buzzard *Pernis apivorus* in regard to collision risk

As for the most commonly recorded globally threatened species; Steppe Eagle *Aquila nipalensis,* the species had a total 17,152 birds (5.3% of the total birds recorded). A total of 10,525 of these birds were recorded by the western part of the Project site (61.4% of the total birds recorded). A percentage of 16.1% of these birds, (1,692 birds) were flying at risk height with the majority of them being recorded in the northwestern part of the project site. As for the birds recorded at the eastern part of the Project site, 1,038 birds out of the 6,627 birds recorded at this part of the Project site were flying at risk height (15.7%), which is very similar to the risk flight of the western part of the project site. Based on this, apart from the northwestern part of the project site, the species is passing above collision risk height throughout most of the project site, see Figure 8-39.

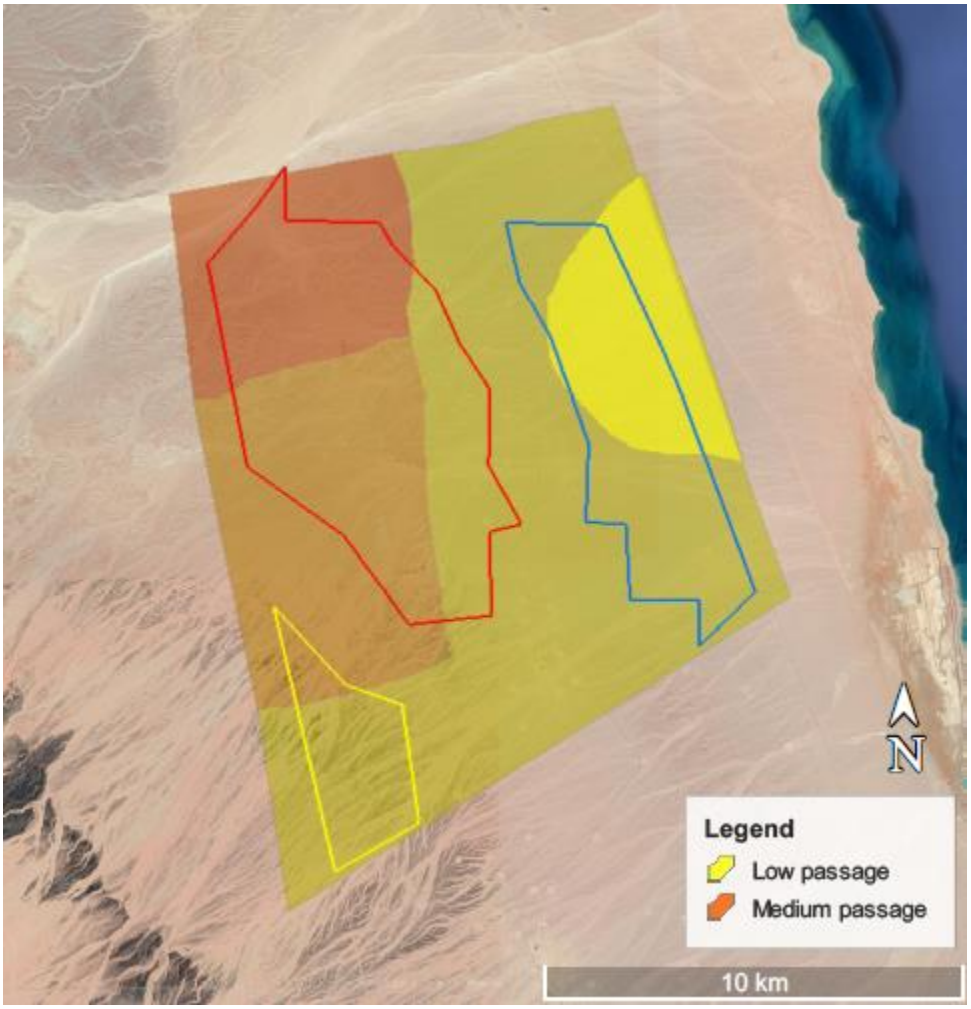

Figure 8-39: Passage of Steppe Eagle *Aquila nipalensis* in regard to collision risk

Table 8-14: Species Numbers and Percentages of Total Numbers at Collision Risk Height at the Different Vantage Points (Consultant, 2019)

Species	OP1		OP2		OP3		OP4		OP5		OP6		OP7		OP8		Total	
	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)
Egyptian Vulture *Neophron percnopterus*	25	6 (24.0)	123	8 (6.5)	75	12 (16.0)	30	6 (20.0)	60	4 (6.7)	28	13 (46.4)	21	6 (28.6)	33	0 (0)	**395**	**55 (13.9)**
Griffon Vulture *Gyps fulvus*	0	0 (0)	3	1 (33.3)	1	0 (0)	1	1 (100)	1	0 (0)	-	-	-	-	2	1 (50.0)	**8**	**3 (37.5)**
Black Kite *Milvus migrans*	1662	491 (29.5)	3021	460 (15.2)	3014	140 (4.6)	1433	367 (25.6)	1918	15 (0.8)	1868	86 (4.6)	1002	364 (36.3)	2311	194 (8.4)	**16229**	**2117 (13.0)**
Osprey *Pandion heliaetus*	-	-	1	0 (0)	2	0 (0)	-	-	-	-	1	1 (100)	-	-	1	0 (0)	**5**	**1 (20.0)**
European Honey-buzzard *Pernis apivorus*	3858	3231 (83.7)	6554	155 (2.4)	2075	56 (2.7)	621	382 (61.5)	2134	15 (0.7)	3586	3355 (93.6)	1066	1039 (97.5)	1732	14 (0.8)	**21626**	**8247 (38.1)**
Booted Eagle *Hieraaetus pennatus*	48	24 (50.0)	247	30 (12.1)	155	9 (5.8)	42	13 (31.0)	90	5 (5.6)	16	4 (25.0)	29	12 (41.4)	231	5 (2.2)	**858**	**102 (11.9)**
Steppe Eagle *Aquila nipalensis*	2071	231 (11.2)	3886	1204 (30.1)	3209	292 (9.1)	1701	229 (13.5)	2121	163 (7.7)	1697	422 (24.9)	1158	156 (13.5)	1309	33 (2.5)	**17152**	**2730 (15.9)**
Tawny Eagle *Aquila rapax*	-	-	-	-	1	0 (0)	-	-	-	-	-	-	-	-	-	-	**1**	**0 (0)**
Eastern Imperial Eagle *Auila heliaca*	2	0 (0)	9	1 (11.1)	5	0 (0)	5	2 (40.0)	11	1 (9.1)	1	0 (0)	4	3 (75.0)	7	0 (0)	**44**	**7 (15.9)**
Greater Spotted Eagle *Clanga clanga*	10	0 (0)	74	2 (2.7)	160	2 (1.3)	26	4 (15.4)	20	2 (10.0)	12	2 (16.7)	19	4 (21.1)	20	1 (5.0)	**341**	**17 (5.0)**

Species	OP1		OP2		OP3		OP4		OP5		OP6		OP7		OP8		Total	
	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)
Lesser Spotted Eagle *Clanga pomarina*	108	6 (5.6)	689	39 (5.7)	436	33 (7.6)	25	4 (16.0)	163	1 (0.6)	175	9 (5.1)	8	5 (62.5)	101	4 (4.0)	**1705**	**101 (5.9)**
Western Marsh-harrier *Circus aeruginosus*	10	6 (60.0)	11	5 (45.5)	15	3 (20.0)	3	2 (66.7)	5	1 (20.0)	16	10 (62.5)	2	2 (100)	5	1 (20.0)	**67**	**30 (44.8)**
Montagu's Harrier *Circus pygargus*	6	5 (83.3)	2	2 (100)	2	1 (50.0)	4	4 (100)	1	1 (100)	4	4 (100)	2	2 (100)	2	1 (50.0)	**23**	**20 (87.0_**
Pallid Harrier *Circus macrourus*	2	1 (50.0)	5	3 (60.0)	1	1 (100)	4	4 (100)	3	2 (66.7)	5	4 (80.0)	2	2 (100)	2	0 (0)	**24**	**17 (70.8)**
Short-toed Snake-eagle *Circaetus gallicus*	136	58 (42.6)	384	30 (7.8)	342	55 (16.1)	109	11 (10.1)	220	7 (3.2)	60	6 (10.0)	93	28 (30.1)	219	21 (9.6)	**1563**	**216 (13.8)**
Eurasian Sparrowhawk *Accipiter nisus*	5	1 (20.0)	24	9 (37.5)	26	1 (3.8)	9	6 (66.7)	17	0 (0)	4	0 (0)	10	2 (20.0)	13	0 (0)	**108**	**19 (17.6)**
Levant Sparrowhawk *Accipiter brevipes*	2000	0 (0)	-	-	2217	2200 (99.2)	3	2 (66.7)	-	-	-	-	5	2 (40.0)	5	0 (0)	**4230**	**2204 (52.1)**
Long-legged Buzzard *Buteo rufinus*	9	7 (77.8)	103	16 (15.5)	119	12 (10.1)	99	11 (11.1)	58	2 (3.4)	15	4 (26.7)	82	16 (19.5)	63	8 (12.7)	**548**	**76 (13.9)**
Steppe Buzzard *Buteo buteo vulpinus*	7762	2268 (29.2)	20777	1834 (8.8)	14605	836 (5.7)	8085	1647 (20.4)	12858	666 (5.2)	4694	320 (6.8)	4507	2130 (47.3)	13452	655 (4.9)	**86740**	**10356 (11.9)**
Lanner Falcon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0 (0)	**2**	**0 (0)**

Species	OP1		OP2		OP3		OP4		OP5		OP6		OP7		OP8		Total	
	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)	Total Birds	At risk height (%)
Falco biarmicus																		
Merlin *Falco columbarius*	-	-	-	-	-	-	-	-	1	1 (100)	-	-	-	-	-	-	**1**	**1 (100)**
Lesser Kestrel *Falco naumanni*	-	-	3	2 (66.7)	3	0 (0)	-	-	2	0 (0)	-	-	-	-	2	0 (0)	**10**	**2 (20.0)**
Eleonora's Falcon *Falco eleonorae*	-	-	1	1 (100)	-	-	-	-	-	-	-	-	1	-	-	-	**1**	**1 (100)**
Sooty Falcon *Falco concolor*	-	-	-	-	-	-	1	1 (100)	1	1 (100)	-	-	-	-	-	-	**2**	**2 (100)**
Red-footed Falcon *Falco vespertinus*	-	-	-	-	-	-	1	1 (100)	-	-	-	-	-	-	-	-	**1**	**1 (100)**
Crane *Grus grus*	1	0 (0)	-	-	7	0 (0)	-	-	-	-	-	-	-	-	-	-	**8**	**0 (0)**
White Pelican *Pelecanus onocorotalus*	455	4 (0.9)	98	17 (17.3)	-	-	-	-	-	-	252	2 (0.8)	-	-	131	120 (91.6)	**936**	**143 (15.3)**
Pink-backed Pelican *Pelecanus rufescens*	-	-	1	0 (0)	-	-	-	-	-	-	-	-	-	-	-	-	**1**	**0 (0)**
Black Stork *Ciconia nigra*	234	72 30.8	646	79 (12.2)	235	23 (9.8)	156	13 (8.3)	190	6 (3.2)	47	2 (4.3)	265	195 (73.6)	383	7 (1.8)	**2156**	**397 (18.4)**
White Stork *Ciconia ciconia*	22011	20100 (91.3)	18296	167 (0.9)	18639	3440 (18.5)	7213	2155 (29.9)	17124	5085 (29.7)	10515	6249 (59.4)	42811	37563 (87.7)	17936	11655 (39.5)	**154545**	**86414 (55.9)**
Eagle Species *Auila sp.*	289	12 (4.2)	197	27 (13.7)	153	3 (2.0)	2	0 (0)	1167	0 (0)	108	11 (10.2)	-	-	1445	4 (0.3)	**3361**	**57 (1.7)**

Species	OP1		OP2		OP3		OP4		OP5		OP6		OP7		OP8		Total	
	Total Birds	**At risk height (%)**	**Total Birds**	**At risk height (%)**	**Total Birds**	**At risk height (%)**	**Total Birds**	**At risk height (%)**	**Total Birds**	**At risk height (%)**	**Total Birds**	**At risk height (%)**	**Total Birds**	**At risk height (%)**	**Total Birds**	**At risk height (%)**	**Total Birds**	**At risk height (%)**
Buzzard species *Buteo sp.*	397	91 (22.9)	237	95 (40.1)	428	44 (10.3)	-	-	1107	51 (4.6)	154	12 (7.8)	-	-	4843	95 (2.0)	**7166**	**388 (5.4)**
Harrier species *Circus sp.*	2	1 (50.0)	7	5 (71.4)	3	2 (66.7)	-	-	2	2 (100)	4	3 (75.0)	-	-	2	2 (100)	**20**	**15 (75.0)**
Falcon species *Falco sp.*	1	0 (0)	5	2 (40.0)	4	2 (50.0)	-	-	3	2 (66.7)	-	-	-	-	8	1 (12.5)	**21**	**7 (33.3)**
Raptor species	193	31 (16.1)	545	162 (29.7)	598	3 (0.5)	2	0 (0)	1564	8 (0.5)	30	3 (10.0)	2	2 (100)	3050	72 (2.4)	**5984**	**281 (4.7)**
Total	**41297**	**26646 (64.5)**	**55949**	**4356 (7.8)**	**46530**	**7170 (15.4)**	**19575**	**4865 (24.8)**	**40841**	**6041 (14.8)**	**23292**	**10522 (45.2)**	**51089**	**41533 (81.3)**	**47310**	**12894 (27.3)**	**325882**	**114029 (35.0)**

Temporal distribution of records and individuals

The highest number of records and individuals were observed during the second month of the survey period with 68.3% of the birds recorded in that period. Several peaks were observered starting by the fourth week of March and continuing to reach the highest peaks in the third week of April.

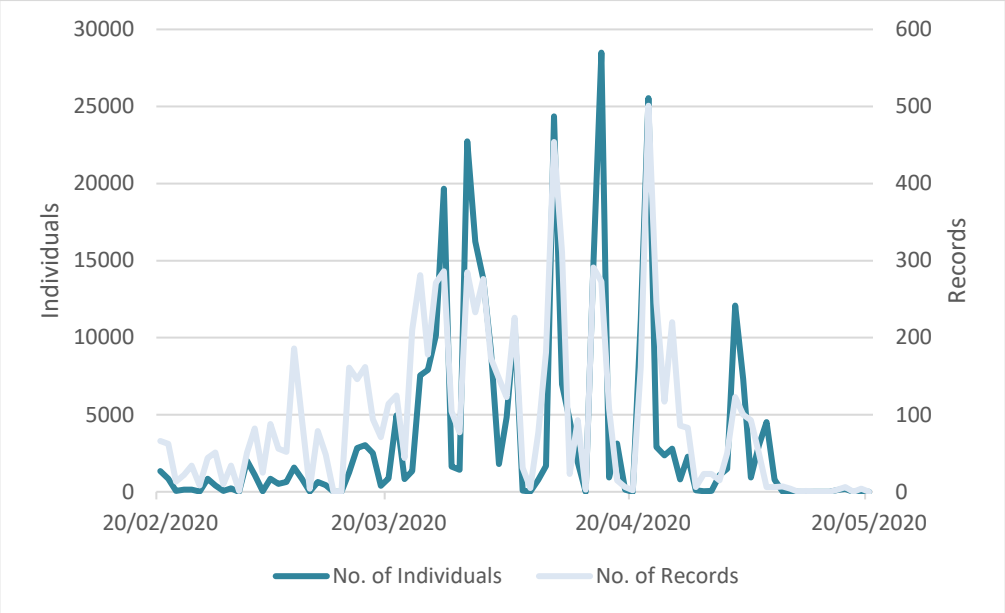

Figure 8-40: Number of Records and Bird Individuals Recorded over the Survey Period (Consultant, 2019)

Considering the diversity of species over the survey period, it can be noticed that the diversity was always relative to the number of records and individuals during the whole spring season. As mentioned earlier, the peaks starting in the fourth week of March have shown an increase in the number of birds, records and also species that has continued to be relative across the three factors throughout the survey.

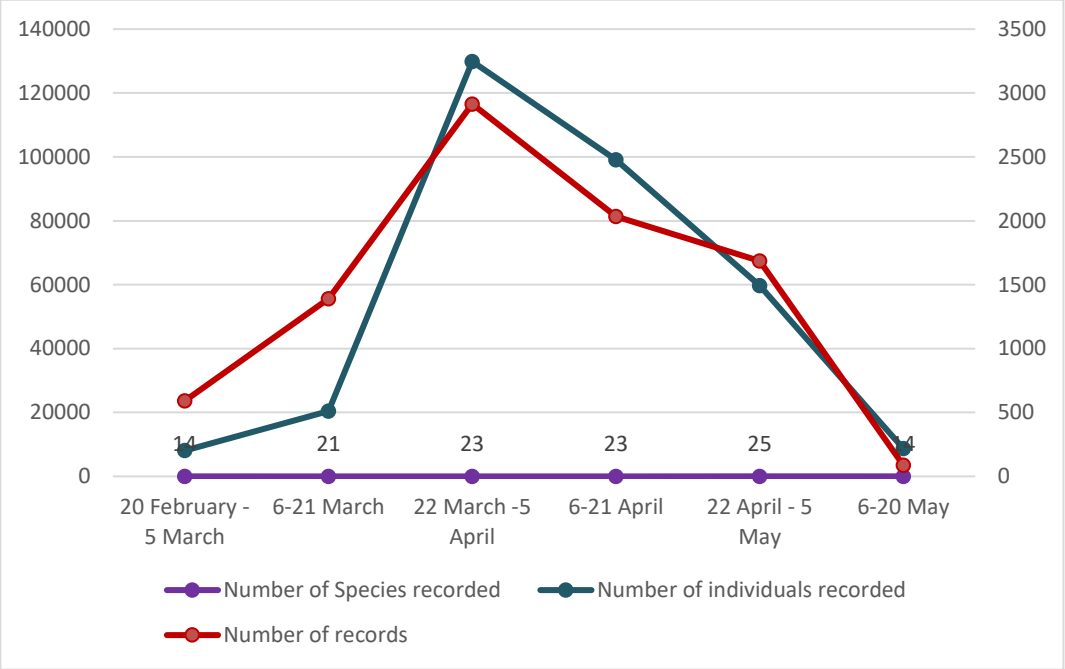

Figure 8-41: Distribution of Species, Records and Individuals over Survey Period (Consultant, 2019)

Analysing the distribution of records and individuals over the hours of the day shows that the peak of migration start in the late hours of the morning from 9:00am onwards. The largest number of birds were recorded between 9:00 and 10:00 with almost 30% of all birds recorded in the season. Also, more than 70% of the birds were recorded before noon while the numbers conintued to decrease until the end f monitoring during the day.

The number of observation records did not follow the same pattern as the highest number of records was alter in the morning than the number of individuals with the peak being between 10:00 and 11:00. However, the majority of the observation records were recorded before noon with a percentage reaching almost 77% of the total observation records. It should be noted that, unlike the autumn migration season, no late peak was noticed during the spring season and very low numbers were recorded to be roosting in comparison to the autumn.

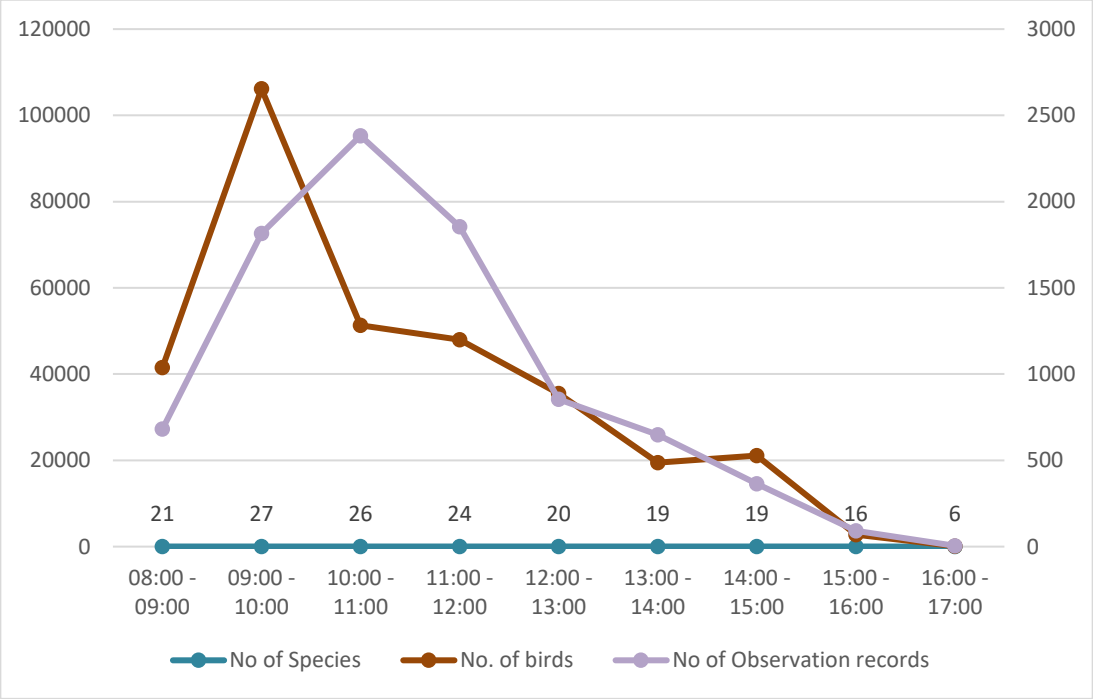

Figure 8-42: Distribution of Species, Records and Individuals over Time (hours) (Consultant, 2019)

Flight direction for bird individuals

As expected in a spring migration survey, the general direction of birds recorded was generally northward. More than 67% of the birds recorded were flying northeast while almost 23% were flying northwest.

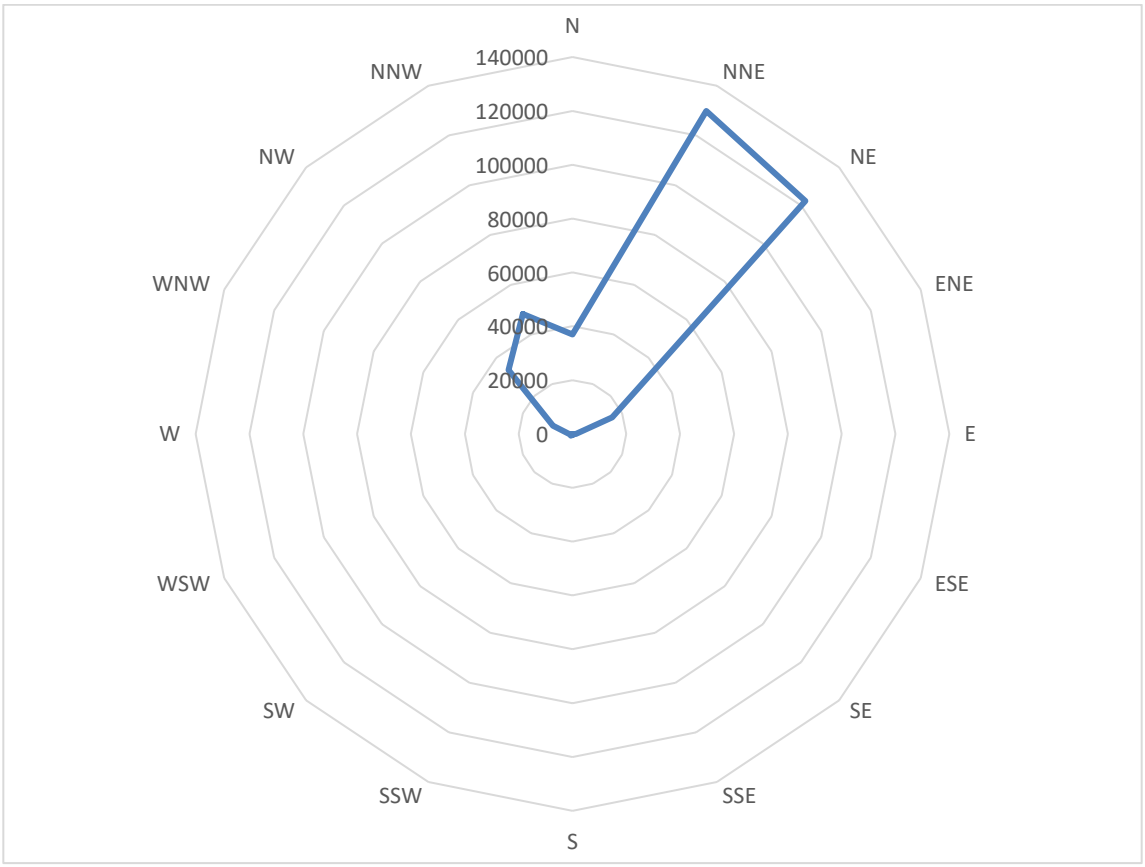

Figure 8-43: Flight Direction of Birds Recorded during the Survey (Consultant, 2019)

Looking at the direction of birds from the different observation points, it can be seen the average direction of birds fomr each observation point was between around northeast throughout the Project site, see Figure 8-19.

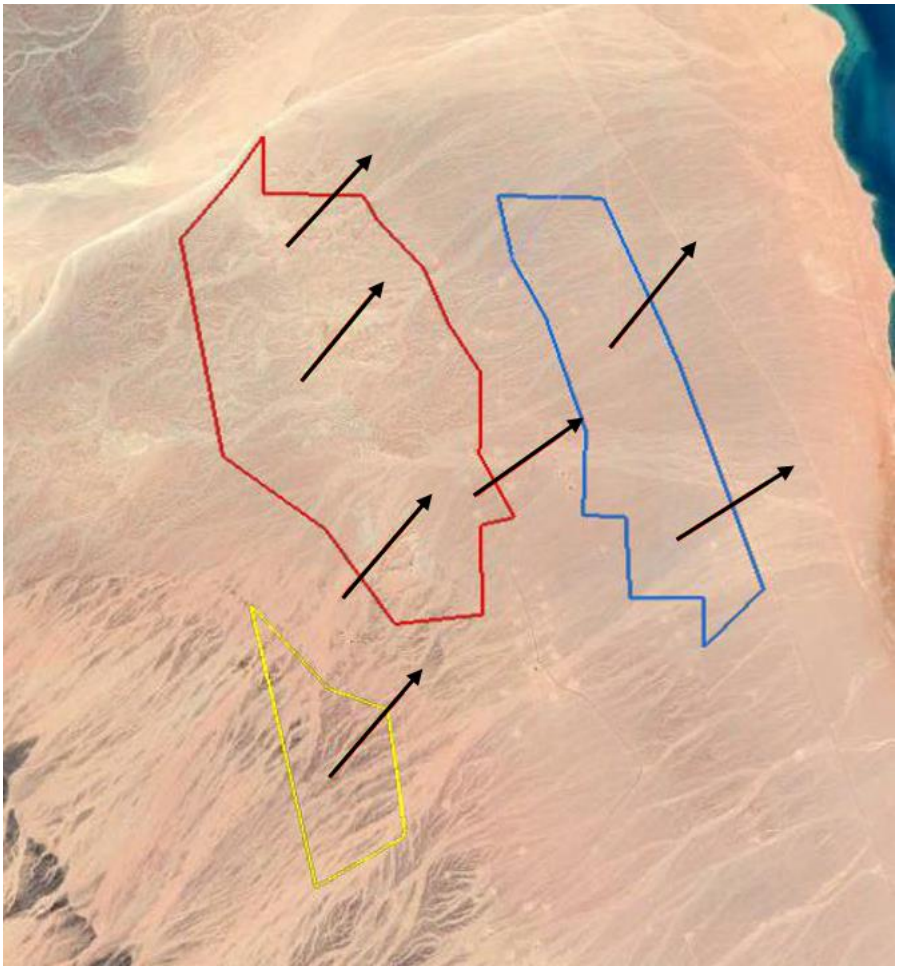

Figure 8-44: Average directions of birds over the Project site

Birds Behaviour

As mentioned earlier, documenting the behaviour of birds during in-flight monitoring would normally provide figures that far exceed the total number of the birds recorded. This is due to the fact that birds could be recorded displaying more than one behaviour while flying across the field of observation. The largest number of birds showing a single behaviour were 369,905 birds soaring followed by 362,836 gliding, see **Error! R eference source not found.**. It should be noticed that 280,630 birds were showing the combined behaviour of soaring and gliding while passing through the Project site, without active flight (70.2% of all birds recorded during the season). Similar to the autumn survey, very few records were documented of birds landing and/or roosting at the project site.

Table 8-15: Number of Birds Recorded According to Behaviour

Behaviour	Number of Records	No. of Individuals
Active Flight	1878	91,694
Gliding	7698	362,846
Soaring	7259	369,905
Resting / Landing / Roosting	18	841

8.6 Bats - Chiroptera

This section provides an assessment of baseline conditions within the wind farm and its surroundings in relation to bats

8.6.1 Baseline Assessment Methodology

The baseline assessment of the Project site was based on a literature review which is discussed in detail below.

(i) Literature Review

This was based on previous studies, data, surveys, and records available in published scientific papers, books, and journals on bats of Egypt and the Gulf of Suez.

(ii) Field Survey

No field survey was undertaken at the Project site, given that the ESIA has been completed during autumn/winter time. In general, the most suitable period to assess bat activity and undertake a bat survey would be during the spring/summer season (i.e. April until August), as bats become active after the hibernation which may last from December to March.

Therefore, at this stage, the literature review is the main source of information about the bats in the Project site and its vicinity.

It is important to note that the Consultant will be undertaking a bat survey during spring 2020 and additional details on this is provided throughout this section.

(iii) Bats Species' status

The conservation status of the bat species listed from the literature review are based on IUCN's Red List of Threatened Species (IUCN, 2019).

8.6.2 Results

Based on literature, a total of 22 bat species are known to occur in Egypt as a whole. Out of which, at least ten species are known to have a presence within the Project site and its vicinity as part of their distribution range. In addition to those ten species, there are at least four more species that have their distribution range adjacent to the area of Gulf of Suez. All ten species listed in the literature are species of Least Concern according to the IUCN Red List of Threatened Species, see Table 8-16.

Table 8-16: List of Bat Species Recorded in Project Site and Vicinity Based on Literature Review (Consultant, 2019)

Family	Scientific name	Common name	IUCN Red List of Threatened Species (IUCN, 2019)
Hipposideridae	*Allesia tridens*	Geoffroy's Trident Leaf-nosed Bat	Least Concern
Nycteridae	*Nycteris thebaica*	Cape Long-eared Bat	Least Concern
Vespertilionidae	*Pipistrellus kuhlii*	Kuhl's Pipistrelle	Least Concern
	Pipistrellus rueppellii	Ruppel's Pipistrelle	Least Concern
	Nycticeinops schliefenni	Schlieffen's Bat	Least Concern
	Eptescisu bottae	Botta's Serotine	Least Concern
Rhinopomatidae	*Rhinopoma microphyllum*	Greater Mouse-tailed Bat	Least Concern
	Rhinopoma hardwickii	Lesser Mouse-tailed Bat	Least Concern

Family	Scientific name	Common name	IUCN Red List of Threatened Species (IUCN, 2019)
	Rhinopoma cystops	Egyptian Mouse-tailed Bat	Least Concern
Emballonuridae	*Taphozous nudiventris*	Naked-rumped Tomb Bat	Least Concern

It important to note that bat activity in general is correlated to insect activity. Where insects are present it is likely that bat activity will be present given that they feed on them. Within the site, nocturnal insect activity is expected to be very low, if not absent, due to the arid nature of the Project site and the very low vegetation coverage (as discussed in Section 8.4 (biodiversity). Vegetation coverage is the main source for many insects (e.g. moths) where they breed and feed.

In addition, based on the biodiversity survey undertaken earlier, it does not seem that the Project site supports any roosting sites for bats (however this will require verification through the bat survey that will be required as discussed below). Potential areas for roosting sites could be within the mountainous areas to the west of the Project site.

8.7 Archaeology and Cultural Heritage

This section provides an assessment of baseline conditions within the Project site and surrounds in relation to archaeology and cultural heritage

8.7.1 Baseline Assessment Methodology

The baseline assessment of the Project site was based on a literature review and a field survey, each of which is discussed below.

(i) Literature Review

Literature review included a comprehensive review of archives, publications, and studies on previous archaeological and cultural heritage work and surveys undertaken in the area, and which are available through desktop review as well as through the Red Sea Antiquities Inspection Office and Suez Antiquities Inspection Office. Such literature review included information available through the French Institute for Oriental Archaeology, French Institute in Cairo, and data published by the French mission working at in Sukhna city.

(ii) Field Survey

A field survey was undertaken by an archaeology and cultural heritage expert. The objective of the field survey was to ascertain the presence of any surface archaeological or cultural heritage remains within the Project site. The survey was undertaken to cover the entire Wind Farm Project site boundary. The surface area was walked by the expert in order to inspect the entire ground surface. Based on the survey, should any sites of interest be recorded the following will be undertaken:

- Sketch plans and /or a photograph as appropriate
- GPS coordinates for the area
- Undertake an analysis to categorize the sites and archaeological features and making an assessment of their significance.

In addition to the above, targeted consultations were undertaken with relevant governmental entities to include: (i) Red Sea Antiquities Inspection Office; and (ii) Suez Antiquities Inspection Office. The objective was to discuss the results and outcomes of the assessment, and identify any key issues of concern or additional requirements they might have.

8.7.2 Results

This section presents the results in accordance with the methodology discussed above. Based on the literature review through desktop research as well as consultations with the Red Sea Antiquities Inspection Office and Suez Antiquities Inspection Office, it is concluded that there are no registered archaeological sites with the Project area itself. The closest sites that are considered of great archaeological, historical and cultural heritage value are described in Table 8-17 below and presented in the figure that follows.

Table 8-17: Description of Closest Archaeological Sites to the Project (Consultant, 2019)

Site	Description	Distance to Project
Wadi Jarf / Red sea coast	A harbour complex which was used regularly during the second half of the Old Kingdom and the Middle Kingdom (from 2550 to 1700 b.c.e.). It was used by the expeditions seeking turquoise and other products from south Sinai. Moreover, it's also known for its very famous wadi jarf papyrus which dates to the reign of king khufu and which describes the organization of labour under the supervision of their leader Merer who recorded the diary of the mission on a long papyrus sheet.	19km to the north
Saint Anthony Monastery (Deir erl Qidis Antun)	Saint Anthony's disciples founded the monastery between 361 and 36 (Starkey.2012:205)	40km to the north
Saint Paul Monastery (Deir el Qidis Nulus):	The monastery is located in front of mount el galala. The caves in this area were used by Christian monks who used the limited resources available in the harsh desert for living, while the cave and chapel of Saint Paul in particular were considered the base for the current monastery (Starkey.2012: 207).	19km to the north

Figure 8-45: Location of Closest Archaeological Sites to the Project Area (Consultant, 2019)

Finally, based on the site survey undertaken, no archaeology and cultural heritage sites were identified or recorded within the Wind Farm Project site. The outcomes of the assessment were discussed with key stakeholder to include: (i) Red Sea Antiquities Inspection Office; and (ii) Suez Antiquities Inspection Office. Similarly, no key issues of concern were raised and no additional requirements were identified by such entities.

