Environmental and Social Impact Assessment

Shadwan 900 MW Wind Farm Overhead Transmission Line (OHTL)

REV-0

June 2026

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Safe Soar

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1. INTRODUCTION

1.1 Background

The energy sector is a key driver for the socio-economic development of Egypt, representing around 13% of current Gross Domestic Product (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.[1]

Acknowledging the severity of the situation, the Government of Egypt (GoE) has taken ambitious measures 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.[2]

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 42% of the electricity generated by the year 2035.[3] This target includes approximately 26% from solar energy, 14% from wind energy, and about 2% from hydropower.[4]

In that respect, the GoE issued the Renewable Energy Law (Decree Law 203/2014) to support the creation of a favorable 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. In addition, the GoE (through the New and Renewable Energy Authority (NREA)) provides the land for the investors.

In accordance with the Law above, the GoE has made land available for investors in the Gulf of Suez (GoS) to install wind power plants. Therefore, Scatec ASA established a Special Purpose Vehicle (SPV), "Shadwan Wind Power SAE", that is wholly owned by Scatec ASA and that will be responsible for the development and implementation of the Project (hereafter referred to as the '**Wind Farm Developer**'). The Wind Farm Developer is proceeding with developing a new wind power plant project with a capacity of 900 MW under the BOO scheme and an associated facility of an Overhead Transmission Line (OHTL) that will connect the Wind Farm Project to the National Grid (hereafter referred to as the '**Project'**) located in the Ras Gharib region within the Red Sea Governorate. Following this, a Power Purchase Agreement (PPA) for a 900 MW Wind Farm between the Developer and the Egyptian Electricity Transmission Company (EETC) has been signed.

[1] UNIDO – Low-Carbon Hydrogen Assessments in Egypt Highlights (PDF)
[2] Renewable Energy Outlook, Egypt (IRENA, 2018)
[3] Egypt - Countries & Regions - IEA
[4] Egyptian State Information Service. (2023). Egypt's efforts in renewable energy and transition to a sustainable energy mix.

1.2 The Environmental and Social Impact Assessment (ESIA) Report

The Regional Centre for Renewable Energy and Energy Efficiency (RCREEE) is managing the Environmental and Social (E&S) process for the Project development on behalf of the Wind Farm Developer. RCREEE commissioned the consortium consisting of ECO Consult and Safe Soar (hereafter referred to as the **'E&S Team'**) to carry out an Environmental and Social Impact Assessment (ESIA) for the Project.

The environmental clearance for this Project is governed by the Egyptian Environmental Affairs Agency (EEAA) as stipulated by "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 wind farm developments 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, which is necessary prior to commencing construction and operation activities.

The Project is seeking financing from International Financing Institutions (IFIs) and therefore the Wind Farm Developer wishes to design and manage the Project in accordance with Good International Industry Practice (GIIP), which also includes the ESIA that will be developed. Typically, the first step within any ESIA study is the undertaking of the scoping process after which a scoping report is submitted. For the purpose of the ESIA, this will be based on the following requirements:

- European Bank for Reconstruction and Development (EBRD) Environmental and Social Policy (2024) and associated Performance Requirements (PR);
- International Finance Corporation (IFC) Policy on Environment and Social (E&S) Sustainability (2012), IFC Performance Standards (2012), and IFC Environment, Health and Safety (EHS) Guidelines including the IFC EHS Guidelines for the Wind Sector;
- African Development Bank (AfDB) Integrated Safeguards System Policy Statement and Operational Standards (2023);

Therefore, the ESIA has been prepared to ensure that local EIA requirements in accordance with "Law No. 4 of 1994" are met as well as international E&S standards and requirements.

This report is the ESIA report to be submitted by the E&S Team to EEAA. This ESIA is undertaken in accordance with the "Law No. 4 of 1994" and its amendments as well as GIIP requirements specified above.

1.3 Project Setup and Responsibilities

Different entities are involved in the planning and implementation of the Project. Responsibilities of each entity are listed in the text below along with a general description of their roles.