8.8 Air Quality and Noise

This section provides an assessment of baseline conditions within the Project site and surrounds in relation to air quality and noise

8.8.1 Baseline Assessment Methodology

Assessment of baseline conditions was based on onsite air quality and noise monitoring program undertaken at the Project site. Additional details are discussed below.

(i) Selection of Parameters

Monitoring was undertaken for the following parameters: (i) gases to include Carbon Monoxide (CO), Sulphur Dioxide (SO_2) and Nitrogen Dioxide (NO_2), (ii) Suspended Particulate Matter to include Total Suspended Particulate (TSP) and Respirable Particulates (i.e. Particulate Matter smaller than 10.0 microns in diameter or PM10) ; and (iii) Noise Pressure Levels (NPL). These parameters were selected based on the following rationale:

- Such parameters are likely to be present within the Project site given its characteristic and attributes. Suspended particulate matter is expected given the barren nature of the site. On the other hand, pollutants (such CO, SO_2, NO_2,) are expected onsite but rather at minimal concentrations as the site is relatively in a remote area; nevertheless, motor emissions particularly from vehicles passing casually through the site (or from the main road) could be a source of such pollutants. Finally, noise levels are expected from vehicular movement and to some extent from onsite and surrounding areas and activities.
- Such parameters are likely to be affected mainly during the Project's construction and operational activities. All air pollutant parameters selected are expected to be slightly impacted and increase specifically during the Project's construction activities. Emissions from vehicles and machinery used onsite and their movement onsite will increase gaseous emissions, suspended particulate matter, as well as noise pressure levels.

(ii) Selection of Locations

To assess the air quality and noise baseline conditions within the Project area, 4 monitoring points were selected taking into account the following criteria. Monitoring was undertaken for 24h at each point respectively for a total of 96 hours of monitoring. The location of the points is presented in the figure that follows.

- Proximity to the nearest receptor: typically, an air quality and noise monitoring program should take into account the location of sensitive receptors. However, as noted earlier, there are no sensitive receptors within the Project site. Therefore, during the point selection one point was located on the Project boundary so that it is considered the closest to potential sensitive receptors (M2). As discussed earlier, the closest potential sensitive receptor would be the Air Force Defence Unit which is located around 3.4km to the east of the Project site (refer to "Section 8.2.3" earlier).
- Coverage of the site in which one point was selected in each of the three (3) Project plots. In addition, coverage of the site took into account to the greatest extent possible ensuring a point is included in each key geographical location of the Project to include North, South, East and West.
- Prevailing wind directions: review of secondary data in relation to wind rose at the Project site indicates that the dominant direction is North and North-West. Therefore 2 points were selected so that one is located upwind (M1) and one is located downwind (M2)
- Logistical issues such as the particular method of instrument used for sampling, resources available, physical access and security against loss and tampering were also taken into account

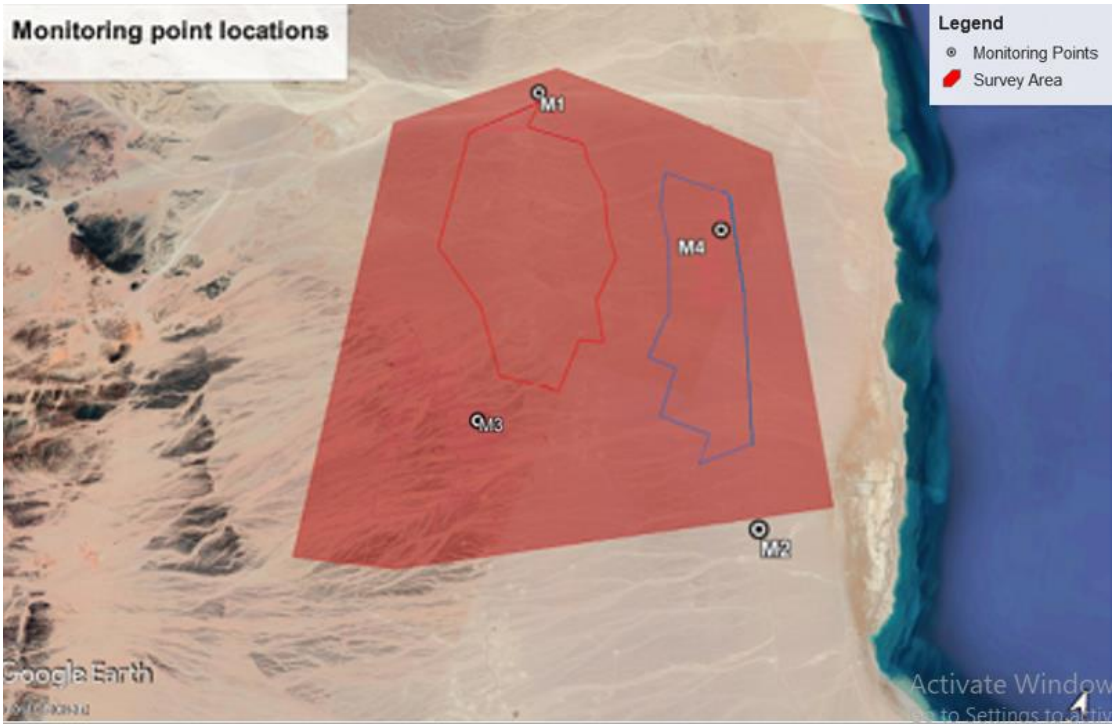

Figure 8-46: Location of Monitoring Points (Consultant, 2019)

(iii) Instrumentation

With regards to air quality a mobile lab unit (check figure below) was utilized for undertaking ambient air quality measurements that was equipped with the following:

- Thermo Model 42i NO-NO2-NOx Analyzer
- Thermo Model 43i SO2 Analyzer
- Thermo Model 48i CO Analyzer
- Thermo Model FH62 C14 PM-10 Monitor
- Thermo Model 5014i TSP Monitor

With regards to noise, a Bruel & Kjaer (B&K) Modular Precision Sound Analyzer Type 2238 and Hand-held Analyzer Types 2270 was used.

Figure 8-47: Instrumentation Used for Onsite Monitoring (Consultant, 2019)

(iv) Legislative Requirements

With regards to air quality, the results of the measurements were compared to the national limits as set within Annex 5 of the Executive Regulation (D1095/2011) for ambient air quality. The table below identifies the corresponding applicable national ambient air quality permissible limits. The limits included for 'industrial' areas where used for comparison given the industrial nature of the site that includes petroleum activities and wind farms.

Table 8-18: Applicable National Ambient Air Quality Permissible Limits (Annex 5 of the Executive Regulation (D1095/2011) for ambient air quality)

Pollutant	Location	Maximum Limit (µg/m³)			
		1 Hour	8 Hours	24 Hours	1 Year
Sulfur Dioxide (SO_2)	Urban	300	---	125	50
	Industrial	350	---	150	60
Carbon Monoxide (CO)	Urban	30 mg/m³	10 mg/m³	---	---
	Industrial			---	---
Nitrogen Dioxide (NO_2)	Urban	300	---	150	60
	Industrial	300	---	150	80
Total Suspended Particles (TSP)	Urban	---	---	230	125
	Industrial	---	---	230	125
Respirable Particulates (PM_{10})	Urban	---	---	150	70
	Industrial	---	---	150	70
Solid Particulates < 2.5 µm	Urban	---	---	80	50
	Industrial	---	---	80	50

With regards to noise, the results were compared to the national limits set in Annex 7 of the Executive Regulation (D710/2012) for the 'Day' and 'Night' intervals. The table below lists the different area classifications and their corresponding applicable permissible limits for noise. Similarly, the limits included for 'industrial' areas where used for comparison given the industrial nature of the site that includes petroleum activities and wind farms, which is set at 70dB(A) for both night and day.

Table 8-19: Applicable National Permissible Limits for Noise (Annex 7 of the Executive Regulation (D710/2012))

Type of Area	Permissible Limit for Noise Intensity [dB (A)]	
	Day (7 am to 10 pm)	Night (10 pm to 7 am)
Sensitive areas to noise	50	40
Residential suburb with low traffic and limited activities service	55	45
Residential areas in the city and have commercial activities	60	50
Residential areas are located on roads less than 12 m and have some workshops or commercial activities or administrative activities or recreational activities … etc.	65	55
Residential areas located on roads equal or more than 12 m, or industrial zones with light industry and some other activities	70	60
Industrial areas (heavy industries)	***70***	***70***

8.8.2 Results

The table below presents the overall results for the air quality monitoring that was undertaken.

As noted in the table below, at all monitoring points and for all parameters monitored, the results are significantly lower than the maximum allowable ambient air levels indicated within the legal limits. This includes both hourly limits as well as 24h average limits as required in the legal limits.

It is important to note that within the Project site and surrounding areas, no point sources of pollutant emissions were noted that could affect the results level. In addition, as noted earlier, within the Project site there is a petroleum storage facility as well as an oil rig – however activities undertaken in such areas are minimal, limited, and utilise minimal equipment and machinery and do not include any significant or key sources of emissions that could affect monitoring results. The only noticeable equipment used which could affect result levels were generators that do not operate all day long.

Taking the above into account, the main source of such pollutants onsite is attributed to their trace values in the atmosphere which could be potentially from the infrequent and periodic vehicular movement within the road networks onsite as well as the minimal emissions from the generators used onsite. Nevertheless, as discussed earlier, all monitoring results are well within the limits specified and none exceed maximum allowable limits for ambient air quality.

The following table follows presents the overall results for the noise monitoring that were undertaken (the LAeq average noise level at each monitoring point). As noted in the table below, in general all results are within the maximum allowable noise limits set for the area with no exceedances recorded. It is important to note that within the Project site and surrounding areas there are no point sources of noise generation that could affect the results or noise levels. In addition, the activities undertaken at the petroleum storage facility and oil rig onsite did not generate any key sources of noise during the monitoring period.

The only source of noise that can be recorded onsite was the occasional vehicles within the onsite road network as well as the high wind speeds which can significantly affect noise baseline levels.

Table 8-20: Outcomes of Ambient Air Quality Monitoring (Consultant, 2019)

Date	Time	Point 1					Point 2					Point 3					Point 4				
		NO_2	SO_2	CO	TSP	RSP	NO_2	SO_2	CO	TSP	RSP	NO_2	SO_2	CO	TSP	RSP	NO_2	SO_2	CO	TSP	RSP
1/11 – 2/ 11 Point 1	12:00	2	1	4	60	23	1	6	2	40	17	1	3	2	41	16	1	1	2	93	40
	13:00	1	0	4			1	6	3			1	3	2			1	1	2		
	14:00	1	0	4			1	10	2			1	0	2			2	5	2		
2/11 – 3/11 Point 2	15:00	1	0	4			1	26	2			1	1	2			1	5	2		
	16:00	1	0	3			1	33	2			1	1	2			1	1	2		
	17:00	1	0	3			4	4	1			1	1	2			2	1	2		
3/11 – 4/11 Point 3	18:00	2	1	4			2	1	2			1	1	2			2	1	2		
	19:00	1	0	4			1	1	2			2	2	2			2	1	1		
	20:00	2	0	4			1	1	2			2	2	2			1	1	1		
4/11 – 5 /11 Point 4	21:00	4	0	4			1	1	1			1	1	2			1	1	2		
	22:00	2	0	3			2	1	1			1	1	2			1	1	2		
	23:00	3	0	4			2	1	2			0	1	2			1	1	2		
	0:00	3	0	4			1	1	2			0	1	2			12	1	1		
	1:00	5	1	3			1	1	2			0	1	2			2	1	1		
	2:00	2	1	3			1	0	2			1	1	2			1	0	1		
	3:00	1	1	3			1	1	2			1	0	2			1	0	1		
	4:00	1	1	3			1	0	2			0	0	2			3	1	1		
	5:00	4	1	3			1	0	2			1	0	2			2	1	1		
	6:00	3	1	3			1	0	2			1	1	2			1	1	1		
	7:00	5	1	3			1	1	2			1	1	2			1	2	1		
	8:00	4	0	3			1	1	2			0	1	2			2	2	1		
	9:00	2	0	3			1	12	2			0	1	2			3	2	1		
	10:00	2	0	3			1	10	2			0	1	2			2	4	1		
	11:00	2	0	3			1	4	2			1	1	2			2	7	2		
Max. 1h		5	1	4			4	33	3			2	3	2			3	7	2		
Max. 8h		-	-	1			-	-	1			-	-	1			-	-	1		
Avg. 24h		2	0	-			1	5	-			1	1	-			2	2	-		
Legal Limits	Max1h	300	350	30	-	-	300	350	30	-	-	300	350	30	-	-	300	350	30	-	-
	Max8h	-	-	10	-	-	-	-	10	-	-	-	-	10	-	-	-	-	10	-	-
	Avg24h	150	150	-	230	150	150	150	-	230	150	150	150	-	230	150	150	150	-	230	150

All units in the above table are in µg/m³ except for CO which is recorded in mg/m³.

Table 8-21: Ambient Noise Levels Monitoring Results (Consultant, 2019)

Monitoring Point	Daytime Average dB (A)	Night-time Average dB (A)
1	69	64
2	65	63
3	59	64
4	61	45
Legal limit [dB(A)]	70	70

8.9 Infrastructure and Utilities

This section provides an assessment of baseline conditions within the Project site and surrounds in relation to infrastructure and utilities

8.9.1 Baseline Assessment Methodology

Assessment of baseline conditions was based on an onsite survey for the Project and consultations with relevant entities that are managing such infrastructure and utility elements. Additional details are discussed below.

8.9.2 Existing Roads and Networks

Based on the survey undertaken on the Project site it was indicated that there are two types of roads in the Wind Farm area (refer to Figure 8-48 below). This includes: (i) dirt road that is used by the quarry sites that are located around 20km from the Project area (as discussed in "Section 8.2.1" earlier) – the dirt road is located just north of the Project site; (ii) existing road networks in and around the Project site that is used by the General Petroleum Company for their activities in the area.

8.9.3 Electricity Lines

An electricity line runs within the most eastern parts of the Wind Farm area including 4 pylons located within the site (refer to Figure 8-52 below). The electricity line is under the responsibility of the Egyptian Electricity Transmission Company (EETC).

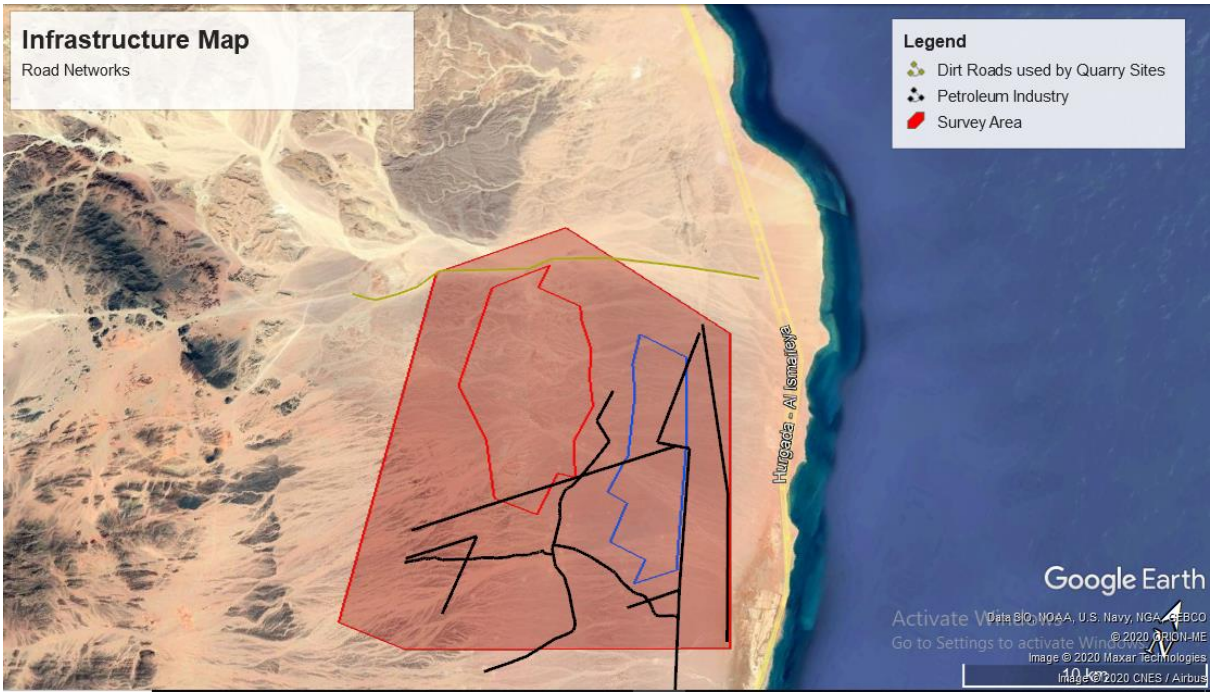

Figure 8-48: Existing Roads Networks within the Wind Farm area (Consultant, 2019)

Figure 8-49: Dirt Roads Used by Quarries (Consultant, 2019)

Figure 8-50: Roads Used by Petroleum Activities (Consultant, 2019)

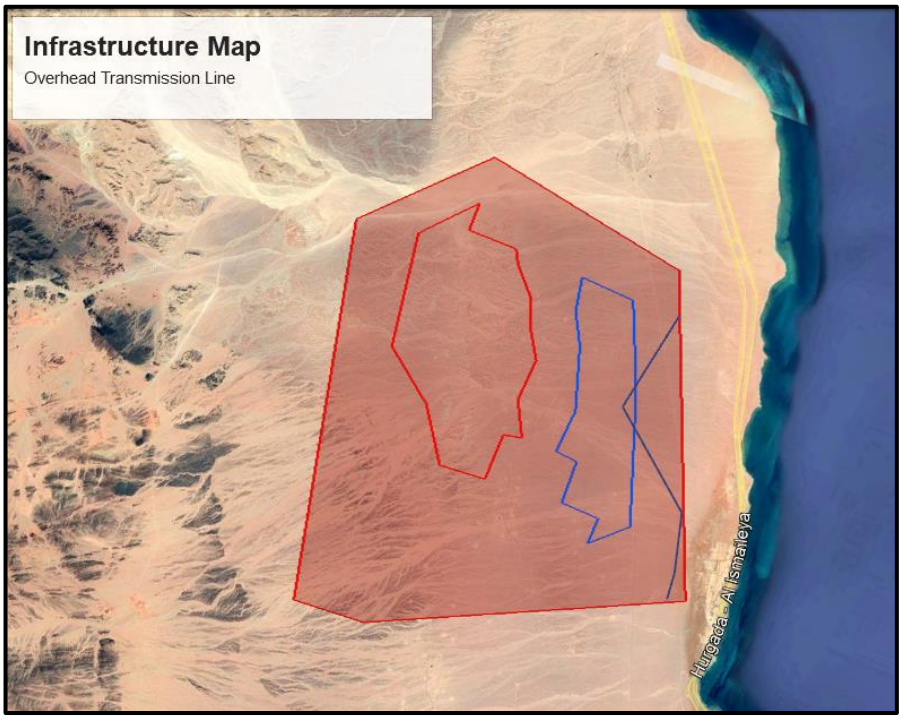

Figure 8-51: Electricity Line within the Project Site (Consultant, 2019)

Figure 8-52: Pylons within the Project Site (Consultant, 2019)

8.9.4 Natural Gas Line

A natural gas pipeline runs to the east of the Project site by around 1km at the narrowest point as noted in the figure below.

Figure 8-53: Gas Pipeline (Consultant, 2019)

8.9.5 Water Management

Based on consultations with Ras Ghareb Water Company there are no existing or planned water connections to the Project area. In addition, it was indicted that developments in such areas in general have to rely on water trucks and tankers from Ras Ghareb to deliver water requirements to the site.

8.9.6 Waste Management (solid waste, wastewater and hazardous waste)

Regarding solid waste management, the Red Sea Governorate has only one controlled dumpsite for the disposal of solid waste. This is known as the Ras Gharib Public dumpsite, located 4 Km west of the City of Ras Ghareb. The dumpsite is owned and operated by the Ras Ghareb City Council.

With regards to wastewater, this is disposed through the Ras Ghareb Water Company whom have tankers that collect wastewater and dispose it at the Ras Ghareb WWTP.

Finally, with regards to hazardous waste management, in Egypt there are currently 2 approved hazardous waste disposal facilities in Alexandria and Helwan which are about 600 and 400 km respectively from site.

The hazardous waste facilities are managed by the Nasiriya Hazardous Waste Treatment Centre (NHWTC) in Alexandria and in Arab Abu Saed the 2 facilities are privately owned and managed by First and EcoConServ Services.

8.9.7 Telecommunication Towers

Based on the site assessment, only 1 telecommunication tower was noted within the Project site located within the Petroleum Storage Facility onsite. The tower is presented in the figure below. No additional details were available on this telecommunication tower. In addition, no details are available on telecommunication broadcasting towers in the area in general including Line of Sight (LoS) connections.

Finally, located within the Project site are 5 meteorological towers that were installed to monitor wind speed and direction for Wind farm development in the area.

Figure 8-54: Telecommunication Tower within Petroleum Storage Facility Onsite (Consultant, 2019)

Figure 8-55: Met Mast Located Onsite (Consultant, 2019)

8.9.8 Civil and Military Radars and Aviation

As discussed earlier, located around 3.5km from the Project site is an Air Force Unit. During the site assessment it was noted that the Unit include military radar. However, no additional details could be obtained on this. In addition, no details are available on civil aviation radars in the area.

8.10 Occupational Health and Safety

Assessment of baseline conditions with regards to occupational health and safety is considered irrelevant. In addition, it is important to note that at this stage the Wind Farm EPC Contractors have not been selected and therefore no details are available on the worker accommodation strategy.

8.11 Public Health and Safety

This section provides an assessment of baseline conditions within the Project site and surrounds in relation to public health and safety

8.11.1 Assessment of Baseline Conditions

As discussed earlier, the human settlements to the Project site are located at around 45km to the north (Zaafarana) and 40km to the southeast (Ras Ghareb); both of which are considered at a distance from the area.

In addition, as discussed within the land use section (refer to part of the land use survey that was undertaken, within the Wind Farm site and a 2km radius around it the following receptors were identified:

- An existing petroleum storage facility located within the eastern part of the western plot of the Project site
- 1 oil rig located within the eastern part of the western plot of the Project site.

Apart from those receptors identified above, the area in general is uninhabited and vacant with no indication or evidence of any physical or economical land use activities. In addition, land use activities in the area in general were also investigated based on review of secondary data available. Key activities noted include the following as presented in the figure below:

- Air Force Defence Unit located around 3.4km to the east.
- Several existing petroleum activities mainly located to the north and east, closest of which is around 4.6km to the north. These activities include oil storage, transportation and oil rigs.
- Other oil rig stations (around 5) located around 3.5km to the south.

The above are not considered to be key sensitive receptors which are defined as areas where the occupants are more susceptible to the adverse effects of a wind farm. This includes but not limited to educational facilities (e.g. school or university), places of worship (e.g. mosque), dwelling houses or units, health care facilities (e.g. hospital or health centre), workforce accommodation, etc.

8.12 Socio-Economics

This section presents the baseline assessment of the Project site in relation to socio-economic conditions

8.12.1 Baseline Assessment Methodology

Socioeconomic conditions were assessed through a combination of a desk-based study, site visits, and consultations with relevant stakeholders. Based on a combination of both primary data collected from the field and secondary resources reviewed, including statistical data, this section highlights basic information about the demographic characteristics and human development profile, access to basic health services, economic characteristics, roads and transportation, and other services.

8.12.2 Results

Basic Demographic Characteristics

- *Population Profile:*

Based on information from the Statistical Yearbook 2018, the total population of the Red Sea Governorate was 366,000, which represents 0.39% of the total national population. Further information about the population in the project area is presented in the following table.

Table 8-22: Population and Households Figures in the Project Area (Red Sea Governorate Information Centre, 2018)

Area	Households	Population		Total Population
		Male	Female	
Red Sea Governorate	90,748	189,081	173,919	363,000
Ras Gharib	15,446	32,870	28,916	61,786
Hurghada	23,944	49,021	46,758	95,779
Safaga	16,836	34,327	33,019	67,346
Quseir	17,086	34,921	33,424	68,345
Marsa Alam	4,554	10,265	7,951	18,216
Shalateen	6,717	14,456	12,412	26,868
Halayeb	6,165	13,221	11,439	24,660

Ras Gharib represents 17% of the total population of the Red Sea Governorate, where the majority of population is located in Hurghada, due to the large-scale touristic activities in the city. However, services and population activities are concentrated in Ras Gharib City.

The following figure shows the distribution of the population in the Red Sea Governorate according to each city:

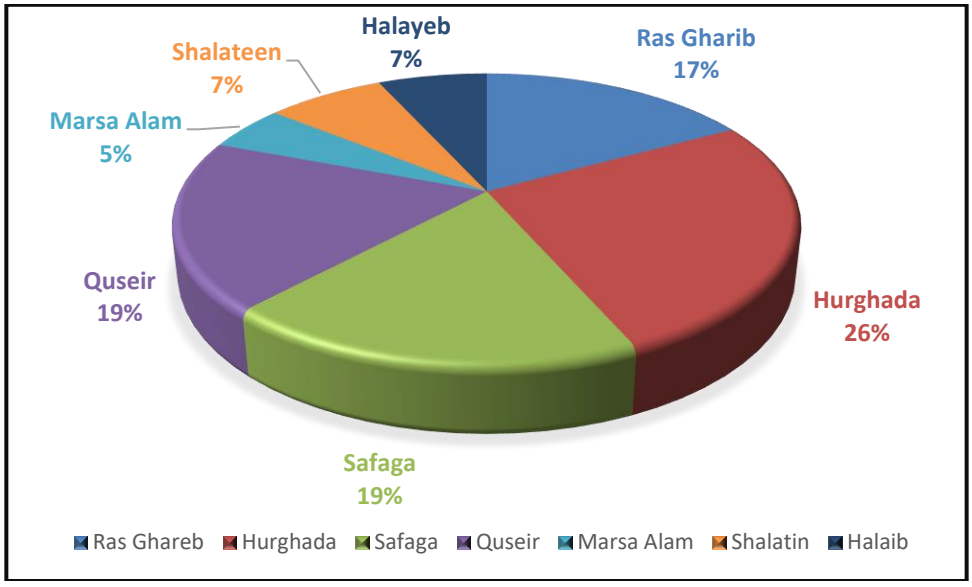

Figure 8-56: Distribution of Population Density According to Districts in the Red Sea Governorate (Consultant, 2019)

The majority of the Governorate's population is located in urban centres, and only a small number is located in rural areas in Zaafarana and Wadi Dara.

Bedouin communities in Ras Gharib are from Ma'ayza, Bashareya, and Ababdeh tribes. They are mostly unsettled, and live deep in the desert, away from the city and the villages. They currently settle permanently in Ras Gharib town, Zaafarana and Wadi Dara. Such Bedouin groups generally engage in traditional economical activities such as agriculture and animal husbandry and in addition, they are also employed in the Development projects in the area (mainly the petroleum companies) either as guides, security guards, or contractors (more details in Section 8.2.3).

The demographic trend also includes migrant workers from neighbouring governorates. The predominant majority of these migrant workers work for oil companies located in the area, and a very small number work in farms in Wadi Dara village.

- *Age and Gender Distribution*

Data from CAPMAS Statistical Yearbook 2018 indicate that the population in the Red Sea Governorate is predominantly young. Based on the outcomes of the 2014 population consensus, up to 86.7% of the population of the Red Sea Governorate are under the age of 45.

With respect to gender, statistical data indicates a disproportionate male/female ratio in the Governorate (194,759: 171,241).

- *Rate of Natural Increase*

The total population in the Red Sea Governorate has grown by 25.30/1000 (*Source: Red Sea Governorate Information Center, Statistical Yearbook of Red Sea Governorate, 2017-2018*), which is the highest rate over the past five years in terms of the natural increase rate. However, it is considered amongst the lowest 10 governorates in terms of birth rate.

The following table illustrates demographic trends in the Red Sea Governorate:

Table 8-23: Demographic Trends in the Red Sea Governorate (Red Sea Governorate Information Center, Statistical Yearbook of Red Sea Governorate, 2017-2018)

Demographic Trends	Value
Average Household Size (persons)	3.8
Natural Growth Rate (per 1,000 persons)	25.30
Urban Population (% of total Egyptian population)	0.39
Birth Rate (Births per 1,000 persons)	29.60
Mortality Rate (Deaths per 1,000 persons)	4.30

A household is defined as family (and non-family) members who share a residence and operates as a single social and economic unit. According to CAPMAS Poverty Map for 2013, the average family size in the city of Ras Gharib is estimated at four persons.

Labour Profile

CAPMAS statistical data indicates that the official unemployment rate decreased to 9.9% in the second quarter of 2018, marking the lowest rate in the past eight years. The job outlook has improved due to steadily accelerating economic growth, with Gross Domestic Product (GDP) growing by 5.4% year-on-year in the third quarter of the year 2017/2018 (January-March), according to data issued by the Ministry of Planning, Monitoring and Administrative Reform.

This followed a growth of 5.2% and 5.3%, respectively, in the first and second quarters, and despite low household incomes and high inflation rates, more of the country's unemployed youth are being absorbed by the labour market, despite the low wages. Workforce research results for the second quarter (April - June) of 2018 in Egypt are provided in the table below.

Table 8-24: Workforce Research Results for Q2 2018 (CAPMAS, Workforce Research Results for the Second Quarter of 2018)

Workforce[1]	Total No. of Employed Persons 26.161 Million		Total No. of Unemployed Persons 2.875 Million		Unemployment Rate 9.9%		Labor Force (by Occupation)		
	Males 80.8%	Females 19.2%	Males 53.1%	Females 46.9%	Males[2]	Females[3]	Agriculture	Industry	Service
29.036 Million	21.138 Million	5.023 Million	1.527 Million	1.348 Million	6.7%	21.2%	28.2%	24.7%	47.1%

The table above shows that the service sector forms the biggest part of the employment sector in the Governorate which accounts for around 47% of the workforce. The Agriculture sector constitutes around 28% of the total workforce, while the industry sector constitutes the lowest percentage of the working population, accounting for around 25%. In addition, the data shows that the rate of unemployment is higher amongst females compared to males.

The following table shows data from the Directorate of Manpower in the Red Sea Governorate, excluding the informal sector. The Governorate's workforce—as a percentage of the local population is estimated at 34.61%.

Table 8-25: The Distribution of the Project Area's Population by Work Status & Sex - Red Sea Governorate (Directorate of Manpower in the Red Sea Governorate, 2018)

Workforce	Total No. of Employed Persons 89.20 Thousand		Total No. of Unemployed Persons 25.7 Thousand		Unemployment Rate 21.7%	
	Males	Females	Males	Females	Males	Females
116.60 Thousand	77.5%	22.5%	59.8%	40.2%	17.6%	27.3%

[1] Including the number of employed and unemployed persons.
[2] Out of the total number of males (15 years of age and above) nationwide.
[3] Out of the total number of females (15 years of age and above) nationwide.

According to the Statistical Yearbook 2018 of the Red Sea Governorate, the service sector constitutes 60.3% of the Governorate's workforce. Hurghada City represents the largest proportion of employment, due to the presence of coastal touristic areas, followed by Safaga City.

According to Ras Gharib City Council officials, the majority of the workforce can be divided into three main categories: Government/Public Sector, Oil and Gas (O&G) Petroleum Sector, and Fishing.

There is also a percentage of wageworkers. Agricultural activities are relatively minor, compared to petroleum-related activities. In addition, tourism-related activities are limited in Ras Gharib, even though some residents work in the tourism sector in other cities in the Governorate, such as Hurghada and Safaga.

Based on discussions with City Council officials, it was indicated that there is a rise in the unemployment rate in Ras Gharib City due to the limited tourism in the Governorate during recent years, which increased the lack of employment opportunities.

Table 8-26: Labour Status of Ras Gharib & Zaafarana (CAPMAS Poverty Map, 2013)

Employment Information	Ras Gharib City	Zaafarana Village
Male Workforce (aged 15+) from Total Population	48%	55.5%
Female Workforce (aged 15+) from Total Population	23.2%	12%
% of Employed Adults (aged 24+) from the Total Workforce	56%	59.3%
Distribution of Workforce by Sector		
Self-Employed Males	48%	20%
Self-Employed Females	23.2%	33.3%
Male Workers in the Agricultural Sector	1.7%	39.7%
Female Workers in the Agricultural Sector	0.05%	83.3%
Workers in the Public Sector	54%	19.04%

Ras Gharib City attracts many migrant workers from neighbouring governorates, such as Beni Suef, Minya, Assyut, Sohag, Qena and Luxor. Workers also come from the Delta Governorates and Sinai, and the majority of them work for oil companies, while few of them work as farmers, particularly in Wadi Dara Village.

Economic Activities and Well Being

Economic activities in the city of Ras Gharib and its affiliated villages include oil and gas production, as well as agricultural activities. According to the representative of Ras Gharib city Council, tourism is not a key economic activity in the city, compared to other regions in Red Sea Governorate.

According to Ras Gharib City Council officials, government employees earn between 1,200 and 3,000 Egyptian pound (EGP) per month, while employees of oil and gas companies earn between 6,000 and 20,000 EGP per month. As for wageworkers (e.g. plumbers, electricians and service workers), they earn between 80 and 120 EGP per working day.

According to City Council officials, family expenses can reach 5,000 EGP, which is disproportionate compared to the current level of income. CAPMAS Poverty Map 2013 indicated that consumption[4] in Ras Gharib City marked 7320.52 per capita, compared to 6066.47 in Zaafarana Village.

[4] Household spending is the amount of final consumption expenditure made by resident households to meet their everyday needs, such as food, clothing, housing (rent), energy, transport, durable goods (notably cars), health costs, leisure, and miscellaneous services. It is typically around 60% of gross domestic product (GDP) and is therefore an essential variable for economic analysis of demand (Source: OECD National Accounts Statistics: National Accounts at a Glance, https://data.oecd.org/hha/household-spending.htm).

Cultivated Lands: The area of cultivated lands in the Red Sea Governorate in 2012/2013 is almost 0.02% of the total nationwide cultivated lands. The Red Sea Governorate relies on rain and underground water in agriculture, which causes fluctuations in cultivated areas.

Fisheries: The Red Sea Governorate contributes to supplying fish, since the Governorate's coastline extends across 1,080 km and 240 km wide. The southern part of the Governorate is rich in fish resources.

Livestock: 78.74% of the total number of livestock is butchered in state-owned slaughterhouses. The Red Sea Governorate has no livestock feed or poultry feed plants. Heifers account for 35% of cattle butchered in state-owned slaughterhouses.

Industrial Activity: The total number of registered industrial firms is 53, operating in four industrial zones. The total number of workers in registered industrial firms is 4,340 workers (*Source: Red Sea Governorate Official Website, 2018).*

Social Services Profiles

- *Education*

Education is one of the most important criteria for measuring the progress of people and their ability to advance and improve their standard of living. According to CAPMAS, September 2018 announced that Egypt's illiteracy rate dropped from 39.4% in 1996 to 29.7% in 2006, and then to 25.8% in 2017.

Ras Gharib City contains 18 schools covering the three basic stages of education (primary, preparatory and secondary), which include two experimental schools. Additionally, there are two secondary vocational training schools. According to Ras Gharib City Council officials who were interviewed by the field research team, the main objective of the two secondary vocational training schools is to provide their students with the necessary basic skills that enable them to work in oil companies.

CAPMAS Poverty Map 2013 shows that 19.22% of males and 19.44% of females of Ras Gharib City received basic education. Likewise, the percentage of males and females who finalized their basic education in Zaafarana is approximately 18% and 16% respectively. The following table details the educational status of inhabitants of Ras Gharib and Zaafarana.

Table 8-27: Education Mapping of Ras Gharib & Zaafarana (CAPMAS Poverty Map, 2013)

Education Information	Ras Gharib City	Zaafarana Village
University Degree Holders/Males	16%	8%
University Degree Holders/Females	13.45%	0%
Male School Enrolment/Males (age: 6-18)	99.26%	71.4%
School Enrolment/Females (age: 6-18)	99.35%	73.3%
School Drop-outs/Males	0.22%	0%
School Drop-outs/Females	0.25%	0%

According to CAPMAS Poverty Map 2013, the illiteracy rate in Ras Gharib City is estimated at 23.3% for males and 18.1% for females, while the illiteracy rate in Zaafarana was 40.17% among males and 48% among females.

Table 8-28: Education Mapping of Ras Gharib City (The Statistical Yearbook, Ras Gharib City Information Center, 2018)

Area	University Degrees		Above Intermediate Education		Intermediate Education		Less than Intermediate Education		Workers	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
Ras Gharib	133	31	112	39	281	199	301	70	232	68

- *Health*

Data from the Health Affairs Directorate in the Red Sea Governorate showed that the Governorate is free of the following diseases:

- Endemic diseases
- Infectious diseases
- Diseases related to water and air quality

The data indicated that non-communicable diseases include diabetes, and hypertension. Other common diseases include digestive system and cardiovascular diseases. Cancer is also increasing, and the most common cancers include breast, liver, bladder and lymph nodes. In addition, there are other communicable diseases to include diarrhoeal diseases (especially in children), cold and flu, fever and inflammations or infections of the ear, nose or throat, as well as skin rashes and infections.

The Red Sea Governorate suffers from a lack of specialized health services which are suitable for the middleclass. Furthermore, these services are concentrated in Hurghada City, and are absent in some other cities, such as Shalateen and Halayeb. The following tables show the health services available in the Governorate.

According to the statistics of the Directorate of Health Affairs (DHA) in Red Sea Governorate, there are 7 hospitals in Governorate with approximately 330 beds, they are government hospitals; one of them is a public and central hospital, in addition to 13 Private hospitals with 399 beds.

Table 8-29: Ministry of Health Hospitals & Other Entities in the Red Sea Governorate (The Statistical Yearbook, Red Sea Governorate Information Center, 2018)

Item	Value
Hospitals Affiliated with the Ministry of Health	7
Hospitals of the General Authority for Health Insurance	0
Medical Treatment Institutions	0
Educational Hospitals	0
No. of Public & Central Hospitals	1
No. of Specialized Hospitals	1
Public Sector Hospitals (Including Military Hospitals)	4
Private Sector Hospitals	13
No. of Haemodialysis Centres Affiliated with the General Authority for Health Insurance	0
No. of Ambulance Vehicles	48

Ras Gharib City contains one central hospital, one ambulance station, and one civil defence unit, in addition to a limited number of private clinics and health centres. All health services are concentrated in Ras Ghareb City; about 40 km from the project area. The central hospital serves all the areas and villages administratively affiliated with Ras Gharib Local Government Unit (LGU). The hospital is equipped with an Emergency room section, and has outpatient clinics. There is an ambulance unit on Zaafarana--Ras Gharib Road north of Ras Ghareb city, about 15 km from the project area, these is the nearest ambulance unit to the project area.

Human resources is one of the main factors for the success and continuity of health services, and the absence of qualified medical staff affects the quality of services provided. The following table illustrates available human resources in the health sector in the Red Sea Governorate.

Table 8-30: Number & Categories of Health Sector Workers in the Red Sea Governorate (CAPMAS, Census of Population Activities of the Governorates, Arab Republic of Egypt, 2016)

Area	No. of Doctors		No. of Pharmacists		No. of Dentists		No. of Nursing Staff		No. of Assistants	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Red Sea Governorate	255	137	60	170	49	29	79	412	102	0

Infrastructure

According to data from the Statistical Yearbook, Red Sea Governorate, a brief summary on access to basic infrastructure services available in the Red Sea Governorate is presented in the following tables.

- *Potable Water & Sanitation*

The following table presents the production and consumption rates of drinking water, as well as the sanitation capacity within the Red Sea Governorate

Table 8-31: Access to Potable Water & Sanitation in the Red Sea Governorate (Red Sea Governorate - Egypt Description by Information, 2014)

Item	Unit	Value
Production of Potable Water	Thousand m3 /Day	107.57
Consumption of Potable Water	Thousand m3 /Day	81.96
Water Consumption Per Capita	Liter. day/ Person	249.24
Capacity of Sanitation	Thousand m3 /Day	16.57
Sanitation Capacity Per Capita	Liter. day/ Person	50.39

The total capacity of wastewater treatment plants in the Red Sea Governorate was 18,000 m3/day in 2014/2015.

The actual capacity of total wastewater treatment plants capacities in Red Sea Governorate was 92.06% in 2014/2015.

The amount of potable water consumption to average produced water in the Red Sea Governorate was 76.19% in 2014/2015.

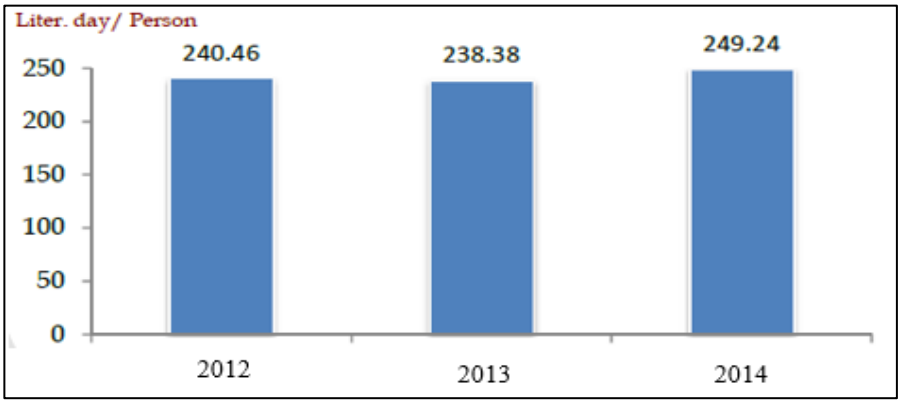

Figure 8-57: The Administrative Borders of the Red Sea Governorate (Source: Red Sea Governorate - Egypt Description by Information, 2014)

Ras Gharib city is connected to Beni Suef's water pump station via the Kuraymat-Zaafarana-Ras Gharib pipeline. CAPMAS poverty mapping 2013 shows that 100% of individuals have access to the public water network in the city of Ras Gharib, and approximately 69.4% in Zaafarana village.

According to CAPMAS 2013, 6.66% of the population in Ras Gharib, and at 6.1% of the population in Zaafarana Village are connected to sanitation and sewage networks. However, the Environmental Department's representative at Ras Gharib City Council stated that sanitation and sewage systems are being completed, and up to 90% of households in the city will soon have access to sanitation and sewage systems.

Electricity

According to Egyptian Human Development Report 2010, access to electricity in Upper Egypt Governorates is around 99.0%; even squatter areas have access to electricity, regardless of their illegality.

The East Delta Electricity Production Company serves the governorates of (Damietta, Ismailia, Port Said, Suez, North Sinai, South Sinai & the Red Sea).

Table 8-32: Access to Electricity in the Red Sea Governorate (Red Sea Governorate - Egypt Description by Information, 2014)

Item	Unit	Value
Total Electricity Production	Million kwh/year	730.00
Total Electricity Consumption	Million kwh/year	621.90
Electricity Consumption for Lighting	Million kwh/year	424.27
Electricity Consumption for Industrial Purposes	Million kwh/year	197.63
No. of Subscribers in the Electricity Grid	Thousand subscribers	157.05
Per Capita Share of Electricity used for Lighting	kwh yearly/Person	1290.21

According to CAPMAS poverty mapping data, access to electricity is estimated at 99.3% in Ras Gharib and 73.65% in Zaafarana.

- *Roads*

The Red Sea Governorate includes a 6,252km network of paved roads, serving all districts of the Governorate. A number of major highways and roads serve the region. Paved roads account for 98.33% of total roads. There are only two major roads in Ras Gharib City, which are classified as highways, with a length of 198 km (Hurghada--Ismailia Rd. & Zaafarana--Ras Gharib Rd.) as presented in the figure below.

Figure 8-58: Zaafarana--Ras Gharib Road (Consultant, 2019)

- *Communication*

The Governorate serves around 24% of the population with fixed telephone lines, in addition to mobile networks that serve all governorates. (*Source: The Statistical Yearbook, Red Sea Governorate Information Center, 2018*).

- *Environment*

The Red Sea Governorate has three natural reserves: Wadi El-Gemal & Hamata, Northern Islands and Elba.

Table 8-33: Environmental Facilities in the Red Sea Governorate (Red Sea Governorate - Egypt Description by Information, 2014)

Item	Number
Natural Reserves	3
Garbage Collection Companies	0
Garbage Recycling Factories	1
Air-Monitoring Stations	0
Solid Waste Landfills	0
Noise-Monitoring Stations	0
Cars Converted to Natural Gas Fuel	1098
Public Buses Using Natural Gas	0
Natural Gas Fuelling Stations	2

Investment and Development

There is large focus on investment in the Red Sea Governorate, and many fields of investment are available (touristic, industrial, services), which positively impact comprehensive development in the Governorate.

The following table shows the fields of investment in the Red Sea Governorate and Ras Gharib City

Table 8-34: Fields of Investment in the Red Sea Governorate & Ras Gharib City (Red Sea Governorate Official Website, 2018)

Item	Red Sea Governorate	Ras Gharib
Mineral Production	The Red Sea is one of the important Egyptian governorates in the field of mineral production, as it contains deposits of most of metallic and non-metallic minerals, decoration stones and construction materials. The Red Sea Governorate stretches across the larger part of Eastern Desert, which forms one-fourth of Egypt's total area (about 250,000 km^2), and contains huge mineral resources.	There are several metal production sites in Ras Gharib, including: ▪ Gold in Abu-Marwat ▪ Iron in Abu-Marwat ▪ White sands in Dakhl Valley ▪ Gypsum in the northwest of El-Dob Valley ▪ Marble in Al-Shaikh Fadl Road and El-Dob Valley ▪ Granite in Al-Shaikh Fadl Road
Fish Production	The Red Sea Governorate is an important region that can be utilized to increase fish production, as it has a 1,080 km-long coastline, with an average width of 240 km. There are various coral reef sites, with 3-5 square mile-area each. Different kinds of fish pass by these sites in certain seasons. Fish food is four times more abundant in the southern part of the Red Sea coast compared to the northern part.	There are several fish production sites in Ras Gharib: ▪ Al-Mallaha fish farm which is located between Ras Gharib and Shoqair, with an area of 15,000 acres and a total annual production of more than 250 tons. ▪ Suez Gulf fish farm with an area of 12,000 acres, and a total annual production of more than 400 tons. ▪ Gamsha Gulf fish farm with an area of 9000 acres and total annual production of more than 350 tons.
Agricultural & Livestock Projects	Agriculture is a basic element in the regional comprehensive and integrated development in the Red Sea Governorate either through providing the food supply required for the development in the region or taking part in the attraction of new population from the crowded places over the Nile banks and confronting the expected increase in the population and consumption. The southern triangle (Shalateen, Halayeb, Abu-Ramad) is one of the most important places for the agricultural investment in addition to other cities in the Governorate.	Suggested areas for agricultural investment in Ras Gharib include: ▪ Cultivation of 500,000 acres in Wadi Araba (to the south of Zaafarana), which can be irrigated by groundwater from El-Bowerat well. ▪ Cultivation of Gharib basin using groundwater in the area, as it is possible to extract 4,000 m3 of medium-salinity water per day, which can be used in irrigating citrus fruits and barley. ▪ Cultivation of Wadi Dara village.
Touristic Investment	**The General Tourist Planning of the Red Sea Governorate** Red Sea Governorate contains a number of planned touristic zones.	▪ Zaafarana Sector ▪ Gamsha Sector
	Available Elements for Supporting the Establishment of Touristic Projects in the Red Sea Governorate: ▪ A colourful, rocky mountain range extends along the Red Sea coast, providing a wonderful backdrop to the beach. The area is teeming with mines that had been exploited during ancient ages; mines that once rendered	

Item	Red Sea Governorate	Ras Gharib
	Egypt as one of the richest nations in ancient times, which were used to excavate gold, diamonds and valuable stones like Schist, white granite, etc. ▪ The beaches of the Red Sea coast are renowned for their clear blue waters, calm waves, and a paradise of colourful underwater coral reefs, which contains a multitude of rare and colourful fish. ▪ The yearlong moderate climates attract tourists both in summer and in winter to Red Sea Governorate resorts. ▪ The Governorate hosts various national parks, which contain a multitude of biological diversity. ▪ The Governorate contains valleys and archaeological, religious and curative sites. ▪ The Red Sea is also renowned for its black sands, which are used to cure rheumatoid and psoriasis.	
	Touristic Projects Proposed for Implementation in the Governorate: ▪ Touristic villages, hotels, motels and camps in Safaga, Qoseir and Marsa Alam, the southern triangle (Shalateen, Abu-Ramad & Halayeb), as well as Zaafarana. Project lands are allocated according to vacant areas. ▪ Cinemas, amusement parks and malls proposed to be established in Hurghada, Safaga, Qoseir & Marsa Alam. ▪ Fairs, aquariums, sports centers, golf courses, billiard halls and bowling alleys proposed to be implemented in Hurghada, Safaga, Qoseir, Marsa Alam & Zaafarana. ▪ Centers for providing diving equipment in Hurghada, Safaga, Qoseir & Marsa Alam. ▪ Tourist companies that provide safari trips in Hurghada, Safaga, Qoseir & Marsa Alam. ▪ Shipyards in Hurghada, Safaga, Qoseir & Marsa Alam. ▪ Internal shipping lines connecting the ports of Hurghada, Safaga & Marsa Alam with the ports of Al-Tour, Nuweiba, Taba & Sharm El-Sheikh, as well as Port Tawfik in Suez. Additionally, an international shipping line is proposed to connect the Governorate's ports with the ports the Red Sea and the Arabian Gulf. ▪ Establishing integrated projects for underwater imaging in Hurghada and Marsa Alam. ▪ An international conference center in Hurghada. ▪ A hotel school in both Hurghada and Qoseir. ▪ Schools for teaching diving and swimming, drawing on graduate divers and specialized trainers in Hurghada, Safaga & Marsa Alam. ▪ Utilizing the islands in the construction of suitable projects in accordance with environmental laws. ▪ Small and medium industries for providing hotel equipment.	

Facilities Offered for Investment in the Governorate

The Investors' Service Office provides the following services for investors:

- Providing technical and administrative advice so that projects comply with the nature of the Governorate and suits investors' capabilities.
- Presenting facilities and support to provide building materials through the Association in the Governorate.
- Helping investors to speed up obtaining necessary permits for construction.
- Granting letters of mortgaging for projects' superstructure that require loans from banks.
- Informational support by providing necessary data, maps and satellite images.

9 Impact Assessment

9.1 Overview of Strategic Environmental and Economic Impacts

9.1.1 Governmental Vision for the Energy Sector

The GoE has taken bold steps to adopt an energy diversification strategy with increased development of renewable energy and implementation of energy efficiency, including assertive rehabilitation and maintenance programs in the power sector (IRENA, 2018).

To this extent, in 2013, the Arab Republic of Egypt (through the Supreme Council of Energy) had developed and adopted the ISES 2015 – 2035, which provides an ambitious plan to increase the contribution of renewable energy to 20% of the electricity generated by the year 2020, of which 12% of wind power plants if foreseen.

To promote renewable energy sources and in order to open the way for private sector to effectively participate in the implementation of renewable energy project, the Renewable Energy Law (Decree Law 203/2014) has been issued. With this law, investors had the opportunity to identify and develop renewable grid-connected electricity production through the BOO scheme as discussed earlier in "Section 7.2".

In line with the above, this development allows for more sustainable development and shows the commitment of the Government of Egypt to realizing its energy strategy and meeting the set targets for renewable energy sources.

9.1.2 Energy Security

Recently, most policy makers around the world are grappling with issues related to energy security, energy poverty, and an expected increase in future demand for all energy sources – and Egypt is no exception. Almost certainly, the most spoken words by policy makers and government bodies in Egypt in the last couple of years revolved around 'energy security'.

Through various strategies and visions, Egypt has emphasised on the importance of energy security. This includes for example the Egypt Sustainable Development Strategy, Egypt Vision 2030, in which the sustainable development targets include energy and in which Goal I specifically addresses security of supply to ensure the availability of reliable energy supplies to satisfy the future development needs of the country through adoption of a more diverse energy mix. Similarly, the ISES 2015 – 2035 addresses energy import dependence and diversification of electricity generation.

In line with the above, the Project in specific will contribute to increasing energy security through reliance on an indigenous, inexhaustible and mostly import-independent energy resource. The estimated electricity generation from the Project is 2,200 Gigawatt hours (GWh) – 2,500 GWh per year, on average; which will serve the annual electricity needs of more than 800,000 local households.

The above has been calculated based on statistics obtained from Egyptian Central Agency for Public Mobilization and Statistics (CAPMAS). The total household electricity consumption in Egypt for 2016 – 2017 (latest statistics available online) was 64,100 GWh (CAPMAS, 2018). In addition, in 2016 – 2017 the total number of household beneficiaries from the public electricity network was 23,383,521 Households (CAPMAS, 2017). Therefore, average electricity consumption per household per year can be assumed to be around 2,700 (kWh/household).

9.1.3 Environmental Benefits

The negative environmental impacts from generating electricity through conventional fossil fuel burning at thermal power plants are very well known. This most importantly includes air pollutant emissions such as ozone, Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Particulate Matter (PM), and other gases which are the cause of some serious environmental concerns such as smog, acid rain, health effects, and many others.

In addition, the burning of fossil fuels results in carbon dioxide emissions; a primary greenhouse gas emitted through human activities which contributes to global warming. The main human activity that emits CO_2 is the combustion of fossil fuels for electricity production and transportation. Concurrently, global climate change has become an issue of concern and so reducing greenhouse gas emissions have also emerged as primary issues to be addressed as the world searches for a sustainable energy future.

Generating electricity through wind power is rather pollution-free during operation. Compared with the current conventional way of producing electricity in Egypt through thermal power, the clean energy produced from renewable energy resources is expected to reduce consumption of fossil fuels, and will thus help in reducing GHG emissions, as well as air pollutant emissions. The Project will likely displace more than 1 million metric tons of CO_2 annually.

The above has been calculated based on statistics obtained from Egyptian CAPMAS. Carbon Dioxide (CO2) emissions for 2016 – 2017 (latest statistic available) was 210 million tons, in which the electricity sector accounted for 43.3% of (i.e. around 91 million tons) (CAPMAS, 2019). In addition, the total electricity generated for 2016 – 2017 was around 190,000 GWh (CAPMAS, 2018). Therefore, CO2 emissions (Tones) per kWh is around 479g per kWh.

9.2 Landscape and Visual

This Section identifies the anticipated impacts on landscape and visual from the Project throughout its various phases. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

9.2.1 Potential Impacts during the Construction Phase

Site preparation activities which are to take place onsite by the Wind Farm EPC Contractors for installation of the wind turbines and the various Project components to include substation, transmission cables, access roads and internal road network, buildings, etc. are expected to include land clearing activities, levelling, excavation, grading, etc.

Construction activities would create a temporary effect on the visual quality of the site and its surroundings. The visual environment during the construction phase would include the presence of elements typical of a construction site such as equipment and machinery to include excavators, trucks, front end loaders, compactors and others.

However, as discussed in "Section 8.1.1", there are no key sensitive visual receptors within the Project site and surrounding vicinity.

The visual environment created during the construction period would be temporary, of a short-term duration, limited to the construction phase only. For the duration of construction, the visual impacts will of a negative nature and be noticeable, and therefore of a medium magnitude. As there are no key sensitive visual receptors which would be affected, the receiving environmental is determined to be of a low sensitivity. Given all of the above, such an impact is considered to be of minor significance.

Mitigation Measures

The following identifies the mitigation measures to be applied by the Wind Farm EPC Contractors during the construction phase and which include:

- Ensure proper general housekeeping and personnel management measures are implemented which could include:
  - Ensure the construction site is left in an orderly state at the end of each work day.
  - To the greatest extent possible construction machinery, equipment, and vehicles that are not in use should be removed in a timely manner and kept in locations to reduce visual impacts to the area.
  - Ensure proper storage, collection, and disposal of waste streams generated as discussed in detail in 'Section 9.4.2 '.

Following the implementation of these mitigation measures, the significance of the residual impact is categorised as not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by Wind Farm EPC Contractors during the construction phase:

- Inspections of the works should be carried out at all times to ensure the above measures are implemented.

9.2.2 Potential Impacts during the Operation Phase

Visual impacts associated with wind energy projects typically concern the turbines themselves (e.g. colour, height, and number of turbines) and impacts relating to their interaction with the character of the surrounding landscape and the visual receptor which might be present. Turbines are tall structures (120m in the case of the Project) that can be seen from several kilometres away and impose a change on the landscape of the area where they are installed. However, visual impacts depend on several factors such as distance, size, visibility, landscape and geography, and the presence of potential sensitive visual receptors.

Nevertheless, visual impacts created from the development of the Project are not considered an issue of concern due to the following:

- Within the Project area and the 15km radius there are no key sensitive visual receptors such as recreational activities, environmental reserves, remarkable historical or cultural sites, water courses or other natural structures normally seen as valuable by the human perception. In addition, as discussed earlier, visibility impacts after 10km are considered irrelevant and can only be seen as minor elements in the landscape (if seen at all).
- Project area is considered a barren and desert area and in general is located within an industrial area with petroleum activities for which its aesthetical value loses some importance.
- There are several wind farm developments in the area as well as several electricity distribution and transmission lines so the addition of this Project will not be a significant impact to the visual and landscape characteristics of the area.
- Being visible is not necessarily the same as being intrusive. Aesthetic issues are by their nature highly subjective. For some viewers, a Wind Farm could be regarded as manmade structures with visual burdens while to others it represents a positive impact in the sense that they introduce a break in the otherwise dull and monotonous view.

Given all of the above, the potential impacts on landscape and visual are of a long -term duration throughout the Project operation phase. The impacts will be of a negative nature, and medium magnitude given that such elements of the Project will be visible. However, there are no key visual receptors in the project route and its surroundings therefore the receiving environment is considered of low sensitivity. Given all of the above, such an impact is considered of low significance.

Mitigation Measures

There are no mitigation measures per se that can be implemented to eliminate the visual impacts from the Project. However, given the outcomes of the assessment presented above, no mitigation measures are required.

9.3 Land Use

This Section identifies the anticipated impacts on land use from the Project throughout its various phases. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

9.3.1 Potential Impacts during the Planning and Construction and Operation Phase

As noted earlier, the Project site location does not conflict with any of the relevant governmental entities formal planning context. Therefore, there are no impacts on formal land use from the Project.

With regards to informal or 'actual land use' as discussed earlier, the following is concluded:

- The Project site itself (to include Wind farm including substation area) in general is uninhabited and vacant and does not include any physical or economical land use activities (with the exception of the petroleum storage facilities as discussed further below). Therefore, physical and economical displacement impacts are considered irrelevant.
- The Project site is owned by NREA and will be utilised for the Development of the Project. However, as discussed earlier, Bedouin Groups in general implement the Ghafra system in such land areas to include the Project site. Therefore, the Developer should be aware of *Al-Ghafra* system, and other aspects of Bedouin culture. The Developer's understanding of Bedouin culture plays a major role in regulating the relationship between them and the tribes in the region. Inappropriate management of such issues could result in potential conflicts with such groups. However, based on discussions with the Developer it was indicated that initial coordination and discussions were undertaken with such Bedouin groups to provide job opportunities as well as services (security services, some construction services, equipment rentals, food and consumables supplies, etc.).
- As noted earlier, within the Project site there is an existing petroleum storage facility and an oil rig. The preliminary layout prepared by the Developer has avoided this area completely therefore there are no impacts related to physical or economical displacement. However, as discussed earlier, based on the "Work Coordination Agreement" that is signed between NREA and the General Petroleum Company in 2005, the company has exploration rights within the allocated area (including the Project site) and certain measures are required to be implemented by the Developers as part of the Agreement. Inappropriate management of such requirements could result in key land use impacts and disputes with the General Petroleum Company as well as other indirect impacts related to health and safety.

Nevertheless, should the above issues not be taken into account as part of the planning phase of the Project, it could result in impacts that are considered of long-term duration, of negative nature, and of medium magnitude and high sensitivity given that it could result in land use impacts and disputes with both Bedouin Groups and the General Petroleum Company. Given all of the above, the impact is considered of moderate significance.

Mitigation Measures

The following identifies the mitigation measures to be applied by the Developer during the planning phase and which include:

- Establish coordination with the Bedouin Groups for inclusion and engagement in employment and procurement opportunities. This issue is further discussed in "Section 8.12"; and
- Establish coordination via NREA/EETC with the relevant entity along with NREA on the Project specific level to: (i) agree on final requirements to be taken into account as part of the detailed design based on the "Work Coordination Agreement" to include for example spacing between turbine rows and individual

turbines as well as agreed buffer from existing facilities (such as the petroleum storage facility); (ii) present and provide detailed design to include turbine locations, cables, roads, etc. along with key requirements identified under point (i) earlier; (iii) further identify access to land requirements, conditions and communication protocol for the Project; (iv) demonstrate safety compliance of all Project components based on excepted activities that could be undertaken by the General Petroleum Company (e.g. drilling and survey activities), and (v) any other issues as applicable.

Following the implementation of these mitigation measures, the significance of the residual impact is categorized as not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the EPC Contractors during the construction phase and which include:

- Implementation of Community Integration Plan (CIP) with Bedouin groups (refer to "Section 8.12" for additional details); and
- Submission of formal communication letter (or similar) with General Petroleum Company

9.4 Geology, Hydrology and Hydrogeology

This Section identifies the anticipated impacts on hydrology and hydrogeology from the Project throughout its various phases. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

9.4.1 Potential Impacts from Flood Risks on the Project Site

In general, it is important to investigate potential risks of local flood hazard during from such wadi systems during the rainy season and especially during flash flood events which in turn could affect the Project components. Such risks must be taken into consideration throughout the planning phase of the Project as they could inflict damage to the Project and its various components.

To this extent, as part of the ESIA a preliminary flood risk assessment has been undertaken to investigate such risks. Results are discussed below.

Literature Review

A flash flood is defined as a rapid developed flood in just a few minutes or hours of excessive rainfall without visible signs of rain, or an accident like a dam or levee break. A flash flood can be generated during or shortly following a rainfall event, especially when high-intensity rain falls on steep slopes with shallow, impermeable soils, exposed rocks and poor or sparse vegetation (Lin, 1999).

Based on the geomorphometric analysis of the drainage basins in the Eastern Desert (ElShamy, 1992) the Red Sea and Gulf of Suez basins are classified into three classes according to the groundwater potential and flood possibility. It is stated as noted in the figure below, that Wadi ElDahal and Wadi Hawashyia are characterized by least groundwater potential and high flooding probability in the times of heavy rainfall.

However, it is important to note that the Project site is quite away from such small drainage basins that could collected a large quantity of rain (Wadi ElDahal is located 3 km to the north while Wadi Hawashiya is located 12 km to the south).

In recent years, flash floods in Egypt became more frequent causing life losses and significant damages. Destructive flash floods along Coastal Areas of Red Sea frequently occurred in Egypt between 1972 to 2016 as presented in the table below. The information included in this table were collected from available reports, newspaper, dissertations and published articles as Eliwa, et al. (2015). As noted in the table below, there are no reported destructive flash floods within the Project area in general.

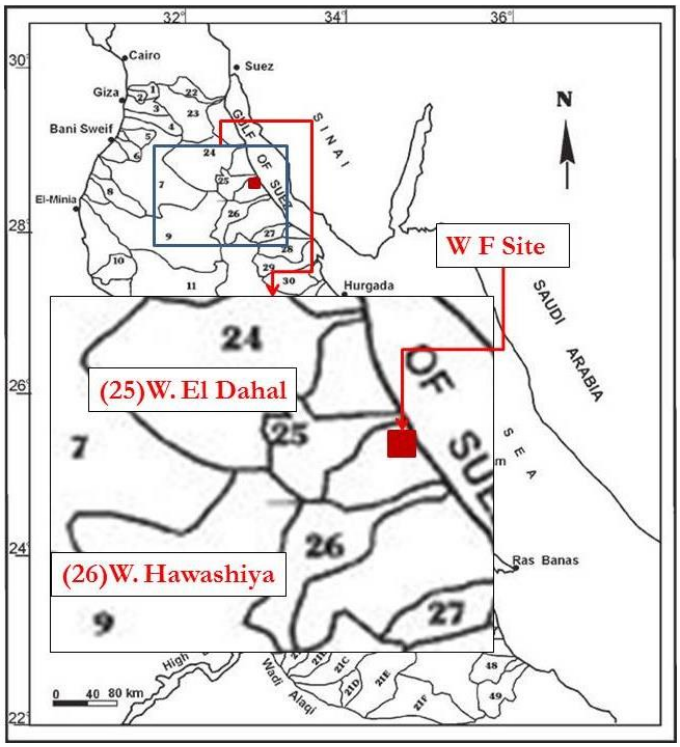

Figure 9-1: Map Showing Drain-Age Basins in the Eastern Desert (El-Shamy, 1992)

Table 9-1: Historical Records of Flash Floods along Coastal Areas of Red Sea (Consultant, 2019)

Date	Area	Recorded damages	References/consulted entity
Oct 2016	Ras Ghareb		Local Unit
Feb 2015	Sinai, Red Sea region	Road damages	
May 2014	Zafarana, G. Zeit, Taba, Sohag, Aswan, Kom Ombo Safaga	Dam failure at Sohag, road damages El Wafd	News papers
2013	South Sanai	2 deaths, road damage	
2012	Wadi Dahab, Catherine area	Dam failure, destroyed houses	News papers
Jan 2010	Along the Red Sea		Water Resources Research Institute (WRRI) Local Unit
Oct 2004	W. Watier	Road damage	News paper
May 1997	Safaga and El Qusier		- Information and Decision Support Center in Red Sea Governorate, 2009. - The National Authority for Remote Sensing and Space Sciences (NARSS) – Red Sea Governorate, 1997
Nov 1996	Hurghada and Marsa Alam		
Nov 1994	Dhab, Sohage, Qena, Safaga, El-Qusier		
Aug 1991	Marsa Alam		Arab tribe members
20 Oct 1990	Wadi El Gemal between Marsa Alam and Shalateen		
23 Oct 1979	Marsa Alam and El Quseir		
Jan 1988	Wadi Sudr	5 deaths	Local ambulance unit

Oct 1987	South Sanai	1 death, roads damage	News papers
May/Oct. 1979	Aswan, Kom Ombo, Idfu, Assiut, Marsa Alam, El-Qusier	23 deaths. demolished houses	News papers
Feb 1975	W. El-Arish	20 deaths, road problems	
1972	Giza	Destroying houses, roads and farms	

In collecting the data required for the flood risk assessment, the team consulted with the following:

- Consulted entity
- Local arab tribe members
- Local ambulance station on the Zaafarana – Ras Ghareb road
- Public Petroleum Company
- Ras Ghareb local Unit
- Red Sea Governorate
- Water Resources Research Institute

Field Visit Findings

Before conducting the field visit, topographic maps, landsat images and the digital elevation models were developed for the Project area using the Shuttle Radar Topography Mission (SRTM) images.

As noted below, such maps show that Project site is characterised by a very simple topography with gentle and regular slope toward the Gulf of Suez. In addition, the drainage basins crossing the project site are characterised as several short and small drainage lines as opposed to Wadi Eldahal for example. There are no large drainage basins crossing the site, the closest of which is Wadi Eldahal which runs outside the Project site.

Based on the above, a field visit was undertaken to assess the possibility of flooding in the Project area. The site visit focused on documenting any actual evidence which confirms the occurrence of floods. Key outcomes include:

- The eastern part of the Project site is wide and almost horizontal with complete absence of deep surface incisions of strong surface flow. The Quaternary sediments are mainly made up of fine to coarse grains clays, sand, and chart that reflects the week intensity of flow that can't carry boulder sized fragments (Figure 9-4).
- The middle parts of the area are shallow and have very wide drainage lines that have been exposed with multi sized grain deposits and sinuosity in some parts which reflect the weakness of the surface flow (Figure 9-5).
- The western parts of the area includes small tributaries that are very shallow, tortuous and have no wide alluvial fans which reflect small volume of water they carry and slow surface water flow (Figure 9-6).

Based on the field study it can be stated that the Project site is far from being subjected to flash flood even in times of heavy rainfall.