- Shadwan Wind Power SAE: The owner and developer of the Project (hereafter referred to as 'the Wind Farm Developer'). Shadwan Wind Power SAE is an SPV wholly owned by Scatec ASA;
- *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 Environmental and Social Impact Assessment (ESIA) and making sure it complies with the "Environmental Protection Law No. 4 of 1994" and granting the environmental clearance for the Project;

- *International Financing Institutions (IFIs):* entities that will provide financing to the Wind Farm Developer for the development of the Project. Such IFIs will ensure that the Project is developed in accordance with international E&S standards and requirements. At this stage, the IFIs have not been selected or appointed yet but to include the reputable and experienced finance institutions in the field.
- *Lenders' Technical Advisor (LTA) and Lenders' Environmental and Social Advisor (LESA):* consultant that is engaged by and on behalf of the IFIs to ensure that the Project is being developed in accordance with their E&S requirements.
- *Egyptian Electricity Transmission Company (EETC):* will be the off taker of electricity and is the entity that signed the Power Purchase Agreement (PPA) with the Wind Farm Developer. In addition, they will also be responsible for designing, building and operating the associated interconnection facilities. This will include the OHTL that will connect from the Project site to the existing national grid.
- *New and Renewable Energy Authority (NREA):* is entity responsible for allocation of the land for the development of the Project;
- *Consultant (ECO Consult and Safe Soar):* hereafter referred to as the 'E&S Team' who is the ESIA Practitioner and the consultant commissioned by RCREEE to prepare the ESIA for the Project in accordance with "Law No. 4 of 1994" as well as GIIP requirements.

2. PROJECT DESCRIPTION

This section 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 construction, operation, and decommissioning phase.

2.1 Project Location

Administratively, Egypt is divided into 27 Governorates. Governorates are then divided into Aqsam (singular: Qism[5]) or Marakez[6] (Districts) which are then subdivided into local units, which are finally divided into cities, villages and hamlets.

The Project site is located within the Red Sea Governorate and is around 280 km to southeast of the capital Cairo. The Red Sea Governorate is bordered by the Red Sea Cost to the east and Bani-Suef, Menia, Asyout, Suhag, Qena, Luxor and Aswan Governorates to the west, Suez Governorate to the North, and North Sudan to the south. Red Sea Governorate's total area is around 120,000 km^2, forming 11.9% of the country's total area.

Administratively, the Red Sea Governorate is divided into seven (7) Cities (also known as Districts), each headed by a Local City Council. The capital of the Governorate is Hurghada that is located around 108 km southeast of the Project site.

Table 1: Region Division of Egypt

Governorate	Legend	Governorate	Legend	Governorate	Legend
Cairo	11	Gharbia	3	Suhag	24
Alexandria	7	Menoufia	2	Qena	25
Port-Said	14	Behera	10	Aswan	27
Suez	12	Ismaiilia	6	Luxor	26
Damietta	13	Giza	19	**Red Sea**	**22**
Dakahlia	4	Bani-Suef	8	El Wadi El Gidid	21
Sharkia	5	Fayoum	18	Matrouh	20
Kalyoubia	1	Menia	17	North Sinai	15
Kafr-El-Sheikh	9	Asyout	23	South Sinai	16

The following table shows the site coordinates, and the following figures show the location of the site.

Table 2: Project Site Coordinates

Point	Latitude	Longitude
1	28.085945	32.944679
2	28.096690	32.945182
3	28.132781	33.001798
4	28.062129	33.077327
5	28.016011	28.016011

[5] Qism. In the administrative division of Egypt, the Qism is an urban district made up of neighborhoods and residential blocks (not villages). It usually has more commercial and government services than smaller neighborhoods and functions as the main local administrative unit in urban governorates and large cities.

[6] Markaz. In the administrative division of Egypt, the Markaz is the main city or village followed by a group of villages in agricultural areas (not urban), and often the most important city is a Markaz for a total of villages. The Markaz has more commercial markets than villages, and there may also be branches of government service institutions and agencies serving villages. Each Governorate of the Delta and Upper Egypt includes a number of Markaz, Cities and villages.