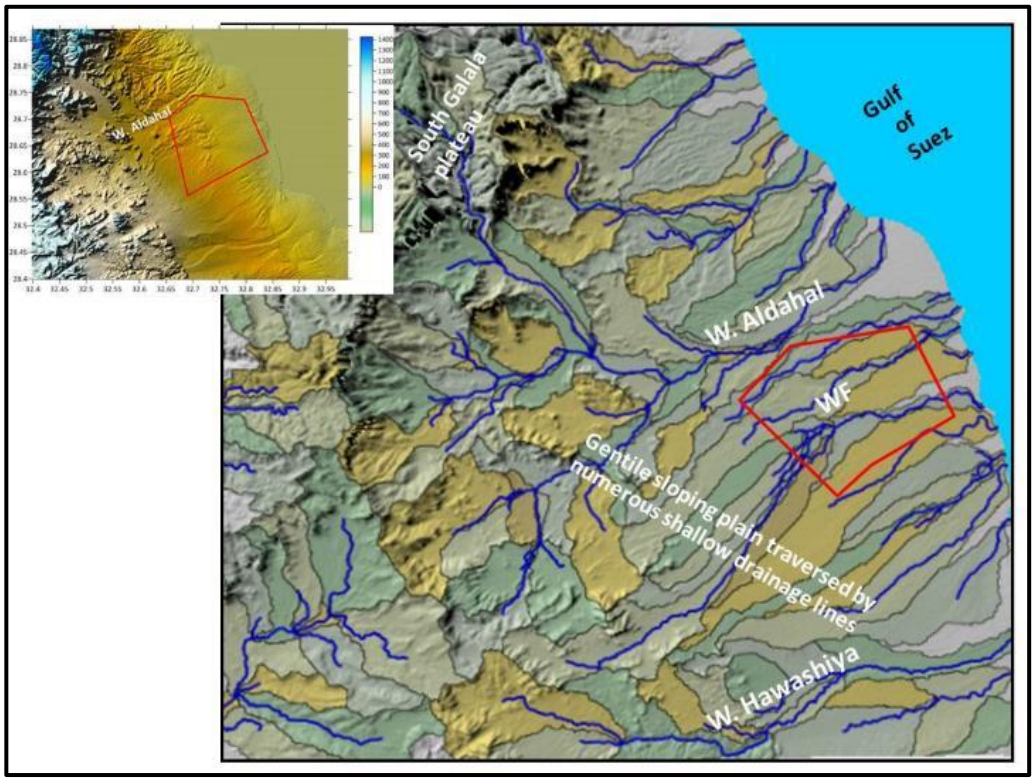

Figure 9-2: Drainage Basins Crossing the Project Site and Nearby Areas (Consultant, 2019)

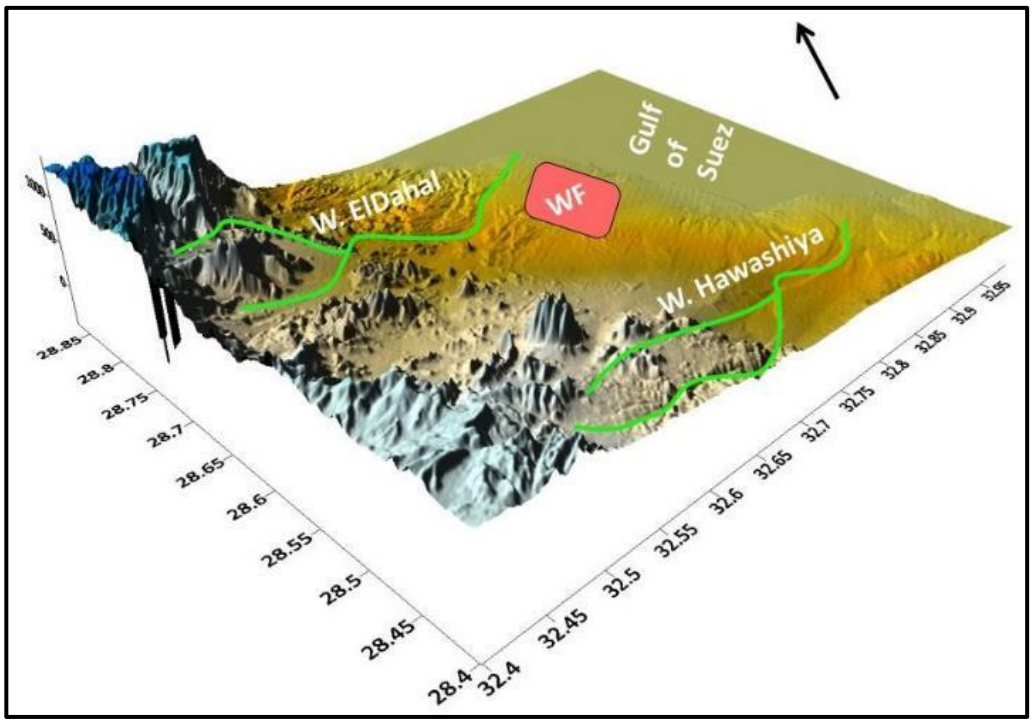

Figure 9-3: Large Drainage Basins in the Area (Consultant, 2019)

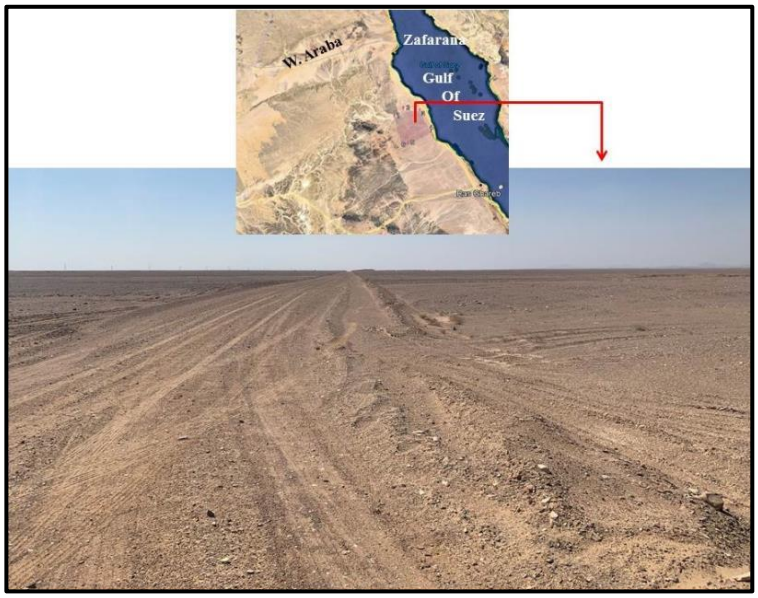

Figure 9-4: Eastern Part of the Project Site (Consultant, 2019)

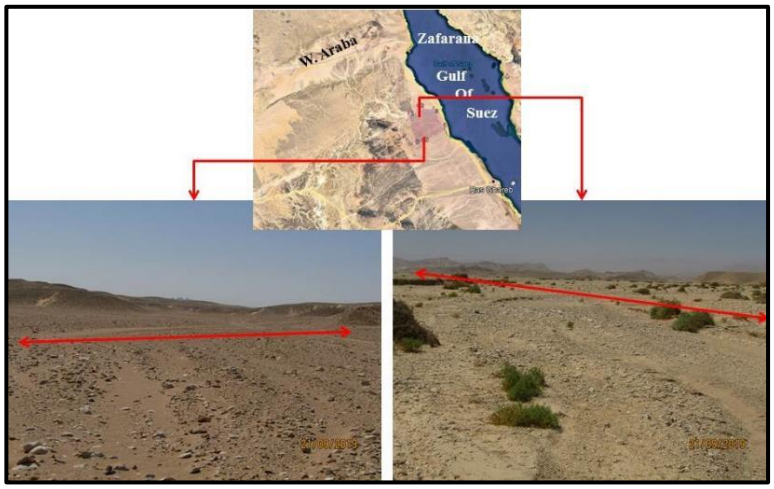

Figure 9-5: Western Part of the Project Site with Shallow and Wide Streams (Consultant, 2019)

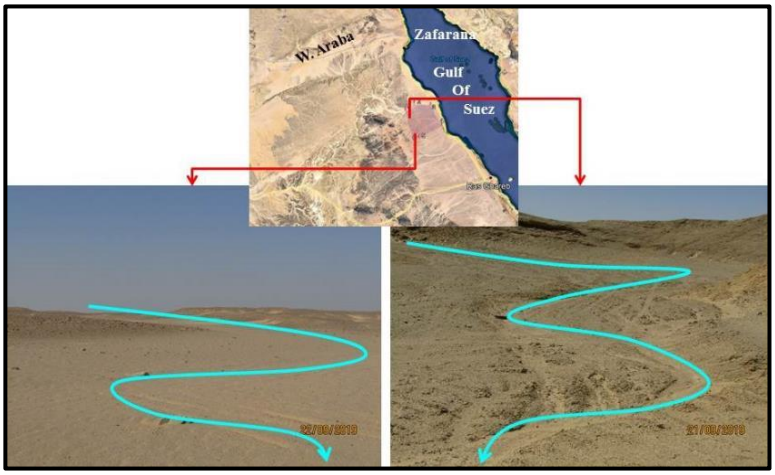

Figure 9-6: Wide Tributaries in South-Western Parts (Consultant, 2019)

Consultations

The 'ESIA team' undertook several consultations with stakeholders focusing on the issues of flood risks that could occur in the Project area and it surrounding. This included in particular the following stakeholders: (i) Ras Ghareb City Council; (ii) existing civil defence unit in the area; and (iii) the General Petroleum Company which is operating in the area for years.

In general, the key outcomes of such consultations indicated the following:

- The Project area in particular is not sensitive to flooding, but only weak surface flows during the period of rainfall that quickly disappear through subsurface leakage or runoff to the Gulf.
- The areas where flood occurs on a semi-annual basis is the area of Ras Gharib, about 35 km south of the site.
- Severe runoff may occur in Wadi Hawashiay 10 km south of the site and Wadi Al-Dahal 3 km north of the site.
- No serious floods have been recorded in the project area in the last 10 years
- No damage has been recorded at any facility in the Project area in general as a result of flood nor any deaths

In addition, the Ras Ghareb City Council provided a map of local constructions that were applied on the areas of expected surface flow to save the coastal road from the danger of flood (refer to figure below). The map shows the locations of the culverts along the coastal road near the project site and one can note that the closest locations of culverts to the location are at the outlet of Wadi Eldahal and Wadi Hawashiay.

Figure 9-7: Areas of Safety Application for Flooding at Gulf of Suez (Ras Ghareb City Council, 2019)

Conclusions

Flood possibility in the Project site has been studied and concludes the following:

- The bed rocks of the site location are mainly clastic deposits rich in clays, sand, gravels and reworked rock fragments with high porosity and permeability. These deposits extend to great depth. This means, the

surface layers of the area have a great tendency to absorb large volume of surface water runoff in times of rain.

- The regional slope of the south Galala Plateau is due to southeast. This means that, the dry wadies that drain the plateau are directed to the southeast toward Wadi El Dahal out of the project site to the north toward Gulf of Suez.
- The site is in a very simple relief area with a very gentle slope in east and southeast direction.
- There is no sign of deep dry wadis crossing the concession site or even large alluvial fan deposits reflecting strong surface flow.
- The concession site is away 'to the north' from the main course of wadi Hawashiay that could expect flooding.
- The drainage lines that drain the project site are very short, wide and shallow that reflects a complete absence of floods.
- Dangerous flooding is not commonly recorded in area of project or even in the areas nearby.

Therefore, taking the above into account there is no evidence to support the cause of serious flooding in the Project area under the current climatic conditions. *Therefore, there are no anticipated impacts in relation to flood risks and there are no further mitigation or monitoring measures to be considered as part of the planning or design phase of the Project.*

9.4.2 Potential Impacts from Improper Management of Waste Streams during Construction and Operation

Given the generic nature of the impacts on soil and groundwater for both phases of the Project (construction and operation) those have been identified collectively throughout this section. Generally, this includes potential impacts from improper housekeeping practices (e.g. improper management of waste streams, improper storage of construction material and of hazardous material, etc.).

Improper housekeeping practices during construction and operation (such as illegal disposal of waste to land) could contaminate and pollute soil which in turn could pollute groundwater resources. This could also indirectly affect flora/fauna and the general health and safety of workers (from being exposed to such waste streams). Generally, such impacts can be adequately controlled through the implementation of general best practice housekeeping measures as highlighted throughout this section, and which are expected to be implemented by the Wind Farm EPC Contractors throughout construction phase and Wind Farm Operator during the operation phase.

The potential impacts from improper management of waste steams could be of a long-term duration throughout the construction and operation phase. Such impacts are negative in nature, and could be noticeable and are therefore of medium magnitude. However, they are considered of low sensitivity as they are generally controlled through the implementation of general best practice housekeeping measures. Given all of the above, such an impact is considered to be of minor significance.

Following the implementation of the mitigation measures highlighted throughout this section, the residual significance can be reduced to not significant.

(i) Solid Waste Generation

Solid waste is expected to be generated from construction and operational activities. Solid waste generated will likely include construction waste (such as debris) and municipal solid waste (during construction and operation such as cardboard, plastic, food waste, etc.).

Municipal solid waste and construction waste generated will likely be collected and stored onsite and then disposed to the closest approved dumpsite (Ras Gharib Public Dumpsite) or, if possible, reused in the construction activities.

Mitigation Measures

The following identifies the mitigation measures to be applied by all involved entities to include the Wind Farm EPC Contractors during the construction phase and the Wind Farm Operator during the operational phase unless stated otherwise:

- Coordinate with Ras Gharib City Council for the collection of solid waste from the site to the municipal approved dumpsite (the closest dumpsite being Ras Gharib Public Dumpsite) or for recycling (as discussed in further details below);
- Prohibit fly-dumping of any solid waste to the land;
- Distribute appropriate number of properly contained litter bins and containers properly marked as "Municipal Waste";
- EPC Contractors only - during construction, distribute a sufficient number of properly contained containers clearly marked as "Construction Waste" for the dumping and disposal of construction waste.
- EPC Contractors only – during construction, it is recommended that recycling measures are implanted. It is recommended that recycling is undertaken in the following approach: (i) separation and disposal of recyclables in a separate container (cardboard, paper, glass, metal, etc.); and (ii) separation and disposal of non-recyclable materials in a separate container (e.g. food waste). Each container must be clearly marked. In addition, EPC Contractors must seek ways to reduce construction waste by reusing materials (for example through recycling of concrete for road base coarse);
- Implement proper housekeeping practices on the construction site at all times; and
- Maintain records and manifests that indicate volume of waste generated onsite, collected by contractor, and disposed of at the landfill. The numbers within the records are to be consistent to ensure no illegal dumping at the site or other areas.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by all involved entities to include the Wind Farm EPC Contractors during the construction phase and the Wind Farm Operator during the operational phase unless stated otherwise:

- Inspection of waste management practices onsite;
- Review of records and manifests for volume of waste generated to ensure consistency; and
- Regular environmental reporting on implementation of the waste management practices onsite.

(ii) Wastewater Generation

Wastewater is mainly expected to include black water (sewage water from toilets and sanitation facilities), as well as grey water (from sinks, showers, etc.) generated from workers during the construction and operation phase. Wastewater quantities are expected to be minimal. It is expected that wastewater will be collected and stored in fully contained septic tanks and then collected and transported by transportation tankers to be disposed at the closest Wastewater Treatment Plant (WWTP) (being Ras Ghareb WWTP).

Mitigation Measures

The following identifies the mitigation measures to be applied by all involved entities to include the Wind Farm EPC Contractors during the construction phase and the Wind Farm Operator during the operational phase unless stated otherwise:

- Coordinate with Ras Gharib Water Company to hire a private contractor for the collection of wastewater from the site to the closest WWTP (being Ras Gharib WWTP);
- Prohibit illegal disposal of wastewater to the land;
- Maintain records and manifests that indicate volume of wastewater generated onsite, collected by contractor, and disposed of at the WWTP. The numbers within the records are to be consistent to ensure no illegal discharge at the site or other areas;
- EPC Contractors only - ensure that constructed septic tanks during construction and those to be used during operation are well contained and impermeable to prevent leakage of wastewater into soil; and
- Ensure that septic tanks are emptied and collected by wastewater contractor at appropriate intervals to avoid overflowing.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by all involved entities to include the Wind Farm EPC Contractors during the construction phase and the Wind Farm Operator during the operational phase unless stated otherwise:

- Inspection of wastewater management practices onsite;
- Review of records and manifests for volume of wastewater generated to ensure consistency; and
- Regular environmental reporting on implementation of the wastewater management practices discussed above.

(iii) Hazardous Waste Generation

Hazardous waste is expected to be generated throughout both the construction and operation phase and this could include consumed oil, chemicals, paint cans, etc. Hazardous waste generated will likely be collected and stored onsite and then disposed at the approved hazardous waste disposal facilities managed by the Hazardous Waste Management Project and supervised by the governorate and the EEAA.

Mitigation Measures

The following identifies the mitigation measures to be applied by all involved entities to include the Wind Farm EPC Contractors during the construction phase and the Wind Farm Operator during the operational phase unless stated otherwise:

- Coordinate and hire a private contractor for the collection of hazardous waste from the site to the approved hazardous waste disposal facilities;
- Ensure that hazardous waste is disposed in a dedicated area that is enclosed; of hard surface; with proper signage and suitable containers as per hazardous waste classifications and that they are labelled for each type of hazardous waste.
- Ensure hazardous waste storage area is equipped with spill kit, fire extinguisher and anti-spillage trays and a hazardous waste inventory is available.

- Prohibit illegal disposal of hazardous waste to the land;
- Possibly contaminated water (e.g. runoff from paved areas) must be drained into appropriate facilities (such as sumps and pits). Contaminated drainage must be orderly disposed of as hazardous waste;
- Ensure that containers are emptied and collected by the contractor at appropriate intervals to prevent overflowing; and
- Maintain records and manifests that indicate volume of hazardous waste generated onsite, collected by contractor, and disposed of at the hazardous waste disposal facilities. The numbers within the records are to be consistent to ensure no illegal discharge at the site or other areas.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by all involved entities to include the Wind Farm EPC Contractors during the construction phase and the Wind Farm Operator during the operational phase unless stated otherwise:

- Inspection of hazardous waste management practices onsite;
- Review of records and manifests for volume of hazardous waste generated to ensure consistency; and
- Regular environmental reporting on implementation of the hazardous waste management practices onsite.

(iv) Hazardous Material

The nature of construction and operational activities entail the use of various hazardous materials such as oil, chemicals, and fuel for the various equipment and machinery. Improper management of hazardous material entails a risk of leakage into the surrounding environment either from storage areas or throughout the use of equipment and machinery.

Mitigation Measures

The following identifies the mitigation measures to be applied by all involved entities to include the Wind Farm EPC Contractors during the construction phase and the Wind Farm Operator during the operational phase unless stated otherwise:

- Ensure that hazardous materials are stored in proper areas and in a location where they cannot reach the land in case of accidental spillage. This includes storage facilities that are of hard impermeable surface, flame-proof, accessible to authorized personnel only, locked when not in use, and prevents incompatible materials from coming in contact with one another;
- Maintain a register of all hazardous materials used and accompanying Material Safety Data Sheet (MSDS) must present at all times. Spilled material should be tracked and accounted for;
- Incorporate dripping pans at machinery, equipment, and areas that are prone to contamination by leakage of hazardous materials (such as oil, fuel, etc.);
- Regular maintenance of all equipment and machinery used onsite. Maintenance activities and other activities that pose a risk for hazardous material spillage (such as refuelling) must take place at a suitable location (hard surface) with appropriate measures for trapping spilled material;
- Ensure that a minimum of 1,000 litters of general-purpose spill absorbent is available at hazardous material storage facility. Appropriate absorbents include zeolite, clay, peat and other products manufactured for this purpose; and

- If spillage on soil occurs, spill must be immediately contained, cleaned-up, and contaminated soil disposed as hazardous waste.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by all involved entities to include the Wind Farm EPC Contractors during the construction phase and the Wind Farm Operator during the operational phase unless stated otherwise:

- Inspection for storage of hazardous materials to include inspections for potential spillages or leakages; and
- Report any spills and the measures taken to minimize the impact and prevent from occurring again.

9.4.3 Potential Impacts from Erosion and Runoff during the Construction Phase

Site preparation activities which are to take place onsite by the Wind Farm EPC Contractors for installation of the various Project components to include wind turbines, substation, cables, etc. are expected to include land clearing activities, excavation, grading, etc.

The nature of construction activities discussed above could disturb soil, exposing it to increased erosion during rainfall events. If onsite erosion and runoff are not controlled, they can result in siltation of surface water. Generally, such impacts can be adequately controlled through the implementation of general best practice housekeeping measures as highlighted throughout this section, and which are expected to be implemented throughout construction phase.

The potential impacts from erosion and runoff is of short-term duration as it is limited to the construction phase. Such impacts are negative in nature, and could be noticeable and are therefore of medium magnitude. However, they are considered of low sensitivity as they are generally controlled through the implementation of general best practice housekeeping measures. Given all of the above, such an impact is considered to be of minor significance.

Following the implementation of the mitigation measures highlighted throughout this section, the residual significance can be reduced to not significant.

Mitigation Measures

The following identifies the mitigation measures to be applied by all involved entities to include the Wind Farm EPC Contractors during the construction phase:

- Avoid executing excavation works under aggressive weather conditions.
- Place clear markers indicating stockpiling area of excavated materials to restrict equipment and personnel movement, thus limiting the physical disturbance to land and soils in adjacent areas.
- Erect erosion control barriers around work site during site preparation and construction to prevent silt runoff where applicable.
- Return surfaces disturbed during construction to their original (or better) condition to the greatest extent possible.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by all involved entities to include the Wind Farm EPC Contractors during the construction phase:

- Inspection for erosion and runoff control to include inspections for implementation of mitigation measures.

9.5 Biodiversity

This Section identifies the anticipated impacts on biodiversity from the Project throughout its various phases. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

It is important to note that biodiversity assessed in this Chapter excludes birds (avi-fauna) and bats, which are discussed separately in "Section 8.59.6" and "Section 9.7" respectively.

9.5.1 Potential Impacts during the Construction Phase

Site preparation activities which are to take place onsite by the Wind Farm EPC Contractors for installation of the wind turbines and the various Project components to include substation, transmission cables, access roads and internal road network, buildings, etc. are expected to include land clearing activities, levelling, excavation, grading, etc.

Such activities are limited to the relatively small individual footprints of these facilities and the actual area of disturbance is relatively minimal. Nevertheless, although alterations are considered to be minimal, such activities would still likely result in the alteration of the site's habitat and thus potentially disturb existing habitats. Other impacts on the biodiversity of the site are mainly from improper management of the site, which could include improper conduct and housekeeping practices by workers (i.e. hunting of animals, discharge of hazardous waste to land, etc.).

However, as discussed earlier, the Project site is general is considered of low ecological significance but special consideration should be given to the globally threatened to the Egyptian Dabb Lizard *Uromastyx aegyptia* since the project site provides a typical habitat for such species.

Given all of the above, the potential impacts on biodiversity created during the construction phase would be of a long-term duration as they would result in a permanent change in the natural biodiversity of the site. Such impacts are considered of negative nature and of a medium magnitude given that the change in the natural biodiversity of the site will be noticeable in limited individual footprints. In addition, as the site is considered of low ecological significance, the receiving environmental is determined to be of a low sensitivity. Given all of the above, such an impact is considered to be of minor significance.

Additional Studies

The following identifies the additional studies that will be undertaken by the Consultant during the planning phase:

- The Consultant will be undertaken another survey during the spring season of 2020 which is considered the most suitable period for assessing the biodiversity of the site. The methodology will be similar to that undertaken as part of this ESIA and the objective will be to record floral and faunal species and confirm/verify the conclusions of the Project site as determined throughout this ESIA (i.e. Project area being of low ecological significance). The survey will also focus in specific on the Egyptian Dabb Lizards as well as their burrows to determine whether it is present within the Project area or not.
- Based on the above a standalone spring 2020 biodiversity assessment report will be submitted as an addendum to the ESIA. The report should identify baseline conditions and also provide updates on any

specific mitigation and monitoring measures that might be required, in addition to those identified within this ESIA.

Mitigation Measures

The following identifies the additional studies and mitigation measures to be applied by the Wind Farm EPC Contractors during the construction phase and which include:

- Implement proper management measures to prevent damage to the biodiversity of the site. This could include establishing a proper code of conduct and awareness raising / training of personnel and good housekeeping which include the following:
  - Prohibit hunting of any wildlife at any time and under any condition by construction workers onsite;
  - Ensure proper storage, collection, and disposal of waste streams generated as discussed in detail in Section 9.4.2;
  - Restrict activities to allocated construction areas only, including movement of workers and vehicles to allocated roads within the site and prohibit off-roading to minimize disturbances; and
  - Avoid unnecessary elevated noise levels at all times. In addition, apply adequate general noise suppressing measures as detailed in "Section 8.8".

Following the implementation of these mitigation measures, the significance of the residual impact is categorized as not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the Wind Farm EPC Contractors during the construction phase and which include:

- Inspection of the works should be carried out at all times

9.5.2 Potential Impacts during the Operation Phase

The only impacts anticipated during the operation phase are related to improper management of the site as discussed earlier. This could include improper conduct and housekeeping practices by workers (i.e. hunting of animals, discharge of hazardous waste to land, etc.).

The potential impacts on biodiversity would of a long-term duration throughout the operation phase of the Project. Such impacts are of negative nature and of a medium magnitude. However, as the site is considered of low ecological significance, the receiving environmental is determined to be of low sensitivity. Given all of the above, such an impact is considered to be of minor significance.

Mitigation Measures

The following identifies the mitigation measures to be applied by the Wind Farm Operator during the operation phase and which include:

- Implement proper management measures to prevent damage to the biodiversity of the site. This could include establishing a proper code of conduct and awareness raising / training of personnel and good housekeeping which include the following:
  - Prohibit hunting of any wildlife at any time and under any condition by workers onsite;
  - Ensure proper storage, collection, and disposal of waste streams generated as discussed in detail in Section 9.4.2; and

- Restrict activities to allocated areas only, including movement of workers and vehicles to allocated roads within the site and prohibit off-roading to minimize disturbances.

Following the implementation of these mitigation measures, the significance of the residual impact is categorized as not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the Wind Farm Operator during the operation phase and which include:

- Inspection of the works should be carried out at all times.

9.6 Birds (Avi-Fauna)

This Section identifies the anticipated impacts on birds (avi-fauna) from the Project throughout its various phases. For each impact, a set of management measures (which could include mitigation and monitoring measures, additional requirements, etc.) have been identified to eliminate or reduce the impact to acceptable levels.

Before discussing the outcomes of the above, it is important to state that the potential impact of wind turbines on birds is considered one of the key issues related to wind farm developments which must be thoroughly addressed within the ESIA.

9.6.1 Potential Impacts during the Construction Phase

Site preparation activities which are to take place onsite by the EPC Contractors for installation of the wind turbines and the various Project components to include substation, transmission cables, access roads and internal road network, buildings, etc. are expected to include land clearing activities, levelling, excavation, grading, etc.

Such activities in particular could impact avi-fauna which use the site for foraging and as a breeding ground– to include soaring and non-soaring resident and migratory species. The survey did not record any roosting areas for migratory species during the autumn survey. It is believed that roosting areas could be further to the south and west of the Project site.

On the other hand, no breeding bird survey was carried out yet at the Project site since the suitable season for the survey is in spring and not autumn. This survey to be undertaken by the Consultant at a later shall provide a clear assessment about the use of the Project site by breeding bird species, including passerines that could be directly dependent on the habitats present on site.

Generally, such construction activities would not result in any major alteration of the site's habitats and thus would not affect the foraging and feeding area of such species, given that such activities are limited to the relatively small individual footprint of these facilities and where the actual area of disturbance is relatively minimal. The Project site is considered of low ecological significance due to its natural setting; characterised by being heavily degraded and arid.

On the other hand, there are additional potential impacts during the construction phase on breeding birds within the site. Construction activities could disturb existing habitats of birds breeding and within the Project site. Such potential impacts are created during the construction phase only and thus are of long-term duration. However, such impacts are considered of negative nature and of a low magnitude given that the construction activities' actual area of disturbance is relatively minimal. In addition, given that breeding activities are likely within the Project site, the receiving environmental is determined to be of a medium sensitivity. Given all of the above, such an impact is considered to be minor significance.

Additional Studies/Survey by the Consultant

The following identifies the mitigation measures to be applied by the Consultant:

- A breeding bird survey to be carried out during the suitable breeding season from March until May of the year 2020, which is prior to construction. This survey would be applied using a set of point counts along route-transects that are spread over the Project site. The objective of the survey is to provide an assessment of the breeding species in the Project site including their abundance, relative density and distribution, in addition to identifying any threatened species that could be breeding in the Project site. The survey must be undertaken by a qualified ornithologist. At each point count, all breeding activities must be recorded. The survey must aim to identify any breeding areas of importance within the Project site. Based on the outcomes of the survey, should any areas of importance be identified, then construction activities must be properly planned to avoid any disturbance to such areas during the breeding season. A report of this survey should be provided as an addendum to the ESIA and the result will provide an impact assessment based on which the mitigation measures and monitoring requirements would be reviewed.

Mitigation Measures by the Developer/EPC Contractors

- Implementation of proper housekeeping measures to reduce impacts including:
  - Avoid any activities in any sensitive areas that could be identified according to the breeding bird survey mentioned earlier.
  - Restrict activities to allocated construction areas only with no breeding activities, including movement of workers and vehicles to allocated roads within the site and prohibit off-roading to minimize disturbances.
  - Prohibit hunting of birds at any time and under any condition by construction workers onsite.
  - Implement proper measures, which would prevent attraction of birds to the site. This includes measures such as prohibiting illiterate dumping and ensuring waste streams are disposed appropriately in accordance with the measures identified in “Section 9.4.2”.
  - Avoid unnecessary elevated noise levels at all times. In addition, apply adequate general noise suppressing measures. This could include the use of well-maintained mufflers and noise suppressants for high noise generating equipment and machinery, developing a regular maintenance schedule of all vehicles, machinery, and equipment for early detection of issues to avoid unnecessary elevated noise level, etc.

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring and Reporting Requirement

The following summarises the monitoring requirements for the projects which must be undertaken and which include:

- EPC Contractors to submit construction schedule and plan and demonstrate that construction is planned to avoid areas of concern during breeding season.

9.6.2 Potential Impacts during the Operation Phase

Wind turbines are associated with impacts on birds from risks of collision and electrocution for both migratory soaring birds (which could pass over the site during the spring and autumn migration seasons) and resident

soaring birds in the area. This section provides a qualitative assessment of such impacts. As discussed previously, to determine the significance of an impact it is important to understand the sensitivity of the receiving environment and the magnitude of the impact both of which are discussed in further details below.

(i) Sensitivity of the Project Site

The baseline assessment that is included in the ESIA covers monitoring of two seasons; atumn season of 2019 and spring season of 2020. Two seasons, autumn 2020 and spring 2021 will be covered in the future. Although both seasons already covered were carried out extensively throughout both seasons providing a comprehensive assessment of the status of bird migration at the project site, still, it is believed that further assessments of the two additional seasons will provide even better understanding of the project site regarding avifauna. It is well documented that the area of the GoS has a much higher significance for passage migration during the spring migration season and currently, it is believed that there is a very good understanding of the avifauna of the site building on both seasons covered.

It should be mentioned that the autumn migration survey that was covered during the ESIA process is probably one of the most extensive avifaunal assessments that were covered in the autumn migration season in the area of the Gulf of Suez. This is due to two main points; firstly the survey has provided a very comprehensive coverage of the whole autumn migration along the GoS from mid-August until mid-November and secondly, the eight observation points that were used during the survey has provided a comprehensive coverage of the whole Project site where double-counting was avoided as explained earlier and more importantly the level of effort was equally divided across the observation points making the data collected from the various observation points statistically comparable without any additional assumptions or complications.

Generally, the survey has recorded relatively moderate number of migratory soaring birds over the Project site in comparison to adjacent Project sites. The number of species recorded was generally high but expected with a total of 21 species. Some of those recorded species have an important status on the international and/or national levels.

The same methodology was followed during the spring migration season and a comprehensive coverage of the season was covered from late February until late May 2020. The numbers and species recorded at the project site were highly significant on the local and flyway levels and has shown, similar to the rest of the area along the GoS that this is a major route for bird migration, especially during spring season.

Comparing these results to other areas reveals that the Project site is part of the intensive migration route extending along the Gulf of Suez.

Taking all the above into account and based on the findings of the autumn season survey, the receiving environment is considered of high sensitivity.

(ii) Magnitude of the Impact

Collision of migratory and resident soaring birds with wind turbines is expected. Based on the assessments that were carried for in-flight monitoring of soaring birds, certain species have shown a higher probability of flying at collision-risk height during certain periods of the year. Generally, to determine the magnitude of the impact, three main factors are considered, which are:

1. The numbers of birds of different species recorded within the Project site and the numbers of these species flying at collision risk height;
2. The conservation status of the species (international IUCN status and local status and importance);

3. The avoidance behaviour and collision risk of recorded species. The analysis was a comparative one in order to identify species that were recorded to have a higher number of collisions and electrocutions and compare them with the species recorded in the Project site.

Out of all the species recorded during both seasons of surveys, there are six species with a high impact magnitude. These six migratory soaring bird species are; Egyptian Vulture *Neophron percnopterus*, Steppe Eagle *Aquila nipalensis*, Eastern Imperial Eagle *Aquila heliaca*, Spotted Eagle *Clanga clanga,* Booted Eagle *Hieraaetus pennatus* and Sooty Falcon *Falco concolor*.

Taking a deeper look at the species mentioned above, below is more detailed interpretation of the observations of these species:

- Egyptian Vulture *Neophron percnopterus*, is a globally threatened species (Endangered). The species was not recorded in the autumn season however in spring 2020, significant numbers were recorded reaching up to 1-3% of the global population. The Similar to most of the migratory soaring birds recorded in the survey, the largest proportion of the records were in the western part of the project site with the highest concentrations in the northwestern part of the project site. Birds passing at collision risk height never exceeded more than 50% of the birds recorded anywhere in the project and therefore the risk is considered to be low to moderate with the highest percentages of birds passing at risk height were only recorded in parts of low passage.

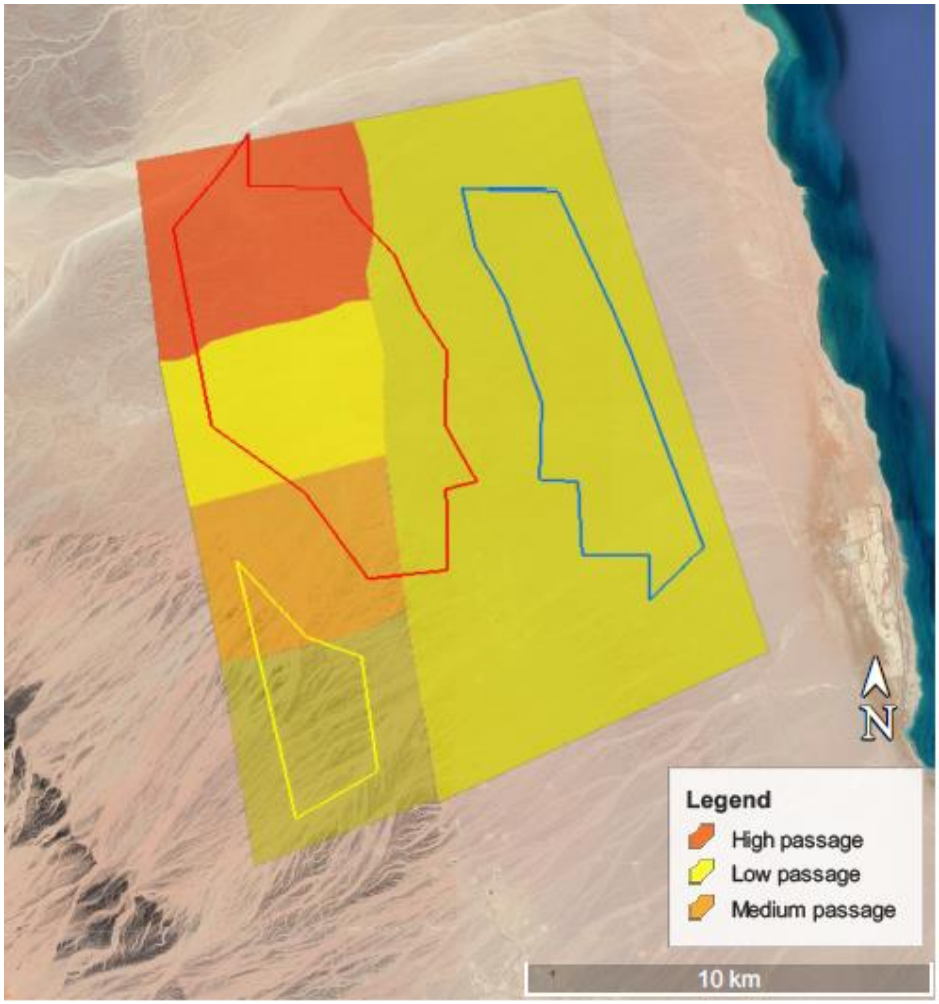

Figure 9-8: Passage of Egyptian Vulture *Neohpron percnopterus* across the Project site in spring season

- Steppe Eagle *Aquila nipalensis*, is a globally threatened species (Endangered). In autumn, the species was recorded in very low numbers with a total of five records of six individuals restricted to the month of October, indicating that the individuals recorded were on passage migration with no indication of wintering individuals. What is significant is that all individuals were recorded to be flying at risk height for almost 70% of their passage over the Project site, while all individuals were recorded to be at least flying at collision risk height at the Project site. During spring migration, globally significant numbers were recorded of the species reaching up to 17,152 birds roughly making up 23-35% of the global population. Although only around 15% of the birds recorded were flying at risk height, even if partially but taking into consideration the high number of individuals passing through, this figure is significant. The species has been documented to be vulnerable to collision to wind power infrastructures and has been lately facing a myriad of threats that has affected its declining global population.

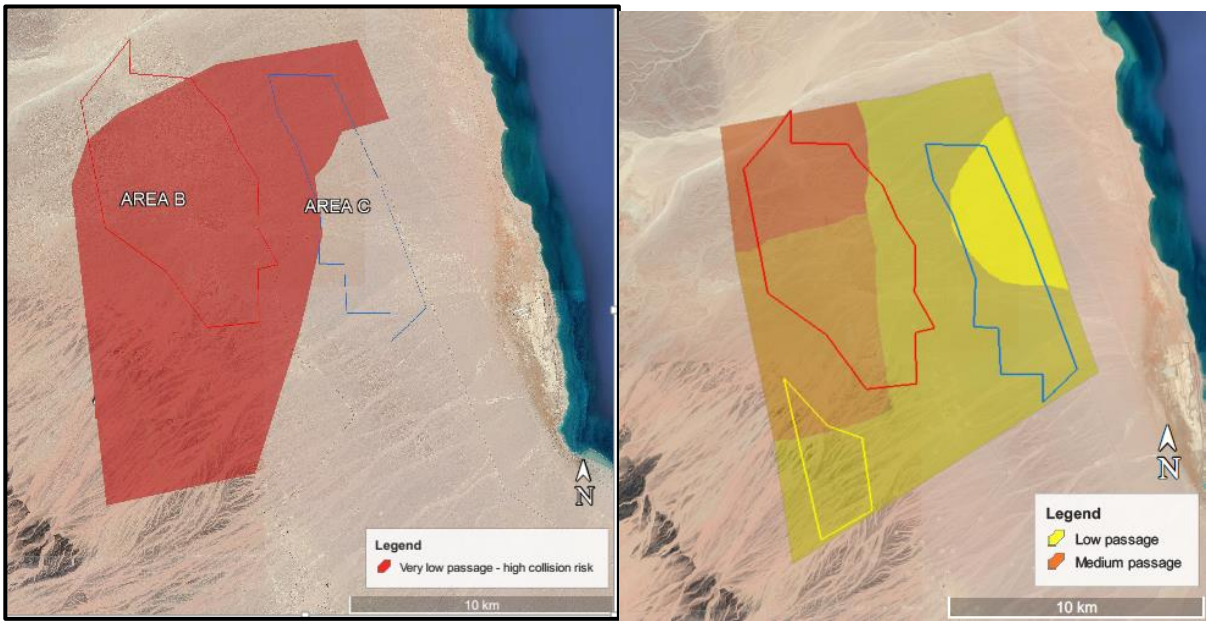

Figure 9-9: Passage of Steppe Eagle *Aquila nipalensis* across the Project site in both autumn (left) and spring (right)

- Eastern Imperial Eagle *Aquila heliaca*, is another globally threatened species (Vulnerable) from the Aquila eagle. In autumn, the species was not recorded while during spring migration, the species was recorded in relatively low numbers accompanied by a low percentage of birds flying at risk height. Still, for a species of global conservaton importance and high vulnerability to collision with wind farm infrastructure, it is still of high significance. Fruther research in the upcimgn two seasons of autumn and spring should provide more solid understanding of the status of the species at the project site.
- Greater Spotted Eagle *Clanga clanga,* is similar to the Eastern Imperial Eagle in that it was not recorded in autumn but had significant numbers in spring with a total of 341 individuals making up 4-10% of the global population of the species. Again, most of the records were in the northwestern part of the project site however the majority of the birds were flying above risk height with only 5% flying at risk height. Although it is a small percentage but for such a globally threatened species with a low population size, the impact of collision on the species is considered to be of high significance.
- Booted Eagle *Hieraaetus pennatus*, is a regular passage migrant that is known to pass over the Gulf of Suez in globally significant numbers during the spring migration season. Similar to Steppe Eagle, the species is known in much larger numbers in spring migration season in comparison to autumn migration season and the species that were recorded during the spring season were quite remarkable. The species is also known to be vulnerable to collision with wind power infrastructure since it is known to migrate at low altitudes

making it vulnerable to collision with wind turbines. However, the percentage of birds flying at collision risk height during the spring migration survey were realtively lower than expected (12.1%), taking into consideration the numbers passing through, this can still be considered a number of concern.The highest passage was in the northwestern and southwestern corners of the project site while the remaining part had low passage.

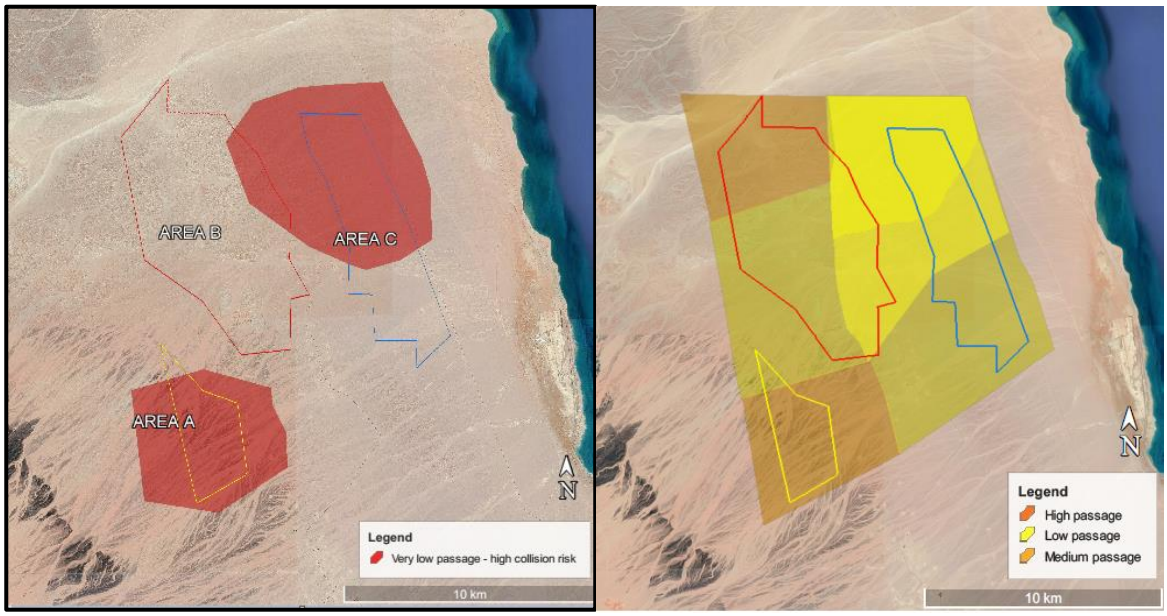

Figure 9-10: Passage of Booted Eagle *Hieraaetus pennatus* across the Project site in both autumn (left) and spring (right)

- Sooty Falcon *Falco concolor* is a globally threatened species (Vulnerable) that has also been recorded in small numbers with only five records in autumn and two records in spring, where all of them were recorded at collision risk height. The records were recorded in three observation points that are scattered across the Project site by the northwest, southwest and southeast. The species is known to breed in West Asia and North Africa while wintering in Madagascar and the coastline of East Africa. Although the number of individuals recorded might not be considered significant, the species is a local breeder and it is breeding population has been facing a continuous decline and it is possible that the individuals recorded in the survey could be of the breeding population of the Gulf of Suez. The global population of the species is 2,800-4,000 species and therefore, any fatalities on the species could affect its declining populations.

In addition, there are additional six species with a medium impact magnitude. These are Black Kite *Milvus migrans*, European Honey-buzzard *Pernis apivorus*, Steppe Buzzard *Buteo buteo vulpinus,* Pallid Harrier *Circus macrourus* (Near Threatened), Montagu's Harrier *circus pygargus* and Red-footed Falcon *Falco vespertinus* (near Threatened). The birds were recorded all across the Project site and the majority of the birds were flying at collision risk height, which is highly typical for harrier species in specific. Both Near Threatened species recorded; Pallid Harrier and Red-footed Falcon were recorded in relatively low numbers however their presence should be taken into consideration and monitoring during the upcoming surveys.

Except for the European honey-buzzard, all species were recorded in modest globally insignificant numbers. As for European Honey-buzzard, the numbers recorded in autumn were globally significant making up at least 1% of the global population of the species while in spring the numbers were marginally lower than 1% of the global population. In autumn, this is a very significant number. One more point to highlight was the timing of these records which were mainly concentrated in late August and early September, which is almost 2-3 weeks earlier than generally known. The monitoring in autumn 2020 should provide more answers to such a phenomenon.

Three more species that are worth noting since they were recorded in relatively large numbers although their vulnerability to collision with wind power infrastructures is not considered to be high are Great White Pelican *Pelecanus onocrtotalus*, White Stork *Ciconia ciconia* and Great Cormorant *Pahalcrocorax carbo*. Although it has the lowest number of records among the three species, the 381 Great White Pelicans recorded during the survey are the most significant of the three species, since it represent roughly around 4% of the mature individuals of the European population, which is considered to be remarkable number for the autumn migration of the Gulf of Suez. Similarly, the numbers passing over in spring are also of high significance and they seem to be consistent throughout the seasons with the numbers reaching to around 10% of the European population.

As for White Stork *Ciconia ciconia*, the species migration in spring is a very well documented phenomenon. The total recorded during the spring migration of 2020 is very significant representing around 30% of the global population. However, in autumn, the total of 5,316 individuals recorded in 12 flocks flying over the Project site is relatively significant as it represents roughly 1% of the flyway population of the species. What is more remarkable is that all flocks were recorded to be flying even if partially at collision risk height. In spring,

Finally the Great Cormorant *Phalacrocorax carbo* was recorded in a locally remarkable number as no previous autumn survey has recorded these numbers. Although the total of 1,993 birds recorded does not represent more than 0.2% of the global population, it is worth assessing the presence of the species during the spring migration where it is expected to be present in larger numbers. The same applies for spring migration, where the total of 6,962 might not be significant for the global population but it is probably the highest for the species along the flyway.

In reference to the autumn survey that was undertaken in 2016 as part of the SESA, the numbers recorded in the Project site was 21 species with a total of 2,180 birds, which makes up around 16% of what was recorded during the current survey. On the other hand, the SESA autumn survey recorded all the species of conservation concern that were recorded during the current survey, including Steppe Eagle *Aquila nipalensis.* It should be highlighted that some species had their conservation status changed since then, including Sooty Falcon *Falco concolor* which was uplisted to become Vulnerable while Saker Falcon *Faclo cherrug*, which was recorded during the SESA survey but not during the current survey was uplisted from Least Concern to Endangered.

The main point that could be highlighted form the SESA autumn survey is that the north-eastern part of the Project site has recorded the highest number of birds and recorded of all the SESA Study Area during autumn. This is confirmed by the current survey, which again highlights the importance of both the eastern and northern parts of the Project site.

Looking at the SESA survey during spring, it can be seen that the northern and central parts of the Project site could prove to have large flocks of birds passing through during spring. This has proven to be the case in general but high numbers were also recorded across the whole western high-altitidue part of the project site while the central and central-eastern parts had the lowest numbers of passage.

Given all the above, the potential impacts on birds created during the operation phase would be of a long-term duration as they are as long as the wind turbines are operating. Such impacts are considered of negative nature and range from a low magnitude to a high magnitude (high magnitude has been taken into account as a worst case scenario). However, the receiving environmental is determined to be of a high sensitivity. Given all of the above, such an impact is considered to be of high significance.

Additional surveys by the Consultant

The following identifies the mitigation and monitoring measures to be applied during operation phase. This mainly includes the undertaking of: (i) breeding survey and (ii) in-flight monitoring for spring migration season:

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

(i) In-flight monitoring during spring and autumn migration seasons

Following the same methods that were applied during the autumn survey of 2019 and spring survey of 2020, in-flight monitoring should be carried out during autumn 2020 and spring 2021 in order to provide a better and more accurate assessment of the level of use of the Project site by vulnerable species. The data obtained from the autumn migration season of 2019 and spring season of 2020 has provided a very good understanding in order to provide solid recommendations about the potential impact of the Project development on the avifauna using the location.

Mitigation and Monitoring Measures

(i) Avi-Fauna Monitoring and On-Demand Turbine Shutdown

Monitoring during the operation of the wind farm must be completed in order to inform the actual impact caused by the wind farm on resident and migratory birds. The monitoring must be undertaken with the primary objective of collision avoidance but also secondary for migration monitoring behaviour.

Monitoring must take place during the spring migration season (from late February until mid-May) and autumn migration season (from mid-August till mid-November). Throughout these periods, monitoring must take place continuously on a daily basis.

Depending on the detailed findings of the follow-up in-flight monitoring, a detailed survey design will be prepared for the Radar-assisted Shutdown On-demand. Also, based on the accumulated findings of the assessments of the various seasons, the highest areas of sensitivity would be identified and key species of concern will be further identified so that they can be considered during the shutdown on-demand procedures.

(ii) Avi-Fauna Carcass Search during Operation

During the operation phase, mortality rate surveys must be undertaken through carcass search surveys covering the entire wind farm. The carcass search will demonstrate the effectiveness of mitigation measures such as turbine shut down and allow an estimation of the annual number of bird deaths caused by the turbine.

a. Carcass Search Surveys

Carcass search surveys shall be carried out by the beginning of the operation phase on a weekly basis during the spring and autumn migration season and twice per month during the summer and winter season. A plot area of 100mX100m would be set around each turbine to search for carcasses. The plot will be covered with search transects 10 m apart, with the searcher looking 5 m on either side.

All found carcasses must be recorded in a log sheet with information to include the following: species, sex, age, condition, cause of death (to the greatest extent possible), coordinates, date, and photos as appropriate, condition (intact, scavenged, feather spots, etc.)

An annual report must be prepared with the results and outcomes to complement the report prepared for the migration monitoring as discussed earlier.

The above carcass search surveys must be undertaken during the first 3 years of operation. After the third year, the carcass search survey will be reviewed and re-evaluated. For example, based on the results it could be decided that autumn surveys should be discontinued or its frequency reduced due to absence of carcasses recorded.

b. Carcass Removal and Searcher Efficiency Bias Trials

Before commencement of the avi-fauna carcass search during the operation phase, a carcass removal and searcher efficiency trial test must be undertaken. The objective of this test is to factor and adjust for carcasses that are removed from the Project site from external factors (such as animals that might feed on such carcasses) as well as for searcher efficiency in locating carcasses.

Also, a carcass removal and searcher efficiency bias trial shall be undertaken for the Wind Farm in order to assess the efficiency of the carcass search team. This trial should factor and adjust for carcasses that are removed from the Project site from external factors (such as animals that might feed on such carcasses) as well as for searcher efficiency in locating carcasses.

Carcasses will be placed and dispersed over the Wind Farm area, avoiding saturation, which could attract animals to the site. They should be checked every day over fifteen days or until the entire carcasses have been removed if earlier.

At the same time, searchers should not be familiar with carcass location and will perform the carcass search annotating how many of the placed carcasses they find. After the trial of each searcher, the carcasses will be checked again to see if they are still there (and were not recorded by the searcher) or have been removed (by animals). Based on the above, the carcass removal and searcher efficiency rates can be calculated.

9.7 Bats - Chiroptera

This Section identifies the anticipated impacts on bats from the Project throughout its various phases. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

9.7.1 Potential Impacts during the Construction Phase

Site preparation activities which are to take place onsite by the Wind Farm EPC Contractors for installation of the wind turbines and the various Project components to include substation, transmission cables, access roads and internal road network, buildings, etc. are expected to include land clearing activities, levelling, excavation, grading, etc.

Such activities are limited to the relatively small individual footprints of these facilities and the actual area of disturbance is relatively minimal. Nevertheless, such activities would likely result in the alteration of the site's habitat and thus potentially impacts bats; particularly through loss of hunting habitats for bats as well as roosting sites.

However, such impacts on bats created during the construction phase would of a long-term duration as they would result in a permanent change in the natural biodiversity of the site. However, such impacts are expected to be of negative nature, low magnitude, and low sensitivity and therefore not significant due to the reasons provided below. However, as noted earlier, this will require verification as part of the 2020 spring bat survey to be undertaken.

- Based on literature review all bat species that are expected within the Project area are considered of Least Concern according to IUCN Red List of Threatened Species.
- The Project site being a feeding ground for bats (which in turn relates to bat activity) is expected to be minimal and insignificant given that the very low nocturnal insect activity due to the arid nature of the Project site and very low vegetation coverage.
- Based on preliminary visits of the Project area it does not seem to support any roosting sites for bats.

Taking the above into account, no mitigation measures are expected to be required.

9.7.2 Potential Impacts during the Operation Phase

The potential impacts from the Project during operation are mainly related to risk of bat strikes and collisions with rotors of the operating wind turbines.

Many reports have corroborated the findings of bat collisions with wind turbines; this includes reports in Germany (Dürr 2001; Trapp *et al.* 2002; Dürr & Bach 2004), Sweden (Ahlén, 2002) and Spain (Alcalde, 2003). Evidences that turbines do not only kill bats from local populations but also from populations at far distance were established (Voigt *et al*., 2012).

In addition, in reference to EUROBATS Guidelines for Considerations on Bats in Wind Farm Projects (Rodrigues et al, 2014), some of the species that are listed to have their distribution range in the Project area and its vicinity are documented to be vulnerable to collisions with wind turbines. For instance, *Pipistrellus spp.* are known to be at high risk of collision from wind turbines. The literature shows that two species of the genus have their distribution range in the area; *Pipstrellus kuhlii* and *P. rueppellii*. Also, *Eptesicus spp.* of which *Eptesicus bottae* is documented to be recorded in the area, are known to be of medium risk to collision with wind turbines. None of the species listed in the literature review are known to have low risk of collision with wind turbines. In fact, all remaining seven species' vulnerability to collision with wind turbines is unknown.

However, the extent and magnitude of such impact cannot be verified at this stage given that no bat survey has been undertaken. Nevertheless, such impacts are anticipated to be of a long-term duration as negative nature, medium magnitude, and low sensitivity and therefore of minor significance due to the reasons provided below. However, as noted earlier, this will require verification as part of the 2020 spring bat survey to be undertaken.

- Risk of collision of bats could potentially entail impacts on population on the species during specific periods of the year, mainly in spring season. However, based on literature review all bat species that are expected within the Project area are considered of Least Concern according to IUCN Red List of Threatened Species.
- The Project site being a feeding ground for bats (which in turn relates to bat activity) is expected to be minimal and insignificant given that the very low nocturnal insect activity due to the arid nature of the Project site and very low vegetation coverage.
- Based on preliminary visits of the Project area it does not seem to support any roosting sites for bats.

Additional Studies

Taking the above outcomes into account, it is recommended that a bat survey is undertaken to: (i) verify and confirm the conclusions discussed earlier, (ii) provide an actual understanding of the significance of the Project site and its vicinity in relation to bats; and (iii) determine the magnitude of impacts anticipated from the Project.

Therefore, a bat survey will be undertaken by the Consultant during the spring season of 2020. The survey will include the use of mobile bat detector following route-transects that will be distributed throughout the Project area (running in an East-West direction) taking into account a 1-km radius around the proposed area as well.

The survey will be undertaken from the months of April until August as this is regarded as the most suitable period of the year to assess bat activity as bats become active after the hibernation which may last from December to March. The survey will be undertaken for a period of 7 days each month (i.e. a total of 35 days spread through the period).

Along each route transect, points will be spread out each 500m. At each point, the recorded will use the bat detector to document any bat activity. Each point would last for 30 minutes. If bat activity is encountered, the coordinates would be recorded and the data will be recorded automatically by the bat detector for further in-depth desktop analysis. Each month, 1-2 transects will be covered and the survey will be undertaken in a rotational method. The survey will be undertaken during nighttime as bats usually rest and sleep during the day and are active during night as they search for prey to feed on.

Recordings of the sound waves are then analysed and compared with a comprehensive database for the sound waves of all bats species known to match and determine the species of the recorded bat accordingly. The assessment will provide quantitative and qualitative data about bats in terms of following:

- Species identification;

- Categorization of species;
- Speculations on height (field observations will aim to identify to the extent possible the height at which the bat was recorded);
- Activity index (the significant of bat activity is based on the concept of activity index which is the number of bat contracts per surveying hour);
- Map with locations of detected bats within the area; and
- Significance of bat activities for the Project.

In addition to the bat monitoring undertaken, once per month during the survey period the Project area and a 2km radius, will be inspected through field observations for potential roosting sites. Any observed potential roosting sites (such as caves, cervices, etc.) will be noted and inspected for roosting activity or any indication of roosting activity (e.g. search for faecal remains). In addition, interviews will be carried out with people from the local area who might recommend potential locations for roosting.

Based on the above a standalone 2020 bats assessment report will be submitted as an addendum to the ESIA. The report should identify baseline conditions and also provide updates on any specific mitigation and monitoring measures that might be required.

9.8 Archaeology and Cultural Heritage

This Section identifies the anticipated impacts on archaeology and cultural heritage from the Project throughout its various phases. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

It is important to note that there are no anticipated impacts during the operational phase of the Project.

9.8.1 Potential Impacts during the Construction Phase

Site preparation activities which are to take place onsite by the Wind Farm EPC Contractors for installation of the wind turbines and the various Project components to include substation, transmission cables, access roads and internal road network, buildings, etc. are expected to include land clearing activities, levelling, excavation, grading, etc.

Although such activities are limited to the relatively small individual footprints of these facilities and the actual area of disturbance is relatively minimal, if such activities are improperly managed, they could damage or disturb archaeological remains present on the surface of the Project site. However, the archaeological baseline assessment discussed earlier concludes that there are no archaeological sites or remains within the Wind Farm Project site. Therefore, there are no anticipated impacts from the Project on surface archaeological remains within the Project site.

In addition, there is a chance that throughout such construction activities, archaeological remains buried in the ground are discovered. Improper management (if such sites are discovered) could potentially disturb or damage such sites which could potentially be of importance. Such potential impacts are of a short-term duration as they are limited to the construction phase, and are irreversible as should sites be discovered then inappropriate management could result in disturbance and/or damage, in which such an impact would be of medium magnitude. The impacts will be of a negative nature and low sensitivity given that the likelihood of such impacts is considered low. Given all of the above, such an impact is considered to be of minor significance.

Mitigation Measures

The following identifies the mitigation measures to be applied by the Wind Farm EPC Contractors during the construction phase and which include:

- Throughout the construction phase, and as the case with any Project development that entails such construction activities, there is a chance that potential archaeological remains in the ground might be discovered. It is expected that appropriate measures for such chance find procedures are implemented. Those mainly require that construction activities be halted and the area fenced along with proper signage, while immediately notifying the Ministry of Tourism and Antiquities/Red Sea and Suez Antiquities Inspection Office. No additional work will be allowed before the Ministry/Inspection Office assesses the found potential archaeological site and grants a clearance to resume the work. Construction activities can continue at other parts of the site if no potential archaeological remains were found. If found, same procedures above apply.

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the Wind Farm EPC Contractors during the construction phase and which include:

- For chance find procedure, inspection of actions taken in case of new discoveries, including fencing, limiting access to site, and contacting the Ministry of Tourism and Antiquities/ Red Sea and Suez Antiquities Inspection Office. Report should be prepared and submitted to the Ministry in such a case which details the above.

9.9 Air Quality and Noise

This Section identifies the anticipated impacts on air quality and noise from the Project throughout its various phases. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

9.9.1 Potential Impacts during the Construction Phase

Site preparation activities which are to take place onsite by the Wind Farm EPC Contractors for installation of the wind turbines and the various Project components to include substation, transmission cables, access roads and internal road network, buildings, etc. are expected to include land clearing activities, levelling, excavation, grading, etc.

Although such activities are limited to the relatively small individual footprints of these facilities and the actual area of disturbance is relatively minimal. Nevertheless, such activities will likely result in an increased level of dust and particulate matter emissions, which in turn will directly and temporarily impact ambient air quality. If improperly managed, there is a risk of nuisance and health effects to construction workers onsite and to a lesser extent to the nearby surrounding receptors from windblown dust (such as workers in Petroleum Storage Facilities). In addition, construction activities will likely entail the use of vehicles, machinery and equipment

(such as generators, compressors, etc.) which are expected to be a source of other pollutant emissions (such as SO_2, NO_2, etc.) which would also have minimal direct impacts on ambient air quality.

In addition, all the above activities will likely include the use of machinery and equipment such as generators, hammers, compressors, etc. and which are expected to be a source of noise and vibration generation within the Project site and its surroundings. If improperly managed, there is risk of nuisance and health affects to construction workers onsite and to a lesser extent to the nearby surrounding receptors (such workers in Petroleum Storage Facilities).

The above impacts are anticipated to be temporary and of short-term nature as they are limited to the construction period only. Such impacts are of a negative nature, and will be noticeable and therefore of medium magnitude. However, the impacts will be dispersed and are reversible as air quality would revert back to baseline conditions after construction works is completed and thus the receiving environment is considered of low sensitivity. Given the above such an impact is considered of minor significance.

Mitigation Measures

The following identifies the mitigation measures to be applied by the Wind Farm EPC Contractors during the construction phase:

- Based on inspections and visual monitoring undertaken, if dust or pollutant emissions were found to be excessive due to construction activities, the source of such emissions should be identified and adequate control measures must be implemented;
- Comply with the Occupational Safety and Health Administration (OSHA) requirements and the Egyptian Codes to ensure that for activities associated with high dust and noise levels, workers are equipped with proper Personal Protective Equipment (e.g. masks, eye goggles, breathing masks, ear muffs, etc.);
- Apply basic dust control and suppression measures which could include:
  - Regular watering of roads for dust suppression;
  - Proper planning of dust causing activities to take place simultaneously in order to reduce the dust incidents over the construction period.
  - Proper management of stockpiles and excavated material (e.g. watering, containment, covering, bundling).
  - Proper covering of trucks transporting aggregates and fine materials (e.g. through the use of tarpaulin).
  - Adhering to a speed limit of 15km/h for trucks on the construction site.
- Develop a regular inspection and scheduled maintenance program for vehicles, machinery, and equipment to be used throughout the construction phase for early detection of issue to avoid unnecessary pollutant and noise emissions.
- Based on inspections and visual monitoring undertaken, if noise levels were found to be excessive from construction activities, the source of such excessive noise levels should be identified and adequate control measures must be implemented; and
- Apply adequate general noise suppressing measures. This could include the use of well-maintained mufflers and noise suppressants for high noise generating equipment and machinery, developing a regular maintenance schedule of all vehicles, machinery, and equipment for early detection of issues to avoid unnecessary elevated noise level, etc.

Following the implementation of these mitigation measures, the significance of the residual impact is categorized as not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the Wind Farm EPC Contractors during the construction phase and which include:

- Inspection and visual monitoring of the works should be carried out at all times. In addition, periodic inspections should be conducted at nearby sites (e.g. Petroleum Storage Facilities) to determine whether harmful levels of dust and noise from construction activities exist; and
- Reporting of any excessive levels of pollutants/dust or noise and the measures taken to minimize the impact and prevent it from occurring again.

9.9.2 Potential Impacts during the Operation Phase

The main foreseen impacts during the operation phase is that related to the noise generated from the operating wind turbines and its potential impact on the health and safety of the nearby surrounding receptors. Given that such impacts are directly related to public health and safety, such impacts have been discussed in details in "Section 9.12 – Public Health and Safety" along with other relevant impacts such as shadow flicker.

9.10 Infrastructure and Utilities

This Section identifies the anticipated impacts on infrastructure and utilities from the Project throughout its various phases. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

9.10.1 Potential Impacts on Road Networks during the Planning and Construction Phase

Wind turbines are manufactured in factories and transported to the installation site where they are assembled. Wind turbine components have big dimensions and weight and their transport poses a challenge to the existing roads and infrastructure. The Project's wind turbine blades have a length of around 57m and are usually transported in one piece. Tower components can have a transport height of up to 5m. Nacelles are also usually transported in one piece and can have a weight of more than 70 tonnes.

Components for wind energy projects are usually transported by sea from the manufacturing country to the country of installation and are then loaded in existing ports to trucks which manoeuvre their way through existing roads to the installation site.

Given the increasing size, weight, and length of components of the wind turbines, proper transportation and logistical solutions could be required for managing the heavy-load long-haul requirements. If improperly planned and managed, the trucks hauling the various heavy Project components may damage the existing roads, highways and bridges, utility lines (e.g. electricity lines), and could also be a public safety concern for other vehicles on the road.

Taking all of the above into account, the anticipated impacts on road networks are considered of short-term duration during the Project construction phase. Such impacts are of a negative nature, and if such impacts are improperly managed, then they are expected to be of high magnitude and medium sensitivity. Given the above impact is considered of moderate significance.

Mitigation Measures

It is recommended that Wind Farm EPC Contractors develop a Traffic and Transport Plan before commencement of any transportation activities to ensure that the transportation process is properly and adequately managed and does not pose a risk of damage to the existing roads, highways, overpasses whilst ensuring public safety. The Plan must analyse and study the entire route for transportation of the Project components from the port till the Project site. The assessment must take into account worst case scenarios for transportation of Project components for blade lengths, tower sections, etc. The study must investigate any constraints which need to be considered along the highways leading to the Project site such as bridges, overhead utility cables, slants in roads, etc. and identify accommodations which need to be taken into account (bypasses, adjustments to roads, etc.)

The Plan must take into account the following:

- The Plan must be developed in accordance with relevant local traffic and transportation legislations related to traffic loads and weights, dimensions, speed limits, etc.
- The plan must consider, to the extent possible, the proper planning of generated trips of trucks to ensure they are spread over the course of a work day and hours of day, and which also take into account peak and non-peak commute hours on the highway;
- As part of the Plan, the EPC Contractors must establish coordination with relevant entity to take into account any specific requirements that should be considered and ensure they are aware of the transportation requirements and details related to the Project.

In addition, the following identifies the mitigation measures that are to be implemented by the Wind Farm EPC Contractors as part of the planning phase of the Project:

- As noted earlier in "Section 9.3.1", formal communications must be established with the General Petroleum Company for a "Work Coordination Agreement". As part of such meetings, formal communication must also aim to discuss and determine any specific requirements to be taken into account for the established road networks within the Wind Farm (e.g. avoidance of such areas, buffer distances to be considered, etc.)

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to <u>not significant.</u>

<u>Monitoring and Reporting Requirements</u>

The following identifies the monitoring and reporting requirements that must be adhered to by the Wind Farm EPC Contractors during the construction phase and which include:

- Submission of Traffic and Transport Plan with proof of coordination with the authorities discussed above for works required as part of the Study.

The following identifies the monitoring and reporting requirements that must be adhered to by the Wind Farm EPC Contractors during the construction phase and which include:

- Submission of proof of coordination with relevant entities

9.10.2 Potential Impacts on Electricity Lines during the Planning and Construction Phase

As noted earlier, an electricity line runs within the most eastern parts of the Wind Farm area including 4 pylons located within the site. The electricity line is under the responsibility of the Egyptian Electricity Transmission Company (EETC).

Inappropriate management of planning activities (e.g. siting of turbines) and construction activities (e.g. excavations) could damage and/or disturb the electricity lines within the Project area. The EETC through the

Electricity Law 87/2015 states that any OHTL has a right of way of 25 m from both sides which should be taken into account. However, this should be confirmed through consultations with EETC.

Taking all of the above into account, the anticipated impacts on electricity networks are considered of short-term duration during the Project construction phase. Such impacts are of a negative nature, and if such impacts are improperly managed, then they are expected to be of high magnitude and medium sensitivity. Given the above impact is considered of moderate significance.

Mitigation Measures

The following identifies the mitigation measures to be applied by the Wind Farm EPC Contractors during the construction phase:

- Establish coordination with relevant entity to discuss and determine any specific requirements to be taken into account for the established electricity networks within the Wind Farm (e.g. avoidance of such areas, buffer distances to be considered, etc.)

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the Wind Farm EPC Contractors during the construction phase and which include:

- Submission of proof of coordination with relevant entities

9.10.3 Potential Impacts on the Gas Pipeline during Construction

As noted earlier, the natural gas pipeline runs to the east of the Project site by around 1km at the narrowest point as noted in the Figure 8-53. Given that it is located outside of the Project site there are no anticipated impacts on the gas pipeline. Therefore, there are no mitigation or additional requirements to be considered.

9.10.4 Potential Impacts on Water Resources during Construction and Operation

It is expected that the Project throughout the construction and operation phase will require water for potable usage (drinking, showering, etc.) and non-potable usage (e.g. cleaning of machinery and vehicles).

Based on information provided by the Developer, the Project is expected to require around 80,000m^3 throughout the construction phase (for a total duration of 28 months) – equivalent to around 75m^3/day. This will include around 60,000m^3 for construction requirements (concrete works, minimize dust, cleaning of requirements, etc.) as well as 20,000m^3 as potable water requirements (drinking, washing, etc.).

Similarly, during the operation phase, water will mainly be required for potable use of onsite staff at the Wind farm. Nevertheless, such requirements are expected to be minimal and insignificant.

As discussed earlier, based on consultations with Ras Ghareb Water Company there are no existing or planned water connections to the Project area. Water will be supplied through water trucks and tankers from Ras Ghareb and stored onsite through water tanks.

Based on the above it is clear that the water requirements for the Project during construction and operation are unlikely to entail any constraints on the existing users. However, the involved entities are required to coordinate with Ras Ghareb Water Company to secure water requirements for the Project most likely through tankers.

Taking all of the above into account, the anticipated impacts on the local water resources and utilities are considered of short-term duration during the Project construction phase and of long-term duration during the Operation phase. Such impacts are of a negative nature, and are expected to be of low magnitude and of low sensitivity given the temporary nature of such impacts during construction and minimal water requirements of the Project during operation. To this extent, the impact is considered not significant.

Additional Requirements

The following identifies additional requirements to be applied by the Wind Farm EPC Contractors during the construction phase and Wind Farm Operator during the operation phase respectively and which include:

- Coordinate with the Ras Ghareb Water Company to sector the water requirements of the Project.

9.10.5 Potential Impacts on Waste Utilities during Construction and Operation

The Project is expected to generate the following waste streams during the construction and operation phases:

- Wastewater during construction and operation to include black water (sewage water from toilets and sanitation facilities) and grey water (from sinks, showers, etc.). Wastewater during the construction phase from the Wind Farm can be assumed by taking into account an 80% wastewater generation factor for potable water requirements which will amount to around 16,000m^3 throughout the construction phase. Wastewater generated from the Wind Farm during operation is expected to be minimal and insignificant. Wastewater will be stored onsite though enclosed septic tanks and collected by tankers from the Project to the closest WWTP.
- Solid waste during construction and operation from the Wind Farm will include construction waste (mainly during construction to include dirt, rocks, debris, etc.) as well as general municipal waste (such as food, paper, glass, bottles, plastic, etc.). Solid waste quantities generated are not expected to be significant and are likely to be easily handled by closest landfill facility.
- Hazardous waste during construction and operation from the Wind Farm will include routine waste generated from such activities to include spent oil, lubricants, paint cans, solvents, etc. Hazardous waste quantities generated are not expected to be significant and are likely to be easily handled by closest authorized facility.

Taking all of the above into account, the anticipated impacts on waste utilities are considered of short-term duration during the Project construction phase and of long-term duration during the Operation phase. Such impacts are of a negative nature, and are expected to be of low magnitude and of low sensitivity given the relatively minimal quantities generated and easy of management by relevant authorities. Given the above impact is considered not significant.

Additional Requirements

The following identifies the additional requirements to be applied by the Wind Farm EPC Contractors during the construction phase and Wind Farm Operator during the operation phase respectively and which include:

- Coordinate with the Ras Ghareb Water Company and obtain list of authorized contractors for collection of wastewaters from the site to the Ras Ghareb WWTP.
- Coordinate with the Ras Gharib City Council to hire a competent private contractor for the collection of solid waste from the site to the Ras Ghareb Public Dumpsite.
- Coordinate with Environmental Management at Ras Ghareb City Council to obtain list of authorized contractors for collection of hazardous waste from the site to the closest approved facility for final disposal.

9.10.6 Potential Impacts on Aviation, Telecommunication and Television & Radio Links during the Planning and Construction Phase

Improper planning and site selection of the Project could impact and affect infrastructure elements related to aviation, telecommunication and television & radio links in the surrounding area. Those are discussed in further details below.

(i) Aviation

Any tall structure could impact aircraft safety if located near airports or known flight paths. In addition, such structures could potentially interfere with certain electromagnetic transmissions associated with air transport, for example primary radar and secondary surveillance radar. Wind turbines have the potential to impact the surveillance systems used to detect and identify aircraft approaching, overlying or leaving Egyptian airspace and for which a Recognized Air Picture (RAP) is produced.

Such issues are generally managed through appropriate setback distances (if applicable) and in addition, regulatory authorities generally include requirements for wind farm developments related to visibility of turbines to include navigational lights and blade paintings.

Nevertheless, if such issues are improperly managed and not taken into account as part of the planning phase, they could affect aircraft safety. Therefore, such impacts are considered of long-term duration, of negative nature, and of low magnitude given impact is related to inappropriate management of activities, however given its importance it is considered if high sensitivity. Given all of the above, the impact is considered of minor significance.

Mitigation Measures

The following identifies the mitigation measures to be applied by the Developer during the planning phase and which include:

- Establish coordination with the relevant entity to provide information on the Project (to include location and specifications of turbines in specific) and include any specific requirements to be considered as part of the detailed design to include setback distances if required (e.g. from radar systems if applicable) and navigational safety requirements (e.g. navigational lights, blade paintings, etc.)

Following the implementation of these mitigation measures, the significance of the residual impact is categorized as not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the Developer during the planning phase and which include:

- Submission of formal non-objection letters from relevant entities

(ii) Telecommunication, TV and Radio Links

Wind turbines during the construction and operation phase could impact telecommunication, TV and Radio infrastructure. For example, construction activities could damage/disturb underground communication cables (if present within the area), while rotating turbines during operation could disrupt Line of Sight (LoS) connections between telecommunication transmission towers.

Such issues are generally managed through appropriate setback distances (if applicable) from such infrastructure elements. Nevertheless, if such issues are improperly managed and not taken into account as part of the planning phase, they could affect such elements. Therefore, such impacts are considered of long-

term duration, of negative nature, and of low magnitude given impact is related to inappropriate management of activities, however given its importance it is considered if high sensitivity. Given all of the above, the impact is considered of minor significance.

Mitigation Measures

The following identifies the mitigation measures to be applied by the Developer during the planning phase and which include:

- Establish coordination via NREA/EETC with the relevant entity (given that a telecommunication tower is noted onsite), and other applicable local agencies to provide information on the Project (to include location and specifications of turbines in specific) and include any specific requirements to be considered as part of the detailed design to include setback distances if required for telecommunication, radio and TV infrastructure (e.g. from LoS connections)

Following the implementation of these mitigation measures, the significance of the residual impact is categorized as not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the Developer during the planning phase and which include:

- Submission of formal non-objection letters relevant entities

9.11 Occupational Health and Safety

This Section identifies the anticipated impacts from the Project throughout its various phases on occupational health and safety. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

This section presents the assessment of potential impacts on occupational health and safety collectively during the construction and operation phase for the wind farm, given that they are similar in nature during both phases.

Throughout the construction and operation phase there will be generic occupational health and safety risks to workers, as working onsite increases the risk of injury or death due to accidents. The following risks are generally associated with wind farm development projects:

- Slips and falls;
- Working at heights;
- Working with powered and hand held tools;
- Struck-by objects;
- Moving machineries;
- Working in confined spaces and excavations;
- Exposure to chemicals, hazardous or flammable materials;
- Working in sunny conditions and high temperatures;
- Exposure to electric shocks and burns when touching live components;
- OHS risks from work with nearby operations to include in specific the oil rigs and petroleum storage facilities

Such impacts are considered of short-term duration during the construction phase and of long-term duration throughout the Project operation phase, of a negative nature, and are expected to be of medium magnitude and medium sensitivity as in extreme cases they could entail permanent impacts (e.g. permanent disability).

Nevertheless, such impacts are generally controlled through the implementation of general best practice. Given the above such an impact is considered of minor significance.

Mitigation Measures

The Wind Farm EPC Contractors are expected to prepare an Occupational Health and Safety Plan (OHSP) each for their construction, installation and commissioning works as well as the general construction site operations. In addition, the Wind Farm Operator is expected to develop an OHSP tailored to the Project's operation phase.

The objective of the OHSP is to ensure the health and safety of all personnel in order to concur and maintain a smooth and proper progress of work at the site and prevent accident which may injure personnel or damage property contractor and all involved sub-contractors, as well as the Project Operators

The OHSP for the construction and operation phase should be Project and site specific and must take into account the national requirements mainly the Law 4/1994 and Law 12/2003 on Labour and Workforce Safety and Book V on Occupational Safety and Health (OSH) and assurance of the adequacy of the working environment. In addition, it must also be compliant with IFC PS2 (Labour and Working Conditions), EBRD PR 4 (Health and Safety) and World Bank ESS 2 (Labour and Working Conditions) which recognize the importance of avoiding or mitigating adverse health and safety impacts on workers and require the development of a project-specific health and safety plan that is in accordance with Good International Practice (GIP).

In general, the OHSP should address the following components:

- Identify roles and responsibilities of the personnel involved within the Project to include the EHS manager, construction manager, supervisor, and other sub-contractor's responsibilities;
- Identify in details information in relation to formulation of safety committees, communication protocols, first aid personnel and facilities, first aid training programs, occupational health and safety culture, emergency preparedness and response, quality system, reporting requirements, competence and job safety training, safety inspections, recruitment procedures, safety audits, risk assessment, etc.;
- Identify in details the hazards which may be associated with various activities to take place and the various measures to be implemented to reduce such risks including the requirements for Personal Protective Equipment (PPE). This includes for example hand tools, access equipment, lifting equipment, mobile working equipment, etc.
- Identify in detail the fire control systems to include fire risk assessment, fire alarm system, fire risk management, and others; and
- Establish training requirements for workers to comply with health and safety procedures and protective equipment.
- Establish OHS and communications measures for working with nearby operations of the General Petroleum Company which has oil rigs and petroleum storage facilities within the Project area.

All entities (to include Wind Farm EPC Contractors and Wind Farm Operator) are expected to adopt and implement the provisions of the OHSP throughout the Project construction and operation phase.

In relation to workers accommodation, as discussed earlier the Wind Farm EPC Contractors have not been selected yet (nor any other sub-contractor which might be involved in the Project). Therefore, it is not clear at this point whether there will be any onsite accommodation for workers, or whether they will be accommodated at closest villages.

Nevertheless, the Wind Farm EPC Contractors must prepare a worker accommodation plan, which must provide details on accommodation requirements of the workforce to include location, facilities, transportation requirements, etc. The Plan must ensure that workers are provided with a decent accommodation which meets the basic worker's needs. In addition, workers accommodation must be compliant with good international industry practices – mainly the "Workers' accommodation: process and standards" (EBRD/IFC

Guidance Note, 2009). The document provides guidance notes on general living facilities, room facilities, medical facilities, management of accommodation units, etc.

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the involved entities as relevant (Wind Farm EPC Contractors during the construction phase and Wind Farm Operator during the operation phase).

- Inspection to ensure the implementation of the provisions of the Occupational Health and Safety Plan and assess compliance with its requirements;
- Regular Reporting on the health and safety performance onsite in addition to reporting of any accidents, incidents and/or emergencies and the measures undertaken in such cases to control the situation and prevent it from occurring again; and
- Inspection on workers accommodation to ensure its compliance with EBRD/IFC's Guidance Note – Workers' accommodation: process and standards".

9.12 Public Health and Safety

This section identifies and assesses the anticipated impacts from the Project activities on public health and safety during the various phases to include planning and construction phase and operation phase. For each impact, a set of management measures (which could include mitigation measures, additional requirements, etc.) and monitoring measures have been identified to eliminate or reduce the impact to acceptable levels.

9.12.1 Potential Impacts from Noise from Wind Turbines during Operation

Wind turbines produce noise during operation from mechanical and aerodynamic sources. Mechanical noises are mainly limited from the machinery in the nacelle of the turbine (gearbox, generator, auxiliary equipment, etc.) while aerodynamic noise is generated from the movement of air around the turbine blades and tower.

Propagation of the sound from a turbine is primarily a function of distance, but it can also be affected by the placement of the turbine, surrounding terrain, and atmospheric conditions. In addition, noise levels depend greatly on the level of operation of the turbines (percentage of rated power). Nevertheless, in some cases, background/ambient sound already exceeds the sound produced by any wind turbine (e.g. high wind speeds, surrounding activities, etc.). In this case, the sound from the wind turbine blends into the background sound, simply becoming part of the present soundscape without the notice of residences.

As required by the IFC EHS Guideline for Wind Energy, the following is noted in relation to noise assessment for wind farms:

- Receptors should be chosen according to their environmental sensitivity (human, livestock, or wildlife).
- Preliminary modelling should be carried out to determine whether more detailed investigation is warranted. The preliminary modelling can be as simple as assuming hemispherical propagation (i.e., the radiation of sound, in all directions, from a source point). Preliminary modelling should focus on sensitive receptors within 2,000 meters (m) of any of the turbines in a wind energy facility.
- If the preliminary model suggests that turbine noise at all sensitive receptors is likely to be below an LA90 of 35 decibels (dB) (A) at a wind speed of 10 meters/second (m/s) at 10 m height during day and night

times, then this preliminary modelling is likely to be sufficient to assess noise impact; otherwise it is recommended that more detailed modelling be carried out, which may include background ambient noise measurements.

The IFC EHS Guideline for Wind Energy is based on the on "the Assessment and Rating of Noise from Wind Farms" (ETSU-R-97). ETSU can be regarded as relevant guidance on good practice, it contains a methodology for generating noise limits for a wind turbine and wind farms. ETSU-R-97 is referenced by the United Kingdom (UK) Government as a best practice guide for UK Legislation. The assessment procedure of ETSU-R-97 consists of the following steps for the screening assessment:

- Determine a study area;
- Identify potentially affected properties;
- Predict noise levels from all turbines (existing and proposed) and determine a noise contour boundary of 35dB(A);
- Identify if any noise sensitive receptors are within this boundary.

Taking the above requirements into account, a screening assessment was undertaken for the Project based on the following:

- Noise prediction calculations using SoundPLAN 8.1 software according to the International Organization for Standardization (ISO) 9613 'Acoustics – Attenuation of Sound During Propagation Outdoors' (International Organization for Standardization -ISO, 1996). ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources
- ISO 9613-2 calculates predicted noise levels with the major assumption that the sources are located upwind from the Noise Sensitive Receiver locations (NSR) as this is the worst-case scenario. Therefore, directivity and attenuation due to metrological factors such as wind speed and wind direction upwind from a source are not taken into account
- Screening was based on a worst-case noise scenario (W10 = 10m/s) as required by the guidelines. Since the proposed wind turbines for the Project operate at a constant maximum sound power output of 106.6 dBA between 10 m/s and 20 m/s, worst cases would be defined as operation within wind speeds which exceed 10 m/s.
- No corrections for uncertainty have been applied as all noise data has been provided by turbine manufacturer and is guaranteed
- Determining the extent of the 35 dB(A) contour boundary emitted from the wind turbine generators (WTG)
- Determining if there are any noise sensitive receptors within the calculated contour boundary;
- Model calculation and parameter setting to include the following:

Table 9-2: Model Calculation and Parameter Setting (Consultant, 2019)

Model Parameter	**Parameter Setting / Standard**
Calculation Standard	(ISO) 9613 'Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General Calculation Method' (ISO, 1996) Application as per IOA GPG
Wind Speed	10 m/s
Ground Absorption Coefficient	0.5
Receiver Height	10 m
Meteorological Data	Humidity 70% Air Pressure 1013.3 mbar T = 10ºC
Atmospheric Attenuation Coefficients (dB / km)	63Hz 125Hz 250Hz 500Hz 1kHz 2kHz 4kHz 8kHz 0.1 0.4 1.0 1.9 3.7 9.7 32.8 117.0

The study is based on the following information:

- General arrangement and layout drawings of the wind farm, including topography;
- Wind turbine supplier data (vendor noise data) as provided by the Developer. The sound power levels during standard operation mode ranges from 95.1.0 dBA at low revolutions per minute (rpm) to 106.6 dBA at full rated power output (high rpm). In accordance with IEC 61400-14 'Wind Turbines – Part 14: Declaration of apparent sound power level and tonality values', the turbine manufacturer provides a performance guarantee of a maximum sound power output of 106.6dBA
- Noise Sensitive Receiver locations (NSR) as identified in "Section 8.11.1" earlier. Review of identified receptors indicate that only one potential receiver has been identified in the vicinity of the proposed wind farm which includes the military base in the form of an Air Force Defence Unit located approximately 3.5km east of the closest wind turbine location, (turbine 191).

A noise contour map for the worst-case noise scenario has been calculated and is presented in the figure below. The map shows both contour lines and noise propagation level areas or 'zones'. The significance of the noise contour map is to allow for an overview of noise levels over a geographic area and therefore allows a quick basic analysis of the noise propagation for identification of the specific NSR.

Table 9-3: Noise Contour Map Setup Specification (Consultant, 2019)

Parameter Description	Noise Map Parameter
Wind Speed (W10)	10 m/s
WTG Operation	Worst Case – All WTGs operating
Mapping Grid Resolution	25 x 25 m
Mapping Result Range	0 - 75 dB(A)

As noted in the figure below, generally the noise levels at the Air Force Defence Unit are likely to be just at LA90 of 35 decibels (dB) (A) at a wind speed of 10 meters/second (m/s) at 10 m as required by the Guidelines. In addition, occupancy details on the Air Force Defence Unit were requested but could not be obtained. Nevertheless, in general, such a receptor is unlikely to be classified as an NSR given that based on observations it includes offices, training grounds, radar system, mosque and barracks for soldiers. Such a barracks is likely to include sleeping arrangements for soldiers whom are likely there on a rotational basis and it is unlikely to include any permanent residences living there.

Taking the above into account, such impacts are considered irrelevant and no detailed noise assessment is required.

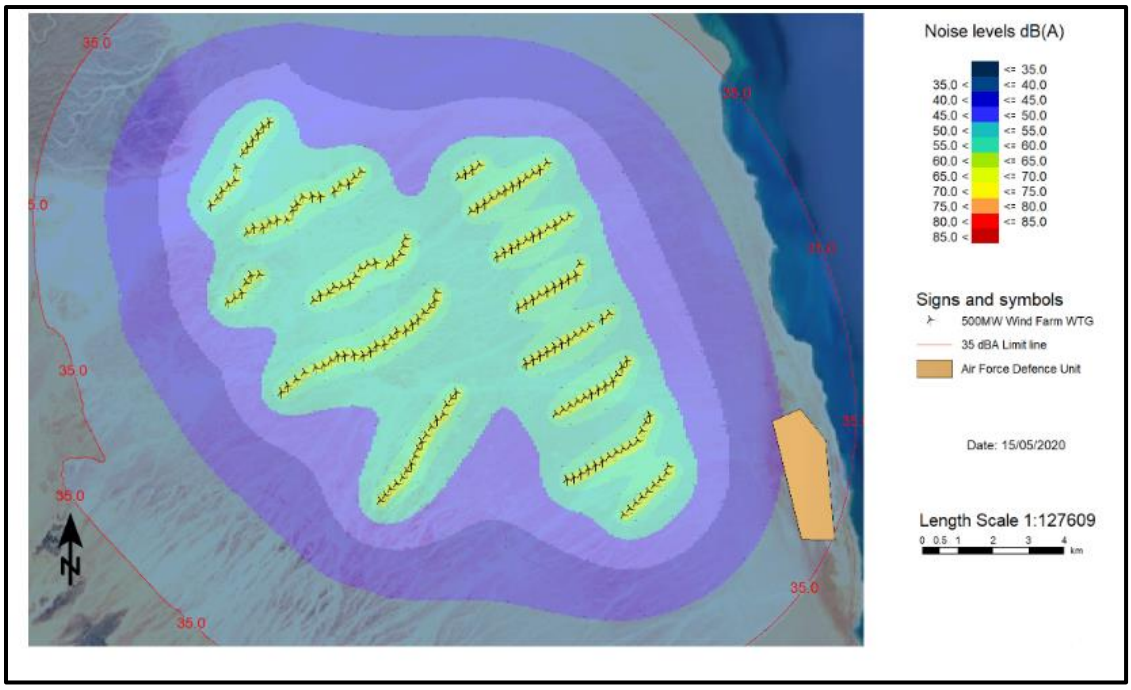

Figure 9-11: Noise Contour Map for Project (Consultant, 2019)

9.12.2 Potential Impacts from Shadow Flicker from Wind Turbines during Operation

Shadow flicker occurs when the sun passes behind the wind turbine and casts a shadow several hundred meters away from the turbine's location. As the rotor blades rotate, shadows pass over the same point causing an effect known as 'shadow flicker'. Shadow flicker only occurs under specific environmental conditions which must also align for flicker to occur which include position and height of the sun, wind speed, direction, cloudiness, and position of the turbine to a sensitive receptor.

Excessive shadow flicker can be a source of nuisance and could create a disturbing indoor environment to the occupants of those buildings especially when casted through windows of buildings that directly face the turbine with no obstructions in sight (trees, hills, etc.).

A companion guide to Planning Policy Statement 22 (PPS22) (2004) and BERR (2007) indicates that shadow flicker is typically limited to occurring within approximately 10 rotor diameters of a wind turbine; at distances beyond 10 rotor diameters shadow flicker effects are essentially undetectable. Beyond this distance, the shadow is diffused such that the variation in light levels is not likely to be sufficient to cause annoyance. This is also acknowledged in the Queensland Wind Farm Planning Guidelines, which state that the first step in performing a shadow flicker assessment is to determine the extent of shadows from turbines and suggest a distance equivalent to 265 maximum blade chords (the thickest part of the blade) as an appropriate limit. This limit corresponds to around 800 m to 1,325 m for modern wind turbines, which typically have maximum blade chord lengths of 3 m to 5 m (AECOM, 2016). The rotor diameter that will be considered for the Project is 114m – therefore shadow flicker effects are likely to occur within 1,200m radius.

The IFC EHS Guideline for Wind Energy states that *where there are nearby receptors*, commercially available software can be used to model shadow flicker in order to identify the distance to which potential shadow flicker effects may extend.

Based on the above and the fact that the closest proposed sensitive receptor is located 3.5km from the Project; such impacts are considered irrelevant and no detailed shadow flicker modelling is required.

9.12.3 Potential Impacts from Trespassing of Unauthorised Personnel

Such impact is mainly related to public access of unauthorized personnel to the various Project components. Such access could result in safety issues such as unauthorized climbing of the turbine, safety hazards from substations (electric shock, thermal burn hazards, exposure to chemicals and hazardous materials, etc.), unauthorized climbing of the transmission tower and others.

Such impacts are considered of long-term duration throughout the Project operation phase, of a negative nature, and are expected to be of medium magnitude and high sensitivity given that it entails potential public safety concerns which in extreme cases they could entail permanent impacts (e.g. death or permanent disability). Given the above such an impact is considered of moderate significance.

Mitigation Measures

The following presents the mitigation measures that are to be implemented by the Wind Farm Project Operator during the operation phase of the Project and which include:

- A Security Risk Assessment should be developed for the Wind Farm Project and which takes into account the following:
  - Each turbine to be fitted with locked doors to prevent unauthorized access to the turbines;
  - Substation area to be completely fenced with concrete walls to prevent unauthorized access;
  - Onsite guards within the entire Project site at all times to ensure the safety and security of the Project as well as preventing unauthorized access to any of the Project components. However, it must be ensured that all onsite guards are adequately trained to deal with unauthorized trespassing incidents.
  - Present to the local communities the public safety hazards of the turbines and the various other Project components.
  - Post informative signs on the turbines and substation about public safety hazards and emergency contact information. Signs, especially warnings need to be pictorial as well as written to ensure they are understood by those unable to read

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to *not significant*.

Monitoring and Reporting Requirements

The following presents the mitigation measures that are to be implemented by the Wind Farm Project Operator during the operation phase of the Project and which include:

- Submission of Security Risk Assessment

9.12.4 Potential Impacts from Worker Influx during Construction

During construction the Project a relatively significant number of workers will be expected onsite (around 1,600 workers) for duration of approximately 28 months. However, as discussed earlier, at this point it is still unclear how many of these workers will be expatriates, Egyptians and/or from local communities and it is still unclear where accommodation of these works will take place.

Nevertheless, the influx of workforce to the area could result in certain community health, safety and security impacts which are discussed below.

Risk of Diseases

Influx of workers may introduce new reservoirs of diseases such as vector-related diseases, water-borne diseases, etc. In addition, there is also a risk of spreading communicable diseases, included sexually

transmitted ones. The risk of catching or exchanging communicable diseases (e.g., Virus B, Virus C, and HIV/AIDS) and the lack of awareness on transmission disease can represent a high risk to workers and community health and safety

Inappropriate Code of Conduct

Other risks from worker influx include inappropriate code of conduct by workers towards local communities which might result in hostilities and resentment. Such inappropriate conduct could include also disrespecting the traditional culture and social norms of the area and local communities.

Increase in Social Vices

Population influx could result in an increase of social vices including alcoholism, drug abuse, and other.

Such impacts are considered of short-term duration during the construction phase, of a negative nature, and are expected to be of medium magnitude and medium sensitivity. Given the above such an impact is considered of minor significance.

Mitigation Measures

The Wind Farm EPC Contractors are expected to prepare a worker influx plan to be implemented for the construction phase of the Project. The plan must take into account the following:

- Medical examination program. All workers must be subject to a preliminary medical examination before commencement of any job tasks in accordance with local applicable requirements. In addition, routine medical examination for workers (bi-annually) must be undertaken. Such medical examinations must be undertaken at certified centres. Copies of medical examination results of all workers must be retained onsite.
- Details and procedures for ensuring and maintaining hygienic conditions onsite at all times specifically related to toilet and washing facilities, eating areas, etc.
- Development of a code of conduct for workers which takes into account appropriate behaviour by workers at all times, religious customs, traditional cultures and social norms in the area. In addition, it must include specifically requirements for social vices including gender-based violence, sexual harassment, alcoholism, drug abuse, etc.
- Induction training and awareness raising sessions on risks associated to the most common contagious diseases (e.g. influenza virus), communicable diseases, general measures for hygiene, code of conduct expected to be implemented and other as appropriate.

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the Wind Farm EPC Contractors:

- Submission of the Worker Influx Plan

9.12.5 Potential Impacts from Security Personnel

Inappropriate management of security issues and incidents by security personnel towards local communities could result in resentment, distrust and escalation of events. Such impacts are considered of short-term duration during the construction phase and long-term duration during the Project operation phase, of a negative nature, and are expected to be of medium magnitude and medium sensitivity. Given the above such an impact is considered of minor significance.

Mitigation Measures

The Wind Farm EPC Contractors and Wind Farm Project Operator are expected to prepare a Security Management Plan to be implemented for the construction and operation phase of the Project.

The plan must identify appropriate measures for hiring, rules of conduct, training, equipping, and monitoring of security personnel to control and manage such issues. The plan must adhere to: (i) IFC PS 4 (Community Health, Safety and Security); (ii) EBRD PR 2 (Labour and Working Conditions); (iii) WB ESS 4 (Community Health and Safety), all of which identify requirements for security personnel. This includes in specific requirements to ensure security personnel are guided by the Voluntary Principles on Security and Human Rights in terms of hiring, rules of conduct, training, equipping and monitoring of such personnel. They also require reasonable inquiries that those providing security measures are not implicated in past abuses, will ensure they are trained adequately in the use of force (and firearms if applicable) and appropriate conduct towards the workers and the local community. Force should only be used when strictly necessary, and to an extent proportional to the threat.

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by the Wind Farm EPC Contractors and Wind Farm operator:

- Submission of the Security Management Plan

9.12.6 Potential Impacts from Blade and Tower Glint of Wind Turbines during Operation

Blade or tower glint occurs when the sun strikes a rotor blade or the tower at a particular orientation. This can impact a community, as the reflection of sunlight off the rotor blade may be angled toward nearby residences.

However, as discussed previously, there are no key sensitive receptors located within the surrounding area of the wind farm which could potentially be impacted by blade and tower glint. In addition, according to the IFC EHS Guidelines on Wind Energy (IFC, 2007), blade glint is a temporary phenomenon for new turbines only, and typically disappears when blades have been soiled after a few months of operation.

Taking all of the above into account, such impacts are considered of short-term duration as they will occur only temporary throughout the operation phase of the Project and of a negative nature. However, given that there are no sensitive receptors located within the surrounding areas and the only temporary occurrence (if occurring at all) such an impact is considered of low magnitude and low sensitivity. Given the above, such an impact is considered of not significant.

Mitigation Measures

The following presents the mitigation measures that are to be implemented by the Wind Farm Project Operator during the operation phase of the Project and which include:

- Consideration should be given to the use of non-reflective finishes to ensure potential impacts are not significant.

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to *not significant*

Monitoring and Reporting Requirements

The following presents the mitigation measures that are to be implemented by the Wind Farm Project Operator during the construction phase of the Project and which include:

- Inspections and visual monitoring to ensure that non-reflective finishes have been used.

9.12.7 Potential Impacts from Blade/Ice Throws from Turbines during Operation

There are potential impacts from blade throws and ice throws from the wind turbines, where if such incidents occur they could affect the public safety of nearby receptors.

According to the IFC EHS Guidelines on Wind Energy (IFC, 2015), a failure in the rotor blade can result in the 'throwing' of a rotor blade – however the overall risk of such an event is extremely low. In addition, if ice accretion occurs in blades, which can happen in certain weather conditions in cold climates, then pieces of ice can be thrown from the rotor during operation, or dropped if the turbine is idling. Ice throws are considered irrelevant given that in general the area does not experience any snow events.

The IFC EHS Guidelines on Wind Energy (IFC, 2015) states a setback distance should be applied between turbines and *populated locations*. The minimum setback distance is 1.5 x turbine height (tower + rotor radius), although modelling suggests that the theoretical blade throw distance can vary with the size, shape, weight, and speed of the blades, and the height of the turbine. Although the Guideline specifies such a setback distance from populated location (which are not applicable for the Project given that there are none), it is still important to consider such requirements for existing onsite facilities (such as the petroleum storage facilities).

Taking all of the above into account, such impacts are considered of long-term duration as they will occur throughout the operation phase of the Project and of a negative nature. However, given that there are no sensitive receptors located within the surrounding areas and given that the risk is extremely low such an impact is considered of low magnitude and low sensitivity. Given the above, such an impact is considered of not significant.

Additional Requirements

As noted earlier in "Section 9.3.1", formal communications must be established with the General Petroleum Company for a "Work Coordination Agreement". As part of such meetings, formal communication must also aim to discuss and determine any specific requirements to be taken into account for the established setback distances from existing onsite facilities (such as the petroleum storage facilities) which could be based on the IFC setback distance requirements.

9.13 Socio-Economics

This Section identifies the potential impacts in relation to socio-economic during the various Project phases. For each impact, a set of mitigation measures and monitoring requirements are identified.

Given the generic nature of the impacts on socio-economic development for both phases of the Wind Farm Project (construction and operation) those have been identified collectively throughout this section.

During the construction and operation phases of the Wind Farm, the Project is expected to create the following job opportunities:

- Around 1,600 job opportunities at peak during the construction phase for a duration of approximately 28 months. This will mainly include around 300 skilled job opportunities (to include engineers, technicians, consultants, surveyors, etc.) and 1,300 unskilled job opportunities (mainly laborers but will also include a number of security personnel).
- Around 40 job opportunities during the operation phase for a duration of 20 years. This will include skilled job opportunities (such as engineers, technicians, administrative employees, etc.) and unskilled job opportunities (such as security personnel, drivers, etc.).

However, the contractors and operators have not been selected at this stage, and therefore there are no details available on the number of job opportunities targeted to local communities, type of jobs, duration, etc. In addition to the above, the local communities could also be engaged in procurement opportunities along different segments of the value chain such as local contractors, local supply of equipment and machinery, cleaning services, etc.

Taking the above into account, the Developer is committed to ensuring that priority for job opportunities and procurement activities where relevant are targeted to the local communities. The above could also entail other indirect positive benefits to the local community from increase in demand for local services, supplies, and businesses. This could include for example possible engagements for supplies and service providers (accommodation services, food, etc.). Such demands could improve the existing local economic activities and impact certain sectors, such as wholesale/retail trade.

Taking all of the above into account, this to some extent could contribute to enhancing the living environment for its inhabitants. The creation of job and procurement opportunities in specific is of crucial importance especially since, as discussed earlier, the local community in general suffers from high unemployment and poverty rates.

However, it is understood that the socio-economic development of the area is not hinged on a single project but rather on implementing collective and coordinated actions, including other development projects and investment within the area.

Nevertheless, proper planning and local community engagement from the start is crucial to understand issues and opportunities which in turn would enable the Project build true sustainable links which will bring maximum benefits to the local communities. Given the above, such impacts are anticipated to be ***positive***.

Recommendations and Required Action

As the impacts discussed are mainly positive, no mitigation measures have been identified. This section provides recommendations which aim to enhance such positive impacts anticipated from the Project throughout the construction and operation phases to the greatest extent possible.

- Taking all of the above into account, it is important for the Developer to adopt different plans and measures to implement initiatives that would contribute to enhancing the living environment of the local communities, elevate their standards of living, and bring social and economic prosperity.

- Due to the high unemployment levels in the area, it is important to prioritise employment in the new planned governmental and private sector investment projects from the community. This shall be reflected in the EPC Contract and subsequent subcontracts. This could be implemented through a joint collaboration between the Developer/EPC Contractors and the other wind farm developers in the area.
- The project development shall entail some indirect positive benefits to the local community from the increase in demand for local services, supplies, and businesses. This could include for example possible engagements from local contractors or local community, as well as other supplies and services (accommodation services, food, household products, etc.). Such demands could improve the existing local economic activities and impact certain sectors, such as construction, wholesale/retail trade, and accommodations, etc.
- The above should be clearly outlined as prerequisites from the contractors and service providers commissioned for development projects in the area. The Developer shall ensure implementation of such measures by clearly stipulating such conditions in the contracts.
- Therefore, it is recommended that the Developer adopt and implement a Community Integration Plan (CIP) for working with the local community members. The Plan must aim to support the local economy stating its aims and objectives and should acknowledge the importance of building a strong socio-economic relationship with the local community through a participatory planning program even before the development is in place. The Plan must include the key requirements identified below.
  - Project Updates Procedure: the procedure should aim to ensure timely and continuous communication and dissemination of information with the local community through appropriate local platforms – this could include for example timely consultation and information disclosure with the related stakeholders, informed participation and have open communication channels with the related stakeholders, a copy of the NTS and SEP in English and in Arabic shall be distributed to the related stakeholders, etc.

    The objective is to: (i) alleviate potential sense of social marginalisation, (ii) improve their understanding and perception of the benefits associated with development, and (iii) manage expectations related to opportunities from the Project and clearly identify commitments by developers related to social development.
  - Local Recruitment Procedure: the procedure must identify the number of job opportunities targeted for local communities to include skilled and unskilled workers. Such job opportunities shall also take into account employment of local communities in the area around the project to include fresh graduate engineers, technicians, labourers, etc.

    In addition, the procedure must include details on how job opportunities will be announced as well as a selection process that is fair and transparent and provides equal opportunities for all including females.
  - Local Procurement Procedure: the procedure must identify the procurement opportunities targeted for local communities to include for example local subcontractors, local supplies and services, cleaning services, etc. In addition, the procedure must include details on how procurement opportunities will be announced as well as a selection process that is fair and transparent and provides equal opportunities for all.
  - Social Responsibility Program: it is recommended that the Developer implement a social responsibility program which aims to benefit the local communities to the greatest extent possible. In this case, a structured approach must be developed which must identify priority development projects which could benefit local communities (e.g. based on a needs assessment if available). Based on that the social responsibility program can prioritise projects for local communities based on available budget, company vision, timeline for implementation as well as other factors.

9.14 Summary of Anticipated Impacts

The tables below present a summary of the anticipated impacts during the planning and construction, operation, and decommissioning phase of the Project. The information in the tables includes:

- Key and generic environmental attributes (e.g. air quality, noise);
- Impact (textual description);
- Nature of impact (negative or positive);
- Duration (long-term or short-term);
- Reversibility (reversible or irreversible);
- Magnitude (high, medium, or low);
- Sensitivity (high, medium, or low);
- Significance (major, moderate, minor, or not significant);
- Management action – generally management actions describe whether an impact can be mitigated or not. Management actions include: (i) mitigation measures; (ii) compensation measures; (iii) additional requirements which must be implemented at a later stage and which could be required by a governmental entity; (iv) for positive impacts recommendations have been provided which aim to enhance the impact; and
- Residual significance after management actions are implemented (major, moderate, minor, or not significant).

Table 9-4: Summary of Anticipated Impacts during Planning and Construction (Consultant, 2019)

Attribute / Issue	Likely Impact – Planning and Construction Phase	Impact Assessment							
		Nature	Duration	Reversibility	Magnitude	Sensitivity	Significance	Management Action	Residual Significance
Landscape and Visual	Visual and landscape impacts due to presence of elements typical of a construction site such as equipment and machinery.	Negative	Short – Term	Reversible	Medium	Low	Minor	Mitigation Available	Not Significant
Land Use	Project could conflict the formal assigned land sues set by the various governmental entities.	There are no anticipated impacts.						No additional requirements	Not relevant
	There are several land uses onsite which if improperly managed could result in potential conflicts and disputes. This includes the Ghafra system of the Bedouin groups and existing petroleum storage facility and an oil rig of the General Petroleum Company.	Negative	Long – Term	Reversible	Medium	High	Moderate	Mitigation Available	Not Significant
Geology, Hydrology and hydrogeology	Potential for flood risks on the Project area.	There are no anticipated impacts.						No additional requirements	Not relevant
	Risk of soil and groundwater contamination during the various construction activities from improper housekeeping activities, spillage of hazardous material, random discharge of waste and wastewater.	Negative	Long – Term	Could be irreversible	Medium	Low	Minor	Mitigation available	Not Significant
Biodiversity	Improper management of construction activities could disturb/damage habitats and fauna.	Negative	Long – Term	Could be irreversible	Medium	Low	Minor	Mitigation Available/ Additional Studies	Not Significant
Avi-Fauna (Birds)	Improper management of construction activities could disturb breeding birds and damage relevant habitats	Negative	Short – Term	Could be irreversible	Low	Medium	Minor	Mitigation Available/ Additional Studies	Not Significant
Bats	Improper management of construction activities could damage habitats and disturb species.	Negative	Long – Term	Could be irreversible	Low	Low	Not Significant	No Mitigation Required	Not Significant
Archaeology	Improper management of construction activities could disturb/damage archaeological remains which could be buried in the ground (if any).	Negative	Short – Term	Could be irreversible	Medium	Low	Minor	Mitigation Available	Not Significant
Air Quality and Noise	Construction activities will likely result in an increased level of dust, particulate matter and pollutant emissions which in turn will directly impact ambient air quality.	Negative	Short - Term	Reversible	Medium	Low	Minor	Mitigation Available	Not Significant
	Possible noise emissions to the environment from the construction activities which will likely include the use of	Negative	Short - Term	Reversible	Medium	Low	Minor	Mitigation Available	Not Significant

	machinery and equipment such as generators, hammers, and compressors and other activities								
Infrastructure and Utilities	Road Networks – if transportation activities of the various project components to the site are not properly managed beforehand, they could entail risk of damage to the existing roads and could be of public safety concerns to other users on the road. In addition, if planning activities are not well managed it could damage/disturb existing onsite road networks.	Negative	Short - Term	Reversible	High	Medium	Moderate	Mitigation Available	Not Significant
	Electricity network – if planning activities are not well managed onsite it could damage/disturb existing onsite electricity network and pylons.	Negative	Short – Term	Reversible	High	Medium	Moderate	Mitigation Available	Not Significant
	Water Resources – water requirements of the Project could entail constraints on the existing resources and users.	Negative	Short - Term	Reversible	Low	Low	Not significant	Additional Requirements	Not Significant
	Waste Utilities – it is important to ensure that existing utilities would be able to handle the amount of waste, wastewater and hazardous generated from the Project during the construction phase.	Negative	Short - Term	Reversible	Low	Low	Not significant	Additional Requirements	Not Significant
	Aviation, Telecommunication, and TV & Radio Links – Improper planning and site selection of the Project could impact aircraft safety and/or could potentially interfere with certain electromagnetic transmissions associated with air transport, telecommunications, and radio/television systems in the area.	Negative	Long-Term	Reversible	Low	High	Minor	Additional Requirements	Not Significant
Occupational Health and Safety	There will be some generic risks to workers health and safety from working on construction sites, as it increases the risk of injury or death due to accidents.	Negative	Short – Term	Could be Irreversible	Medium	Medium	Minor	Mitigation Available	Not Significant
Public Health and Safety	Public access of unauthorized personnel to the various Project components (turbines, substation) could results in various public safety hazards.	Negative	Long – term	Could be Irreversible	Medium	High	Moderate	Mitigation Available	Not Significant
	Worker influx could result in certain community health, safety and security impacts to include risk of diseases, inappropriate code of conduct by workers towards locals, increase in social vices, etc.	Negative	Short-term	Reversible	Medium	Medium	Minor	Mitigation Available	Not Significant
	Inappropriate conduct of security personnel towards local communities could result in resentment, distrust and escalation of events	Negative	Short-term	Reversible	Medium	Medium	Minor	Mitigation Available	Not Significant
Socio-economic Development	The Project is expected at a minimum to provide job opportunities for local communities. This, to some extent,	Positive	Not applicable.						

	could contribute to enhancing the living environment for its inhabitants, elevate their standards of living, and bring social and economic prosperity to local communities.		

Table 9-5: Summary of Anticipated Impacts during Operation (Consultant, 2019)

Attribute / Issue	Likely Impact – Operation Phase	Impact Assessment							
		Nature	Duration	Reversibility	Magnitude	Sensitivity	Significance	Management Action	Residual Significance
Landscape and Visual	Visual impacts concern the turbines themselves (e.g. colour, height, and number of turbines) relating to their interaction with the character of the surrounding landscape.	Could be Negative or Positive	Long – Term	Reversible	Medium	Low	Minor	No mitigation required	Minor
Geology, Hydrology and Hydrogeology	Risk of soil and groundwater contamination during the various operational activities from improper housekeeping activities, spillage of hazardous material, random discharge of waste and wastewater.	Negative	Long – Term	Could be irreversible	Medium	Low	Minor	Mitigation available	Not significant
Biodiversity	Improper management of operation activities could disturb/damage habitats and fauna.	Negative	Long – Term	Could be irreversible	Medium	Low	Minor	Mitigation Available	Not Significant
Avi-Fauna (Birds)	Wind turbines are associated with impacts on birds from risks of strikes and collision on both migratory and resident soaring birds. Such impacts depend on several factors but could affect the population levels of certain species especially those with international/national critical conservation status.	Negative	Long – Term	Could be irreversible	Low – High	Medium	Moderate	Mitigation Available	Not Significant
Bats	The potential impacts from the Project during operation are mainly related to risk of bat strikes and collisions with rotors of the operating wind turbines.	Negative	Long – Term	Could be irreversible	Low	Low	Not Significant	Mitigation Available / Additional Studies	Not Significant
Infrastructure and Utilities	Water Resources – water requirements of the Project could entail constraints on the existing resources and users.	Negative	Short - Term	Reversible	Low	Low	Not significant	Additional Requirements	Not Significant
	Waste Utilities – it is important to ensure that existing utilities would be able to handle the amount of waste, wastewater and hazardous generated from the Project during the construction phase.	Negative	Long – Term	Reversible	Low	Low	Not significant	Additional Requirements	Not Significant
Occupational Health and Safety	There will be some risks to workers health and safety during the operation and maintenance activities of the Project.	Negative	Long – Term	Could be irreversible	Medium	Medium	Minor	Mitigation Available	Not Significant

Public Health and Safety	Operating wind turbines will produce noise from mechanical and aerodynamic effects. This could be a source of disturbance and nuisance to the receptors and could create a disturbing indoor environment.	There are no anticipated impacts.						No additional requirements	Not relevant
	Operating wind turbines will produce shadow flicker which could be a source of disturbance and nuisance to the receptors and could create a disturbing indoor environment.	There are no anticipated impacts.						No additional requirements.	Not relevant
	Public access of unauthorized personnel to the various Project components (turbines, substation) could results in various public safety hazards.	Negative	Long – term	Could be Irreversible	Medium	High	Moderate	Mitigation Available	Not Significant
	Inappropriate conduct of security personnel towards local communities could result in resentment, distrust and escalation of events	Negative	Short-term	Reversible	Medium	Medium	Minor	Mitigation Available	Not Significant
	Blade or tower glint can impact sensitive receptors as the reflection of sunlight off the rotor blade may be angled toward nearby receptors.	Negative	Short – Term	Reversible	Low	Low	Not Significant	Mitigation available	Not Significant
	Failure in rotor blade can result in the 'throwing' of the blade. Although overall risk of such events is extremely low, it could affect the public safety of nearby receptors.	Negative	Long – term	Could be Irreversible	Low	High	Minor	Mitigation Available	Not Significant
Socio-economic Development	The Project is expected at a minimum to provide job opportunities for local communities. This, to some extent, could contribute to enhancing the living environment for its inhabitants, elevate their standards of living, and bring social and economic prosperity to local communities.	Positive	Not applicable						

9.15 Assessment of Cumulative Impacts

As discussed earlier, currently an area of around 284km^2 in the GoS is being developed for multiple wind farm projects (in which the Project site is located). A Strategic and Cumulative Environmental and Social Assessment (SESA) was undertaken for the 284km^2 area. One of the objectives of the SESA was to investigate the cumulative impacts of the wind farm developments and identify constraints to be taken into account by the various developers.

This section provides an assessment of cumulative impacts mainly based on the outcomes of the SESA. The table below provides the key outcomes of the SESA for each attribute, key outcomes of the project-specific ESIA and key additional requirements to be considered.

Table 9-6: Assessment of Cumulative Impacts (Consultant, 2019)

E&S Attributes	Outcomes of SESA	Outcomes of Project Specific ESIA	Additional Requirements
Landscape and Visual	Key outcome of SESA is related to visibility of the turbines during operation. SESA concludes that due to absence of people living in the area where visual impacts are relevant and given that the key receptors to be impacted include several petroleum facilities and passengers on main highways such issues are not considered key. No additional requirements have been identified in the SESA.	Key impact is related to visibility of the turbines during operation. No key issues of concern given that no key sensitive visual receptors which could be impacted from the Project during operation were identified.	Site-specific mitigation and monitoring requirement. Refer to "Section 9.2"
Land Use	Key outcome is that SESA area is uninhabited and unutilized; therefore there are no land use impacts related to physical or economical displacement. No additional requirements have been identified in the SESA.	Key outcome is that in general Project site is uninhabited and vacant and does not include any physical or economical land use activities. Within the site there is only a petroleum storage facility and an oil rig. In addition, Bedouin Groups in general implement the Ghafra system in such land areas to include the Project site.	Site-specific mitigation and monitoring requirement. Refer to "9.3".
Geology, Hydrology, Hydrogeology	Key outcome of SESA is recommendation to avoid placing turbines within the beds of large wadi systems where there could be flood risks. In addition, if infrastructure and utility elements for wind farm developers are required within such areas (e.g. roads) then appropriate engineering measures are required (e.g. culverts). SESA requires project-specific ESIA's to investigate flood risks further. In addition, SESA identifies routine measures for waste management during construction and operation.	No key site-specific issues of concern noted and based on preliminary assessment, there are no flood risks anticipated at the Project site. There are routine impacts during construction and operation from improper waste management.	Site-specific mitigation and monitoring requirement for waste management. Refer to "Section 9.4"
Biodiversity	No major issues identified by SESA since the habitats of the area are considered to be of low or no importance. However, it is required to investigate at specific project locations avoidance of wadis for turbine erection to avoid direct damage to plants and habitats. Fauna could be affected by construction activities but are not believed to be impacted during the operations of the wind farms.	No floral species were identified at the project site to be of high concern. Faunal species, including three mammal species and one reptiles require consideration since literature has shown that the project site is located in their distribution range.	Spring 2020 biodiversity survey will be undertaken by Consultant to verify findings of literature review

Birds (avi-fauna)	Significant considerations were provided with the SESA regarding impacts on avifauna, specifically during spring migration season while autumn migration was considered to be of low significance since species recorded were of least concern and were relatively low.	The autumn survey is generally in line with the SESA as the numbers of birds recorded were moderate with the highest numbers being for species of low concern.	Site-specific mitigation and monitoring requirements, including in-flight monitoring during spring and autumn 2020 and spring 2021. Refer to "Section 9.6"
Bats	Bats were not considered specifically by the SESA	The Literature review has shown that there are some species that could be of high vulnerability to collision with wind power infrastructures	Mobile detection survey to be carried out in spring-summer 2020 to verify findings of the literature review. Refer to "Section 9.7"
Archaeology and Cultural Heritage	There are no archaeological and cultural heritage sites within the SESA studied area. No additional requirements have been identified for site-specific ESIA's or for developers.	There are no site-specific archaeology or cultural heritage remains. Therefore, there are no anticipated impacts during construction and operation. There is routine chance find impacts related to the construction phase.	Site-specific mitigation and monitoring requirement. Refer to "Section 9.8"
Air Quality and Noise	Key outcome is that there are no key issues of concern identified within SESA studied area due to absence of sensitive receptors which could be affected by air quality and dust during construction phase. SESA identified routine air quality and noise mitigation measures for construction phase. *Note: impacts from noise during operation of turbines are assessed as part of the public health and safety section below.*	No key issues of concern identified. Routine impacts on air quality and noise from construction activities on several receptors. *Note: impacts from noise during operation of turbines are assessed as part of the public health and safety section below.*	Site-specific mitigation and monitoring requirement. Refer to "Section 9.9".
Infrastructure and Utilities	No key issues of concern identified. Several infrastructure and utility elements were noted within the SESA studied area to include roads, electricity lines, oil exploitation facilities, and other. SESA concludes there are no impacts on such infrastructure and utility elements and SESA does not identify any additional requirements.	No key issues of concern identified. Several site-specific infrastructure and utility elements were noted within the area to include a petroleum storage facility, oil rig, roads, telecommunication tower, electricity network, and other which could be impacted during the construction and operation phase if improperly managed.	Site-specific mitigation and monitoring requirement. Refer to "Section 9.10".
Occupational Health and Safety	No key issues of concern are noted. There are routine impacts during construction and operation on occupational health and safety and SESA identifies additional route measures to control such impacts.	No key issues of concern are noted. There are routine impacts during construction and operation on occupational health and safety.	Site-specific mitigation and monitoring requirement. Refer to "Section 9.11".
Public Health and Safety	Key issues include noise and shadow flicker. SESA concludes that due to large distance from any nearby settlement, there are no impacts related to noise and shadow flicker during operation of turbines. No additional requirements are identified in the SESA	Key issues include noise and shadow flicker during operation of turbines. Site specific assessment indicates that there are no anticipated impacts on nearby sensitive receptors. However, as part of the site-specific ESIA, a cumulative noise model was undertaken which takes into account the closest wind farm to the Project site. Results are discussed in further details below. In addition, it is important to note that there are no cumulative impacts in	Site-specific mitigation and monitoring requirement for other public health and safety concerns. Refer to "Section 9.12".

		relation to shadow flicker given that project impacts are limited to 1200m where no sensitive receptors are located within such areas.	
Socio-economics	Impacts anticipated are positive in nature.	Impacts anticipated are positive in nature.	Project specific recommendations to enhance positive impacts have been provided. Refer to "Section 9.13".

Cumulative Noise Assessment

Similar to the noise screening assessment undertaken in "Section 9.12.1", a similar methodology and analysis was undertaken taking into account the nearby wind farm developments for a cumulative screening assessment.

Based on information reviewed by the SESA and as provided by RCREEE, there are two existing wind farms present in the surrounding area of the proposed project location. This includes the Lekela Wind Farm and the RGWE Wind Farm with respect to the Proposed Wind Farm. The Lekela Wind Farm consists of 87 wind turbine generators, each of which houses a Gamesa SG 2.9-114 IA turbine. The nearest wind turbine in the Lekela Wind Farm to the Air Force Defence Unit is located approximately 3km away. Due to the proximity to the proposed wind farm location, this wind farm will be included in the noise modelling assessment.

The RGWE Wind Farm consists of 125 wind turbine generators, each of which houses a G97- 2.1MW MaxPower wind turbine. The nearest wind turbine in the RGWE farm to the Air Force Defence Unit It is located approximately 44km away. Due to the large distance from the RGWE to the proposed NSR, it is anticipated that noise levels from this wind farm will not increase background noise levels at proposed NSR location.

A noise contour map for the worst-case noise scenario has been calculated and is presented in the figure below. Based on the results of the noise contour map and the identification of the potential NSR (i.e. Air Force Defence Unit), the contribution noise levels at the NSR for the designated worst-case scenario for a W10 of 10 m/s from a cumulative perspective is calculated at 38.6 dB(A). Therefore, the results show that under these conditions, the Air Force Defence Unit will exceed the prescribed noise limit of 35 dB(A) required in the IFC Wind Energy EHS Guideline.

However, as discussed earlier in "Section 9.12.1", the Air Force Defence Unit can be declassified as an NSR. Occupancy details on the Air Force Defence Unit were requested but could not be obtained. Nevertheless, in general, such a receptor is unlikely to be classified as an NSR given that based on observations it includes offices, training grounds, radar system, mosque and barracks for soldiers. Such a barracks is likely to include sleeping arrangements for soldiers whom are likely there on a rotational basis and it is unlikely to include any permanent residences living there.

Taking the above into account, such impacts are considered irrelevant and no detailed noise assessment is required.

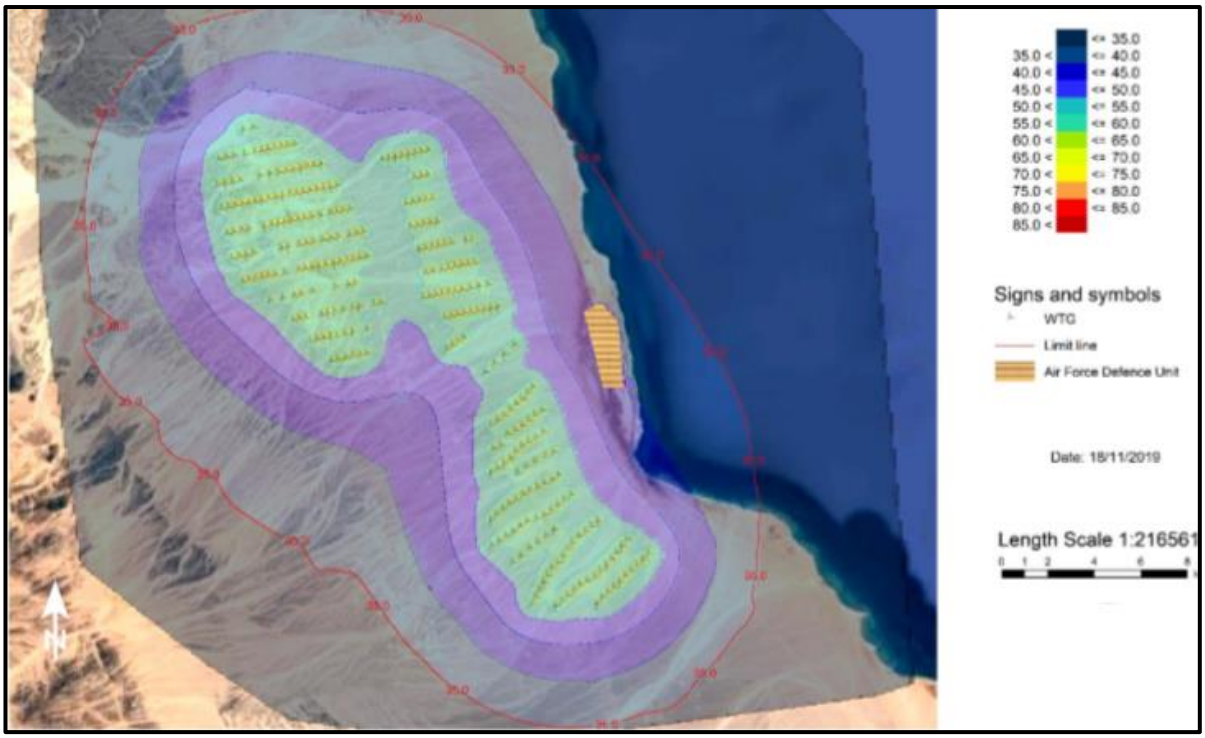

Figure 9-12: Noise Contour Maps for Cumulative Assessment (Consultant, 2019)

10 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

10.1 Institutional Framework and Procedure Arrangements for ESMP Implementation

Generally, two main pillars govern the successful implementation of any Environmental and Social Mitigation and Monitoring Plan (ESMP) as well as the Environmental, Social, Health and Safety Management System (ESHS-MS) for the project that will be developed at a later stage (as discussed in further details in below). These pillars include:

1. Proper identification of roles and responsibilities for the entities involved; and

2. Effective control of the process.

All management practices are interlinked, and this section describes how these two pillar criteria could be fulfilled, which in turn helps ensure that the overall objectives are met.

Staffing Requirements

Defining roles and responsibilities of the involved entities identifies where and when each entity should be engaged, their degree of involvement, and the tasks expected of the entity. This in turn eliminates any overlap of jurisdiction or authority and ensures proper communication and effective management of ESMP and ESHS-MS components.

The table below identifies the staffing requirements that are expected for the Project. This should be expanded further in the Environment, Health, and safety (EHS) Manual that is required as part of the ESHS-MS (as discussed in further details below). This should include an organisational structure that identifies the lines of authority and roles and responsibilities of all involved entities.

Table 10-1: Roles and Responsibilities of Entities Involved in ESMP (Consultant, 2019)

Project Role	Entity	Responsibilities	Staffing Requirements
Project Owner and Developer	Red Sea Wind Energy	▪ Selection of EPC Contractors and Project Operator; ▪ Implement mitigation and monitoring requirements as applicable for such entity as detailed in the ESMMP; and ▪ Ensure overall compliance of EPC Contractors and Project Operator with the requirements of the ESMMP and ESHS MS.	Appoint competent HSE Manager or as part of Third-Party Employer representative (e.g. Owner's Engineer)
Wind Farm EPC Contractors	Orascom Construction, Siemens Gamesa Renewable Energy	▪ Appoint a competent HSE team. ▪ Implement mitigation and monitoring requirements as detailed in the ESMMP and ESHS MS requirements;	For Project nature and duration, this is expected to include at a minimum full-time and onsite HSE Manager and 5 HSE officers.
Wind Farm Operator	Red Sea Wind Energy	▪ Appoint a competent HSE team. ▪ Implement mitigation and monitoring requirements as detailed in the ESMMP and ESHS MS requirements;	For Project nature and duration, this is expected to include HSE Manager (which is not required to be full-time or onsite at all times)
EEAA	Granting environmental clearance to the Project	▪ Undertake compliance monitoring	N/A

Training and Awareness

An EHS training plan must be developed and maintained onsite which identifies the type of training that is required for each worker onsite. In addition, signed attendance sheets and training material must be

maintained onsite at all times. This should be completed by the Wind farm EPC Contractors and Wind Farm Operator as applicable.

Training should include the following as applicable and as highlighted in the table that follows.

- Basic visitor HSE induction training
- Worker HSE induction training for all workers onsite to include for example EPC Contractors and subcontractor crew
- Emergency response training for all workers onsite to include for example EPC Contractors and subcontractor crew
- Specialized training: there are other specific training requirements that must be adhered to and which are related to specific topics as applicable. This includes for example specific training for Occupational Health and Safety (OHS) issues such as working at height, electrical works, etc.
- Tool Box Talks (TBT): regular TBT meetings must be undertaken with for example EPC Contractors respective crews and subcontractor crew. Topics and frequency are developed and distributed regularly.

Table 10-2: Project Training Requirements (Consultant, 2019)

Training	Wind Farm EPC Contractor	Wind Farm Operator
Basic visitor HSE induction training	✓	✓
Worker HSE induction training	✓	✓
Emergency response training	✓	✓
Specialized training	✓	✓
Tool Box Talks (TBT)	✓	✓

Inspection and Monitoring

EHS inspection and monitoring must be undertaken to ensure compliance of involved entities with the mitigation and monitoring requirements as detailed in the ESMP and ESHS-MS requirements. This should be completed by the Developer, Wind farm EPC Contractors, and Wind Farm Operator as applicable.

Inspection and monitoring should include the following as applicable and as highlighted in the table that follows.

- Daily HSE inspection and monitoring at the site and preparation of a daily observation report stating therein the corrective measures on observed safety deficiencies, unsafe acts and conditions.
- Weekly site inspections to be carried out using the weekly site inspection checklists template based on requirements of the ESMP and EHSS-MS
- HSE Audits to be undertaken by Developer on EPC Contractors to ensure compliance with ESMP requirement and EHSS-MS. HSE audits should be undertaken monthly during the construction phase and quarterly during the operation phase

Table 10-3: Project Inspection and Monitoring Requirements (Consultant, 2019)

Inspection and Monitoring	Developer	Wind Farm EPC Contractors	Wind Farm Operator
Daily HSE Inspection and Monitoring		✓	
Weekly Site Inspections		✓	✓
HSE Audits	✓		

Meetings

Regular EHS meeting must be undertaken to discuss EHS performance onsite, outstanding issues, key issues of concern and other as applicable. Signed attendance sheets and Minutes of Meeting (MoM) must be

maintained onsite at all times. This should be completed by the Developer, Wind farm EPC Contractors, and Wind Farm Operator as applicable.

Meetings should include the following as applicable and as highlighted in the table that follows.

- Weekly HSE meetings
- Monthly HSE meeting
- Quarterly management HSE reviews

Table 10-4: Project Meeting Requirements (Consultant, 2019)

Meetings	Developer	Wind Farm EPC Contractors	Wind Farm Operator
Weekly HSE Meetings		✓	
Monthly HSE Meeting	✓	✓	
Quarterly Management HSE reviews	✓	✓	✓

Reporting

HSE reporting will be required to summarize the following:

- Progress in implementing the ESMMP and EHSS MS plans as required
- Findings of the monitoring programs, with emphasis on any breaches of the control standards, action levels or standards of general site management
- Outstanding incident report forms
- Relevant changes or possible changes in legislation, regulations and international practices
- Reporting on Key Performance Indicators (KPI).

Reporting should be submitted to the Developer as applicable by the relevant entities as identified below.

Table 10-5: Project Reporting Requirements (Consultant, 2019)

Reporting	Wind Farm EPC Contractors	Wind Farm Operator
Reporting	Monthly	Semi-annually

10.2 Environmental, Health, Safety and Social Management System (EHSS-MS)

The ESIA is considered a key document in assessing and managing environmental and social risks related to the Project. The key output of the ESIA is the ESMP which aims to provide high level mitigations and requirements for managing the environmental and social risks anticipated from the Project.

Throughout the Project's construction and operation phase an Environmental, Health, Safety and Social Management System (EHSS-MS) must be implemented by all relevant parties (i.e. Developer, EPC Contractors and Project Operator). The EHSS-MS must be project and site specific and must build on and take into account the requirements of the ESMP. The development and implementation of an EHSS-MS is considered a key requirement under IFC PS1, in addition the EHSS-MS must also be in line with the IFC PSs.

Summarised below is the overall framework, structure and key requirements for the EHSS-MS for the key entities involved in the Project.

Developer

- HSE Manual that should include: (i) HSE Policy; (ii) Human Resources Policy and Procedures; (iii) HSE Organisational Structure and Responsibilities; and (iv) HSE Training, Monitoring and Reporting Plan
- Community Integration Plan (which includes local recruitment and procurement procedures)

- Stakeholder Engagement Plan and Community Grievance Mechanism

Wind Farm EPC Contractors

- HSE Manual (in line with Developer) that should include: (i) HSE Policy; (ii) Human Resources Policy and Procedures; (iii) HSE Organizational Structure and Responsibilities; (iv) HSE Training, Monitoring and Reporting Plan
- Water Management Plan
- Waste Management Plan
- Air Quality and Noise Management Plan
- Traffic and Transport Plan
- Worker Accommodation Plan
- Worker Influx Plan
- Occupational Health and Safety Plan
- Emergency Preparedness and Response Plan
- Security Management Plan
- Chance Find Procedures
- Worker Grievance Mechanism

Wind Farm Operator

- HSE Manual (in line with Developer) that should include: (i) HSE Policy; (ii) Human Resources Policy and Procedures; (iii) HSE Organizational Structure and Responsibilities; (iv) HSE Training, Monitoring and Reporting Plan
- Water Management Plan
- Waste Management Plan
- Occupational Health and Safety Plan
- Emergency Preparedness and Response Plan
- Security Management Plan

10.3 Compilation of Environmental and Social Management Plan (ESMP)

The tables below present the ESMP for the: (i) planning and construction, and (ii) operation phase respectively and which include the following:

- The environmental attribute (e.g. air quality) that is likely to be impacted;
- A summary of the potential impact and/or likely issue;
- The identified management measures that aim to eliminate and/or reduce the potential impact to acceptable levels. Management measures include mitigation actions, further requirements, additional studies, etc.;

- Monitoring actions to ensure that the identified mitigation measures are implemented. Monitoring actions include: inspections, review of reports/plans, reporting, etc.;
- The frequency for implementing the monitoring actions, which include: once, continuously throughout the construction/operation period (depending on the mitigation measure identified this could include daily, weekly, or monthly), or upon occurrence of a certain issue;
- Parameters and location of monitoring actions as identified and applicable; and
- Responsible entity for implementing the mitigation measures and monitoring actions identified; and

Table 10-6: ESMP for the Planning and Construction Phase (Consultant, 2019)

Environmental Attribute	Potential Impact	Management Action (mitigations, additional requirements, additional studies, compensation measures, etc.)	Type of Action	Monitoring Action	Parameters to be monitored / location	Frequency	Responsible Entity
Landscape and Visual	Visual and landscape impacts due to presence of elements typical of a construction site such as equipment and machinery.	Ensure proper general housekeeping and personnel management measures are implemented which could include: (i) ensure the construction site is left in an orderly state at the end of each work day; (ii) to the greatest extent possible construction machinery, equipment, and vehicles that are not in use should be removed in a timely manner and kept in locations to reduce visual impacts to the area.	Mitigation	Visual inspections	At construction active areas	Daily / Weekly	Wind Farm EPC Contractors
Land Use	There are several informal land uses onsite which if improperly managed could result in potential conflicts and disputes. This includes the Ghafra system of the Bedouin groups and existing petroleum storage facility and an oil rig of the General Petroleum Company.	Establish coordination with the Bedouin Groups for inclusion and engagement in employment and procurement opportunities	Additional requirement	Submit agreement with Bedouin groups	Not applicable	Once before commencement of construction	Developer
		Establish coordination via NREA/EETC with the relevant entity on the Project specific level to: (i) agree on final requirements to be taken into account as part of the detailed design based on the "Work Coordination Agreement" with NREA; (ii) provide detailed design to include turbine locations, cables, roads, etc; (iii) further identify access to land requirements, conditions and communication protocol for the Project; (iv) demonstrate safety compliance of all Project components based on excepted activities that could be undertaken by the General Petroleum Company (e.g. drilling and survey activities), and (v) any other issues as applicable.	Additional requirement	Submit formal communication letter (or similar) with relevant entity	Not applicable	Once before commencement of construction	Developer
Geology, Hydrology and hydrogeology	Solid waste management	Coordinate with Ras Gharib City Council for the collection of solid waste from the site to the municipal approved dumpsite (the closest dumpsite being Ras Gharib Public Dumpsite)	Mitigation	Submit contract	Not applicable	Once before commencement of construction	Wind Farm EPC Contractors
		Prohibit fly-dumping of any solid waste to the land	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Distribute appropriate number of properly contained litter bins and containers properly marked as "Municipal Waste	Mitigation	Visual inspections	At construction active areas	Once before commencement of construction	
		Distribute a sufficient number of properly contained containers clearly marked as "Construction Waste" for the dumping and disposal of construction waste	Mitigation	Visual inspections	At construction active areas	Once before commencement of construction	
		Implement proper housekeeping practices on the construction site at all times	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Maintain records and manifests that indicate volume of waste generated onsite, collected by contractor, and disposed of at the landfill	Mitigation	Submit manifests	Not applicable	Throughout construction period	
	Wastewater management	Coordinate with Ras Gharib Water Company to hire a private contractor for the collection of wastewater from the site to the closest WWTP	Mitigation	Submit contract	Not applicable	Once before commencement of construction	Wind Farm EPC Contractors
		Prohibit illegal disposal of wastewater to the land	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Ensure that constructed septic tanks during construction and those to be used during operation are well contained and impermeable to prevent leakage of wastewater into soil	Mitigation	Visual inspections	At applicable area	Once before commencement of construction	
		Ensure that septic tanks are emptied and collected by wastewater contractor at appropriate intervals to avoid overflowing	Mitigation	Visual inspection	At applicable area	Daily/weekly	
		Maintain records and manifests that indicate volume of wastewater generated onsite, collected by contractor, and disposed of at the WWTP	Mitigation	Submit manifests	Not applicable	Throughout construction period	
	Hazardous Waste Management	Hire approved private contractor for the collection of hazardous waste from the site to the approved hazardous waste disposal facilities	Mitigation	Submit contract	Not applicable	Once before commencement of construction	Wind Farm EPC Contractors
		Ensure that hazardous waste is disposed in a dedicated area that is enclosed, of hard surface, with proper signage and suitable containers as per hazardous waste classifications and that they are labelled for each type of hazardous waste	Mitigation	Visual inspections	At applicable area	Once before commencement of construction	
		Ensure hazardous waste storage area is equipped with spill kit, fire extinguisher and anti-spillage trays and a hazardous waste inventory is available	Mitigation	Visual inspections	At applicable area	Daily / weekly	
		Prohibit illegal disposal of hazardous waste to the land	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Possibly contaminated water (e.g. runoff from paved areas) must be drained into appropriate facilities (such as sumps and pits). Contaminated drainage must be orderly disposed of as hazardous waste	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Ensure that containers are emptied and collected by the contractor at appropriate intervals to prevent overflowing	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Maintain records and manifests that indicate volume of hazardous waste generated onsite, collected by contractor, and disposed of at the hazardous waste disposal facilities	Mitigation	Submit manifests	Not applicable	Throughout construction period	

Environmental Attribute	Potential Impact	Management Action (mitigations, additional requirements, additional studies, compensation measures, etc.)	Type of Action	Monitoring Action	Parameters to be monitored / location	Frequency	Responsible Entity
	Hazardous material management	Ensure that hazardous materials are stored in an area that is of hard impermeable surface, flame-proof, accessible to authorized personnel only, locked when not in use, and prevents incompatible materials from coming in contact with one another	Mitigation	Visual inspections	At applicable area	Once before commencement of construction	Wind Farm EPC Contractors
		Maintain a register of all hazardous materials used and accompanying MSDS must present at all times. Spilled material should be tracked and accounted for	Mitigation	Visual inspections	At applicable area	Daily / weekly	
		Incorporate dripping pans at machinery, equipment, and areas that are prone to contamination by leakage of hazardous materials (such as oil, fuel, etc.)	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Maintenance activities and other activities that pose a risk for hazardous material spillage (such as refueling) must take place at a suitable location (hard surface) with appropriate measures for trapping spilled material	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Ensure that a minimum of 1,000 litters of general-purpose spill absorbent is available at hazardous material storage facility.	Mitigation	Visual inspections	At applicable area	Daily / weekly	
		If spillage on soil occurs, spill must be immediately contained, cleaned-up, and contaminated soil disposed as hazardous waste	Mitigation	Visual inspection	At applicable area	Upon occurrence	
	Erosion and runoff management	Avoid executing excavation works under aggressive weather conditions	Mitigation	Visual inspections	At construction active areas	Upon occurrence	Wind Farm EPC Contractors
		Place clear markers indicating stockpiling area of excavated materials to restrict equipment and personnel movement, thus limiting the physical disturbance to land and soils in adjacent areas	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Erect erosion control barriers around work site during site preparation and construction to prevent silt runoff where applicable	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Return surfaces disturbed during construction to their original (or better) condition to the greatest extent possible	Mitigation	Visual inspections	At construction active areas	Upon occurrence	
Biodiversity	Construction activities would disturb existing habitats (flora and fauna). In addition, other impacts could be from improper management of the site (e.g. improper conduct and housekeeping practices).	Undertake a detailed survey (through an ecological expert) to identify the presence of any active Egyptian Dabb Lizards as well as their burrows within all assigned areas to be disturbed by construction.	Additional Requirement	Submit survey report	At project site	Prior to construction	Wind Farm EPC Contractors
		Implement proper housekeeping practices on the construction site at all times	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Should any fencing be erected as part of the Project, it must be ensured that it allows for the natural movement of small faunal species within the area	Mitigation	Inspection	At construction active areas	Once	
Birds (avi-fauna)	Construction activities could disturb existing habitats of birds breeding and/or nesting within the Project site.	A breeding bird survey to be carried out during the suitable breeding season from March until May of the year 2020	Additional Requirement	Submit survey report to be added as Addendum to ESIA	At project site	Prior to construction	Consultant
		Implement proper housekeeping practices on the construction site at all times	Mitigation	Visual inspections	At construction active areas	Daily / weekly	Wind Farm EPC Contractors
Archaeology and Cultural Heritage	Improper management of construction activities could disturb/damage archaeological remains which could be buried in the ground (if any).	If potential archaeological remains in the ground are discovered, appropriate measures for such chance find procedures are implemented. Those mainly require that construction activities be halted and the area fenced along with proper signage, while immediately notifying the Ministry of Tourism and Antiquities/Red Sea and Suez Antiquities Inspection Office. No additional work will be allowed before the Ministry/Inspection Office assesses the found potential archaeological site and grants a clearance to resume the work. Construction activities can continue at other parts of the site if no potential archaeological remains were found. If found, same procedures above apply	Mitigation	Visual inspections and submittal of chance find report	At applicable area	Upon occurrence	Wind Farm EPC Contractors
Air Quality and Noise	Construction activities will likely result in an increased level of dust, particulate matter and pollutant emissions as well as noise which in turn will directly impact ambient air quality and noise levels.	If dust or pollutant emissions were found to be excessive due to construction activities, the source of such emissions should be identified and adequate control measures must be implemented (as identified below)	Mitigation	Visual inspections	At construction active areas and other receptors to include petroleum storage facilities and internal road networks	Upon occurrence	Wind Farm EPC Contractors
		Comply with the Occupational Safety and Health Administration (OSHA) requirements and the Egyptian Codes to ensure that for activities associated with high dust and noise levels, workers are equipped with proper Personal Protective Equipment	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Apply basic dust control and suppression measures which could include: (i) regular watering of roads for dust suppression; (ii) proper planning of dust causing activities to take place simultaneously in order to reduce the dust incidents over the construction period; (iii) proper management of stockpiles and excavated material (e.g. watering, containment, covering, bundling); (iv) proper covering of trucks transporting aggregates and fine materials (e.g. through the use of tarpaulin); and (v) adhering to a speed limit of 15km/h for trucks on the construction site.	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
		Develop a regular inspection and scheduled maintenance program for vehicles, machinery, and equipment to be used throughout the construction phase for early detection of issue to avoid unnecessary pollutant and noise emissions	Mitigation	Submission of maintenance program	Not applicable	Monthly	
		If noise levels were found to be excessive from construction activities, the source of such excessive noise levels should be identified and adequate control measures must be implemented	Mitigation	Visual inspections	At construction active areas and other receptors to	Upon occurrence	

Environmental Attribute	Potential Impact	Management Action (mitigations, additional requirements, additional studies, compensation measures, etc.)	Type of Action	Monitoring Action	Parameters to be monitored / location	Frequency	Responsible Entity
					include petroleum storage facilities		
		Apply adequate general noise suppressing measures. This could include the use of well-maintained mufflers and noise suppressants for high noise generating equipment and machinery, developing a regular maintenance schedule of all vehicles, machinery, and equipment for early detection of issues to avoid unnecessary elevated noise level, etc.	Mitigation	Visual inspections	At construction active areas	Daily / weekly	
Infrastructure and Utilities	Traffic and transport management	Develop a Traffic and Transport Plan to ensure transportation process of turbine components does not pose a risk of damage to the existing roads, highways, overpasses whilst ensuring public safety. The Plan must analyse and study the entire route for transportation of the Project components from the port till the Project site. The study must investigate any constraints which need to be considered along the highways leading to the Project site such as bridges, overhead utility cables, slants in roads, etc. and identify accommodations which need to be taken into account.	Additional study	Submission of Traffic and Transport Plan and approval from local authorities	Not applicable	Once before commencement of construction	Wind Farm EPC Contractors
		Establish coordination via NREA/EETC with the relevant entity to discuss and determine any specific requirements to be taken into account for the established road networks within the Wind Farm (e.g. avoidance of such areas, buffer distances to be considered, etc.)	Additional requirement	Submit formal communication letter (or similar) with relevant entity	Not applicable	Once before commencement of construction	Developer
	Improper planning and design of project could affect electricity lines and pylons within Project area.	Establish coordination with relevant entity to discuss and determine any specific requirements to be taken into account for the established electricity networks within the Wind Farm (e.g. avoidance of such areas, buffer distances to be considered, etc.)	Additional requirement	Submit formal communication letter (or similar) with relevant entity	Not applicable	Once before commencement of construction	Developer
	Water resources management	Coordinate with the Ras Ghareb Water Company to sector the water requirements of the Project	Additional requirement	Submit formal communication letter (or similar) with Ras Ghareb Water Company	Not applicable	Once before commencement of construction	Wind Farm EPC Contractors
	Waste utilities	Undertake the following: (i) coordinate with the Ras Ghareb Water Company and obtain list of authorized contractors for collection of wastewater from the site; (ii) coordinate with the Ras Gharib City Council to hire a competent private contractor for the collection of solid waste from the site; and (iii) obtain list of authorized contractors for collection of hazardous waste from the site	Additional requirement	Submit formal communication letter with relevant entities	Not applicable	Once before commencement of construction	Wind Farm EPC Contractors
	Aviation, telecommunication and TV/Radio management	Establish coordination with the relevant entity to provide information on the Project (to include location and specifications of turbines in specific) and include any specific requirements to be considered as part of the detailed design to include setback distances if required (e.g. from radar systems if applicable) and navigational safety requirements (e.g. navigational lights, blade paintings, etc.)	Additional requirement	Submit formal communication letter with relevant entities	Not applicable	Once before commencement of construction	Developer
		Establish coordination via NREA/EETC with relevant entity (given that a telecommunication tower is noted onsite), and other applicable local agencies to provide information on the Project (to include location and specifications of turbines in specific) and include any specific requirements to be considered as part of the detailed design to include setback distances if required for telecommunication, radio and TV infrastructure (e.g. from LoS connections)	Additional requirement	Submit formal communication letter with relevant entities	Not applicable	Once before commencement of construction	Developer
Occupational Health and Safety	There will be some generic risks to workers health and safety from working on construction sites, as it increases the risk of injury or death due to accidents.	Develop and submit an Occupational Health and Safety Plan (OHSP) that is project and site specific to ensure the health and safety of all personnel in order to concur and maintain a smooth and proper progress of work at the site and prevent accident which may injure personnel or damage property.	Additional study	Submit OHSP plan	Not applicable	Once before commencement of construction	Wind Farm EPC Contractors
Public health and safety	Relatively large worker influx could result in H&S issues such as risk of diseases, inappropriate code of conduct, social vices, etc.	Submit a worker influx plan which takes into account the following: (i) medical examination program for workers; (ii) procedures to maintain hygienic conditions onsite; (iii) code of conduct for workers; (iv) induction training and awareness requirements for risk of diseases, etc.	Additional study	Submit worker influx plan	Not applicable	Once before commencement of construction	Wind Farm EPC Contractors
	Inappropriate management of security issues and incidents by security personnel towards local communities could result in resentment, distrust and escalation of events	Prepare a Security Management Plan that identifies appropriate measures for hiring, rules of conduct, training, equipping, and monitoring of security personnel to control and manage such issues	Additional study	Submit security management plan	Not applicable	Once before commencement of construction	Wind Farm EPC Contractors
	Potential impacts from blade throw which could affect the public safety of nearby receptors.	Establish coordination via NREA/EETC with the General Petroleum Company to discuss and determine any specific requirements to be taken into account for the established setback distances from existing onsite facilities (such as the petroleum storage facilities) which could be based on the IFC setback distance requirements.	Additional requirement	Submit formal communication letter (or similar) with General Petroleum Company	Not applicable	Once before commencement of construction	Developer
Socio-economics	The Project is expected at a minimum to provide job opportunities for local communities. This, to some extent, could contribute to enhancing the living environment for its inhabitants, elevate their standards of living, and bring social and economic prosperity	▪ Adopt different plans and measures to implement initiatives that would contribute to enhancing the living environment of the local communities, elevate their standards of living, and bring social and economic prosperity. ▪ Prioritise employment in the new planned governmental and private sector investment projects from the community. This shall be reflected in the EPC	Recommendation	Regular reporting on outcomes of Program implementation	Not applicable	Continuous	Project Developer/EPC Contractors

Environmental Attribute	Potential Impact	Management Action (mitigations, additional requirements, additional studies, compensation measures, etc.)	Type of Action	Monitoring Action	Parameters to be monitored / location	Frequency	Responsible Entity
		Contract and subsequent subcontracts. This could be implemented through a joint collaboration between the Developer/EPC Contractor and the other wind farm developers in the area. ▪ Include prerequisites from the contractors and service providers commissioned for development projects in the area. Such measures shall be clearly stipulated in the contracts. ▪ Adopt and implement a Community Integration Plan (CIP) for working with the local community members. The Plan must aim to support the local economy stating its aims and objectives and should acknowledge the importance of building a strong socio-economic relationship with the local community through a participatory planning program even before the development is in place. The Plan must include the key requirements identified below. - Project Updates Procedure: the procedure should aim to ensure timely and continuous communication and dissemination of information with the local community through appropriate local platforms – this could include for example timely consultation and information disclosure with the related stakeholders, informed participation and have open communication channels with the related stakeholders, a copy of the NTS and SEP in English and in Arabic shall be distributed to the related stakeholders, etc. - Local Recruitment Procedure: the procedure must identify the number of job opportunities targeted for local communities to include skilled and unskilled workers. Such job opportunities shall also take into account employment of local communities in the area around the project to include fresh graduate engineers, technicians, labourers, etc. In addition, the procedure must include details on how job opportunities will be announced as well as a selection process that is fair and transparent and provides equal opportunities for all including females. - Local Procurement Procedure: the procedure must identify the procurement opportunities targeted for local communities to include for example local subcontractors, local supplies and services, cleaning services, etc. In addition, the procedure must include details on how procurement opportunities will be announced as well as a selection process that is fair and transparent and provides equal opportunities for all. - -Social Responsibility Program: it is recommended that the Developer implement a social responsibility program which aims to benefit the local communities to the greatest extent possible. In this case, a structured approach must be developed which must identify priority development projects which could benefit local communities (e.g. based on a needs assessment if available). Based on that the social responsibility program can prioritise projects for local communities based on available budget, company vision, timeline for implementation as well as other factors.					

Table 10-7: ESMP for the Operation Phase (Consultant, 2019)

Environmental Attribute	Potential Impact	Management Action (mitigations, additional requirements, additional studies, compensation measures, etc.)	Type of Action	Monitoring Action	Parameters to be monitored / location	Frequency	Responsible Entity
Geology, Hydrology and hydrogeology	Solid waste management	Coordinate with Ras Gharib City Council for the collection of solid waste from the site to the municipal approved dumpsite (the closest dumpsite being Ras Gharib Public Dumpsite)	Mitigation	Submit contract	Not applicable	Once before commencement of operation	Wind Farm Operator
		Prohibit fly-dumping of any solid waste to the land	Mitigation	Visual inspections	At operational active areas	Daily / weekly	
		Distribute appropriate number of properly contained litter bins and containers properly marked as "Municipal Waste	Mitigation	Visual inspections	At operational active areas	Once before commencement of operation	
		Implement proper housekeeping practices onsite at all times	Mitigation	Visual inspections	At operational active areas	Daily / weekly	
		Maintain records and manifests that indicate volume of waste generated onsite, collected by contractor, and disposed of at the landfill	Mitigation	Submit manifests	Not applicable	Throughout operational period	
	Wastewater management	Coordinate with Ras Gharib Water Company to hire a private contractor for the collection of wastewater from the site to the closest WWTP	Mitigation	Submit contract	Not applicable	Once before commencement of operation	Wind Farm Operator
		Prohibit illegal disposal of wastewater to the land	Mitigation	Visual inspections	At operational active areas	Daily / weekly	
		Ensure that septic tanks are emptied and collected by wastewater contractor at appropriate intervals to avoid overflowing	Mitigation	Visual inspection	At applicable area	Daily/weekly	

Environmental Attribute	Potential Impact	Management Action (mitigations, additional requirements, additional studies, compensation measures, etc.)	Type of Action	Monitoring Action	Parameters to be monitored / location	Frequency	Responsible Entity
		Maintain records and manifests that indicate volume of wastewater generated onsite, collected by contractor, and disposed of at the WWTP	Mitigation	Submit manifests	Not applicable	Throughout operational period	
	Hazardous waste management	Hire approved private contractor for the collection of hazardous waste from the site to the approved hazardous waste disposal facilities	Mitigation	Submit contract	Not applicable	Once before commencement of operation	Wind Farm Operator
		Ensure that hazardous waste is disposed in a dedicated area that is enclosed, of hard surface, with proper signage and suitable containers as per hazardous waste classifications and that they are labelled for each type of hazardous waste	Mitigation	Visual inspections	At applicable area	Once before commencement of operation	
		Ensure hazardous waste storage area is equipped with spill kit, fire extinguisher and anti-spillage trays and a hazardous waste inventory is available	Mitigation	Visual inspections	At applicable area	Daily / weekly	
		Prohibit illegal disposal of hazardous waste to the land	Mitigation	Visual inspections	At operational active areas	Daily / weekly	
		Possibly contaminated water (e.g. runoff from paved areas) must be drained into appropriate facilities (such as sumps and pits). Contaminated drainage must be orderly disposed of as hazardous waste	Mitigation	Visual inspections	At operational active areas	Daily / weekly	
		Ensure that containers are emptied and collected by the contractor at appropriate intervals to prevent overflowing	Mitigation	Visual inspections	At operational active areas	Daily / weekly	
		Maintain records and manifests that indicate volume of hazardous waste generated onsite, collected by contractor, and disposed of at the hazardous waste disposal facilities	Mitigation	Submit manifests	Not applicable	Throughout operational period	
	Hazardous material management	Ensure that hazardous materials are stored in an area that is of hard impermeable surface, flame-proof, accessible to authorized personnel only, locked when not in use, and prevents incompatible materials from coming in contact with one another	Mitigation	Visual inspections	At applicable area	Once before commencement of operation	Wind Farm Operator
		Maintain a register of all hazardous materials used and accompanying MSDS must present at all times. Spilled material should be tracked and accounted for	Mitigation	Visual inspections	At applicable area	Daily / weekly	
		Incorporate dripping pans at machinery, equipment, and areas that are prone to contamination by leakage of hazardous materials (such as oil, fuel, etc.)	Mitigation	Visual inspections	At operational active areas	Daily / weekly	
		Maintenance activities and other activities that pose a risk for hazardous material spillage (such as refueling) must take place at a suitable location (hard surface) with appropriate measures for trapping spilled material	Mitigation	Visual inspections	At operational active areas	Daily / weekly	
		Ensure that a minimum of 1,000 litters of general-purpose spill absorbent is available at hazardous material storage facility.	Mitigation	Visual inspections	At applicable area	Daily / weekly	
		If spillage on soil occurs, spill must be immediately contained, cleaned-up, and contaminated soil disposed as hazardous waste	Mitigation	Visual inspection	At applicable area	Upon occurrence	
Biodiversity	Improper management of the site could disturb existing habitats (e.g. improper conduct and housekeeping practices).	Implement proper management measures to prevent damage to the biodiversity of the site.	Mitigation	Inspection	At applicable area	Continuous	Wind Farm Operator
Birds (avi-fauna)	Wind turbines are associated with impacts on birds from risks of strikes and collision on both migratory soaring birds and resident soaring birds in the area. Generally, such impacts depend on several factors but could affect the population levels of certain species especially those with international/national critical conservation status.	In-flight monitoring during spring and autumn migration seasons	Additional requirement	Submission of survey reports for each season to be added as addendum to ESIA	At operational active areas	Before commencement of operation	Consultant
		Avi-Fauna Monitoring and On-Demand Turbine Shutdown	Mitigation	Submission of report	At operational active areas	Continuous	
		Avi-Fauna Carcass Search during Operation	Additional requirement	Submission of report	At operational active areas	Continuous	
		Carcass Search Surveys	Additional requirement	Submission of report	At operational active areas	Continuous	
Bats	The potential impacts from the Project during operation are mainly related to risk of bat strikes and collisions with rotors of the operating wind turbines.	Bat mortality survey	Additional requirement	Submission of report	At operational active areas	Continuous	Wind Farm Operator
Infrastructure and Utilities	Water resources management	Coordinate with the Ras Ghareb Water Company to sector the water requirements of the Project.	Additional requirement	Submit formal communication letter (or similar) with Ras Ghareb Water Company	Not applicable	Once before commencement of construction	Wind Farm Operator
	Waste utilities	Undertake the following: (i) coordinate with the Ras Ghareb Water Company and obtain list of authorized contractors for collection of wastewater from the site; (ii) coordinate with the Ras Gharib City Council to hire a competent private contractor for the collection of solid waste from the site; and (iii) obtain list of authorized contractors for collection of hazardous waste from the site	Additional requirement	Submit formal communication letter with relevant entities	Not applicable	Once before commencement of construction	Wind Farm Operator
Occupational Health and Safety	There will be some generic risks to workers health and safety from working on construction sites, as it increases the risk of injury or death due to accidents.	Develop and submit an Occupational Health and Safety Plan (OHSP) that is project and site specific to ensure the health and safety of all personnel in order to concur and maintain a smooth and proper progress of work at the site and prevent accident which may injure personnel or damage property.	Additional study	Submit OHSP plan	Not applicable	Once before commencement of operation	Wind Farm Operator

Environmental Attribute	Potential Impact	Management Action (mitigations, additional requirements, additional studies, compensation measures, etc.)	Type of Action	Monitoring Action	Parameters to be monitored / location	Frequency	Responsible Entity
Public Health and Safety	Public access of unauthorized personnel to the various Project components.	A Security Risk Assessment should be developed for the Wind Farm Project and which takes into account the following: (i) each turbine to be fitted with locked doors to prevent unauthorized access to the turbines; (ii) substation area to be completely fenced with concrete walls to prevent unauthorized access; (iii) onsite guards; (iv) post informative signs on the turbines and substation about public safety hazards and emergency contact information, and other as applicable	Additional study	Submit Security Risk Assessment	Not applicable	Once before commencement of operation	Wind Farm Operator
	Inappropriate management of security issues and incidents by security personnel towards local communities could result in resentment, distrust and escalation of events	Prepare a Security Management Plan that identifies appropriate measures for hiring, rules of conduct, training, equipping, and monitoring of security personnel to control and manage such issues	Additional study	Submit security management plan	Not applicable	Once before commencement of operation	Wind Farm Operator
	Blade or tower glint can impact nearby receptors in the area	Consideration should be given to the use of non-reflective finishes to ensure potential impacts are not significant	Mitigation	Visual inspection	Turbines	Once before commencement of operation	Wind Farm Operator
Socio-economics	The Project is expected at a minimum to provide job opportunities for local communities. This, to some extent, could contribute to enhancing the living environment for its inhabitants, elevate their standards of living, and bring social and economic prosperity	▪ Adopt different plans and measures to implement initiatives that would contribute to enhancing the living environment of the local communities, elevate their standards of living, and bring social and economic prosperity. ▪ Prioritise employment in the new planned governmental and private sector investment projects from the community. This shall be reflected in the EPC Contract and subsequent subcontracts. This could be implemented through a joint collaboration between the Developer/EPC Contractor and the other wind farm developers in the area. ▪ Include prerequisites from the contractors and service providers commissioned for development projects in the area. Such measures shall be clearly stipulated in the contracts. ▪ Adopt and implement a Community Integration Plan (CIP) for working with the local community members. The Plan must aim to support the local economy stating its aims and objectives and should acknowledge the importance of building a strong socio-economic relationship with the local community through a participatory planning program even before the development is in place. The Plan must include the key requirements identified below. - Project Updates Procedure: the procedure should aim to ensure timely and continuous communication and dissemination of information with the local community through appropriate local platforms – this could include for example timely consultation and information disclosure with the related stakeholders, informed participation and have open communication channels with the related stakeholders, a copy of the NTS and SEP in English and in Arabic shall be distributed to the related stakeholders, etc. - Local Recruitment Procedure: the procedure must identify the number of job opportunities targeted for local communities to include skilled and unskilled workers. Such job opportunities shall also take into account employment of local communities in the area around the project to include fresh graduate engineers, technicians, labourers, etc. In addition, the procedure must include details on how job opportunities will be announced as well as a selection process that is fair and transparent and provides equal opportunities for all including females. - Local Procurement Procedure: the procedure must identify the procurement opportunities targeted for local communities to include for example local subcontractors, local supplies and services, cleaning services, etc. In addition, the procedure must include details on how procurement opportunities will be announced as well as a selection process that is fair and transparent and provides equal opportunities for all. - -Social Responsibility Program: it is recommended that the Developer implement a social responsibility program which aims to benefit the local communities to the greatest extent possible. In this case, a structured approach must be developed which must identify priority development projects which could benefit local communities (e.g. based on a needs assessment if available). Based on that the social responsibility program can prioritise projects for local communities based on available budget, company vision, timeline for implementation as well as other factors.	Recommendation	Regular reporting on outcomes of Program implementation	Not applicable	Continuous	Project Developer/ Operator

11 E&S ASSESSMENT FOR PROJECT SUBSTATION

As discussed earlier, the Project components will include a substation and a project electricity transmission line as provided in details below. As required by RCREEE and in order to clarify the specific impacts and mitigations for such components, this has been included in a standalone chapter.

- **Substation**: as discussed throughout the document, the ESIA also includes the assessment of impacts from the substation components. The substation is a high voltage transformer substation that collects and converts the output from the turbines to a higher voltage (from 33 kV to 220 kV) that is appropriate for connection with the High Voltage National Grid (220 kV). The location of the substation is presented in the figure below.

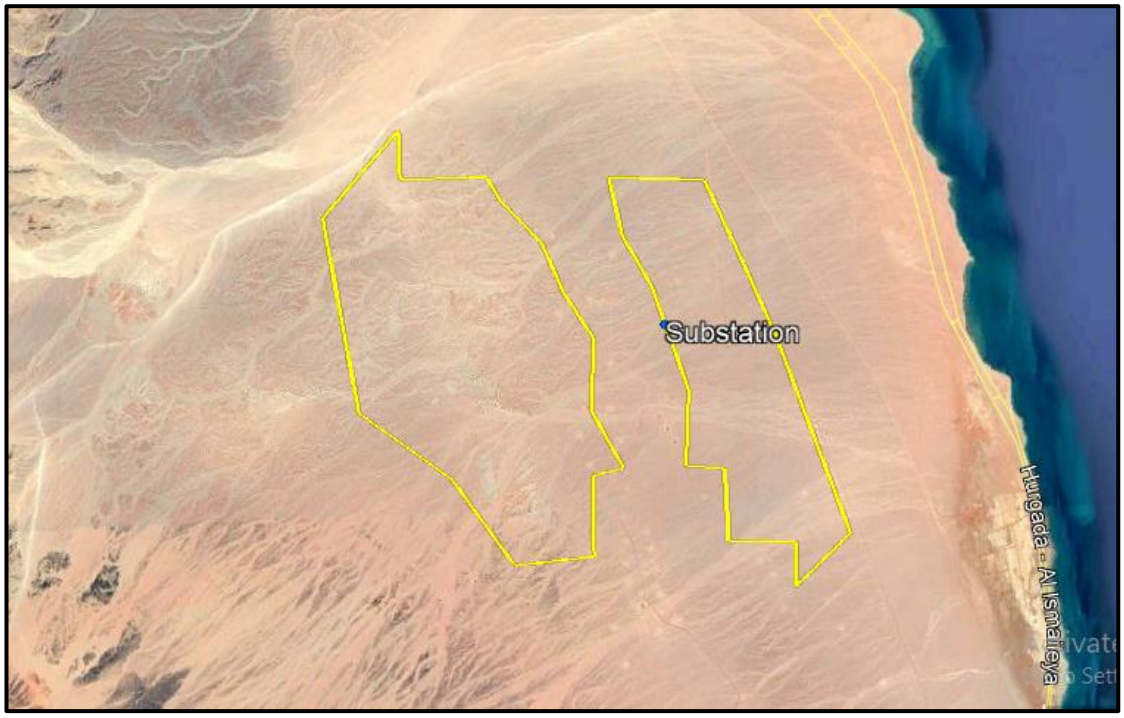

Figure 11-1: Location of Substation within Project Area

- **Project Electricity Transmission Line:** electricity generated from the Project will be connected to the national grid from the substation through an Overhead Transmission Line (OHTL). As discussed earlier, a standalone ESIA will be undertaken for the OHTL at a later stage.

The table below provides a summary of: (i) the baseline conditions (which are similar to the Project area given that the substation is located within the same Project plots), (ii) anticipated impacts from the substation; and (iii) mitigations required.

Attribute	Summary of E&S Baseline	Impact	Mitigation Measures
Landscape and Visual	No key issues of concern given that no key sensitive visual receptors which could be impacted from the Project during operation were identified.	***Construction Phase***. Site preparation activities which are to take place onsite by the Wind Farm EPC Contractor for the substation are expected to include land clearing activities, levelling, excavation, grading, etc. Construction activities would create a temporary effect on the visual quality of the site and its surroundings. The visual environment during the construction phase would include the presence of elements typical of a construction site such as equipment and machinery to include excavators, trucks, front end loaders, compactors and others	Application of similar mitigations to those identified in Section 9.2.1 which are to be implemented by the Wind Farm EPC Contractors
Land Use	Project site is uninhabited and vacant and does not include any physical or economical land use activities. Within the site there is only a petroleum storage facility and an oil rig. In addition, Bedouin Groups in general implement the Ghafra system in such land areas to include Project site	***Construction Phase***. Project area includes petroleum storage facilities and an oil rig as well as informal land use by Bedouin Groups through the Ghafra system. Inappropriate management of such issues could result in land use impacts and disputes.	Application of similar mitigations to those identified in Section 9.3.1 which are to be implemented by the Wind Farm EPC Contractors
Geology, Hydrology, Hydrogeology	No key site-specific issues of concern noted and based on preliminary assessment, there are no flood risks anticipated at the Project site.	***Construction and Operation Phase***. Construction and operation activities for the substation area will generate waste streams to include solid waste, wastewater and hazardous waste. In appropriate management of such waste stream could contaminate and pollute soil which in turn could pollute groundwater resources	Application of similar mitigations to those identified in Section 9.4.2 which are to be implemented by the Wind Farm EPC Contractors and Operator.
Biodiversity	No floral species were identified at the project site to be of high concern. Faunal species, including three mammal species and one reptiles require consideration since literature has shown that the project	***Construction Phase***. Site preparation activities which are to take place onsite for the substation are expected to include land clearing activities, levelling, excavation, grading, etc. Such activities are limited to the relatively small individual footprints of the substation and the actual area of disturbance is relatively minimal. Nevertheless, although alterations are considered to be minimal, such activities would still likely result in the alteration of the site's habitat and thus potentially disturb existing habitats	Application of similar mitigations to those identified in Section 9.5.1 which are to be implemented by the Wind Farm EPC Contractors

	site is located in their distribution range		
Avi-Fauna (birds)	The autumn survey is generally in line with the SESA as the numbers of birds recorded were moderate with the highest numbers being for species of low concern.	***Construction Phase***. Site preparation activities which are to take place onsite for the substation are expected to include land clearing activities, levelling, excavation, grading, etc. Such activities in particular could impact avi-fauna which use the site for foraging and as a breeding ground– to include soaring and non-soaring resident and migratory species	Application of similar mitigations to those identified in Section 9.6.1 which are to be implemented by the Wind Farm EPC Contractors
Bats	The Literature review has shown that there are some species that could be of high vulnerability to collision with wind power infrastructures	***Construction Phase***. Site preparation activities which are to take place onsite by the Wind Farm EPC Contractor for the substation are expected to include land clearing activities, levelling, excavation, grading, etc. Such activities are limited to the relatively small individual footprints of these facilities and the actual area of disturbance is relatively minimal. Nevertheless, such activities would likely result in the alteration of the site's habitat and thus potentially impacts bats; particularly through loss of hunting habitats for bats as well as roosting sites.	Application of similar mitigations to those identified in Section 9.7.1 which are to be implemented by the Wind Farm EPC Contractors
Archaeology and Cultural Heritage	There are no site-specific archaeology or cultural heritage remains.	***Construction Phase***. Site preparation activities which are to take place onsite by the Wind Farm EPC Contractor for the substation are expected to include land clearing activities, levelling, excavation, grading, etc. Although such activities are limited to the relatively small individual footprints of these facilities and the actual area of disturbance is relatively minimal, if such activities are improperly managed, they could damage or disturb archaeological remains present on the surface of the Project site	Application of similar mitigations to those identified in Section 9.8.1 which are to be implemented by the Wind Farm EPC Contractors
Air Quality and Noise	No key issues of concern identified.	***Construction Phase***. Site preparation activities which are to take place onsite by the Wind Farm EPC Contractor for the substation are expected to include land clearing activities, levelling, excavation, grading, etc. Although such activities are limited to the relatively small individual footprints of these facilities and the actual area of disturbance is relatively minimal. Nevertheless, such activities will likely result in an increased level of dust, air emissions and noise.	Application of similar mitigations to those identified in Section 9.9.1 which are to be implemented by the Wind Farm EPC Contractors.
Infrastructure and Utilities	No key issues of concern identified. Several site-specific infrastructure and utility elements were noted within the area to include a	***Construction Phase***. Improper management of construction activities could affect the infrastructure and utility elements present onsite such as road networks, electricity lines, telecommunication towers, etc.	Similar mitigations to those identified in Section 9.10 which are to be implemented by the Wind Farm EPC Contractors

	petroleum storage facility, oil rig, roads, telecommunication tower, electricity network, and other.		
Occupational Health and Safety	N/A	***Construction and Operation Phase***. Activities at the substation entail occupational health and safety risks and hazards such as electrocution, exposure to hazardous materials, etc.	Similar mitigations to those identified in Section 9.11 which are to be implemented by the Wind Farm EPC Contractors
Public Health and Safety	N/A	***Operation Phase – Public Access***. Public access of unauthorized personnel to the substation area could result in safety issues such as electric shock, thermal burn hazards, exposure to chemicals and hazardous materials, etc.),	Similar mitigations to those identified in Section 9.12.3/9.12.4/9.12.5 which are to be implemented by the Wind Farm EPC Contractors
		Operation Phase – EMF exposure. Electric and magnetic fields (EMF) are radiation associated with the use of electric power such as household wiring, electric appliances and also from substations. Electric fields are produced from the voltage in the electrical lines while magnetic fields are produced from the electric current. While electric fields can be shielded by objects (such as buildings or trees), magnetic field pass through most objects. Such fields are strongest at the source and decrease significantly with increasing distance from the source. Extensive scientific research and studies have been undertaken to address potential human health impacts from long term exposure to EMF. The general consensus is that the overall scientific evidence for human health risk from EMF exposure is weak however EMF exposure could not yet be recognized as entirely safe. Similarly, the EHS Guidelines for Electric Power Transmission and Distribution issued by the IFC also states that although there is public and scientific concern over the potential health effects associated with exposure to EMF (not only high voltage power lines and substations, but also from everyday household uses of electricity), there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmissions lines and equipment. However, while the evidence of adverse health risks is weak, it is still sufficient to warrant limited concern.	None

The IFC EHS Guideline also requires that exposure level limits to the public should remain below the International Commission on Non-Ionizing Radiation Protection (ICNIRP) limits provided in the table below.

Frequency	Electric Field (V/m)	Magnetic Field (μT)
50 Hz	5000	100
60 Hz	4150	83

According to the National Institute of Environmental Health Sciences (NIEHS) at a distance of around 100m EMF from power lines are similar to typical background levels found in most homes ("Electric and Magnetic Fields Associated with the Use of Electric Power" (NIEHS, 2012)). In addition, several other studies indicate that EMF produced by substation equipment are generally not appreciable beyond the substation boundaries (US National Academies Press, 1997) and therefore the above limits are likely to be met. Finally, the IFC EHS guideline also state that transmission lines and facilities require Right of Way (RoW) to protect the system and also protection from potential hazards and in which RoW for transmission lines are generally from 15m to 100m.

Taking the above into account, as discussed earlier, there are no key sensitive receptors located within the surrounding area of the Project site including the substation area including in specific within 100m from it (as well as up to 1km from it). Therefore, such impacts are considered irrelevant.