The Project site is located within the Ras Gharib City (or District) and therefore administratively is under the Ras Gharib City Council. The Ras Gharib District is further divided into Ras Gharib town as well as two (2) rural (village) local units (Zaafarana and Wadi Dara). The closest community settlement to the Project site is Ras Gharib city that is located around 8km to the east. Ras Gharib City is the second-largest city in the Red Sea Governorate, and the most important Egyptian city in terms of oil production.

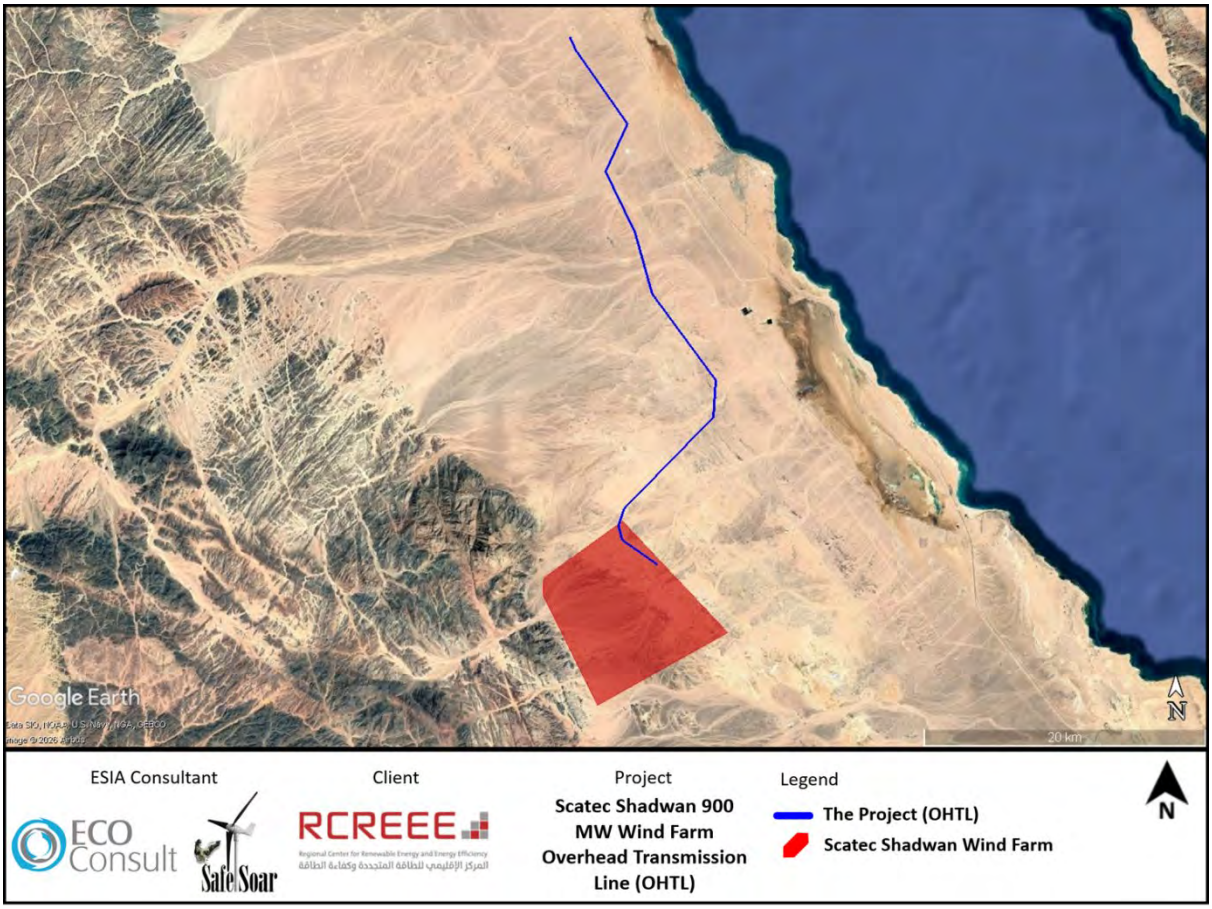


Figure 1: The Project Site

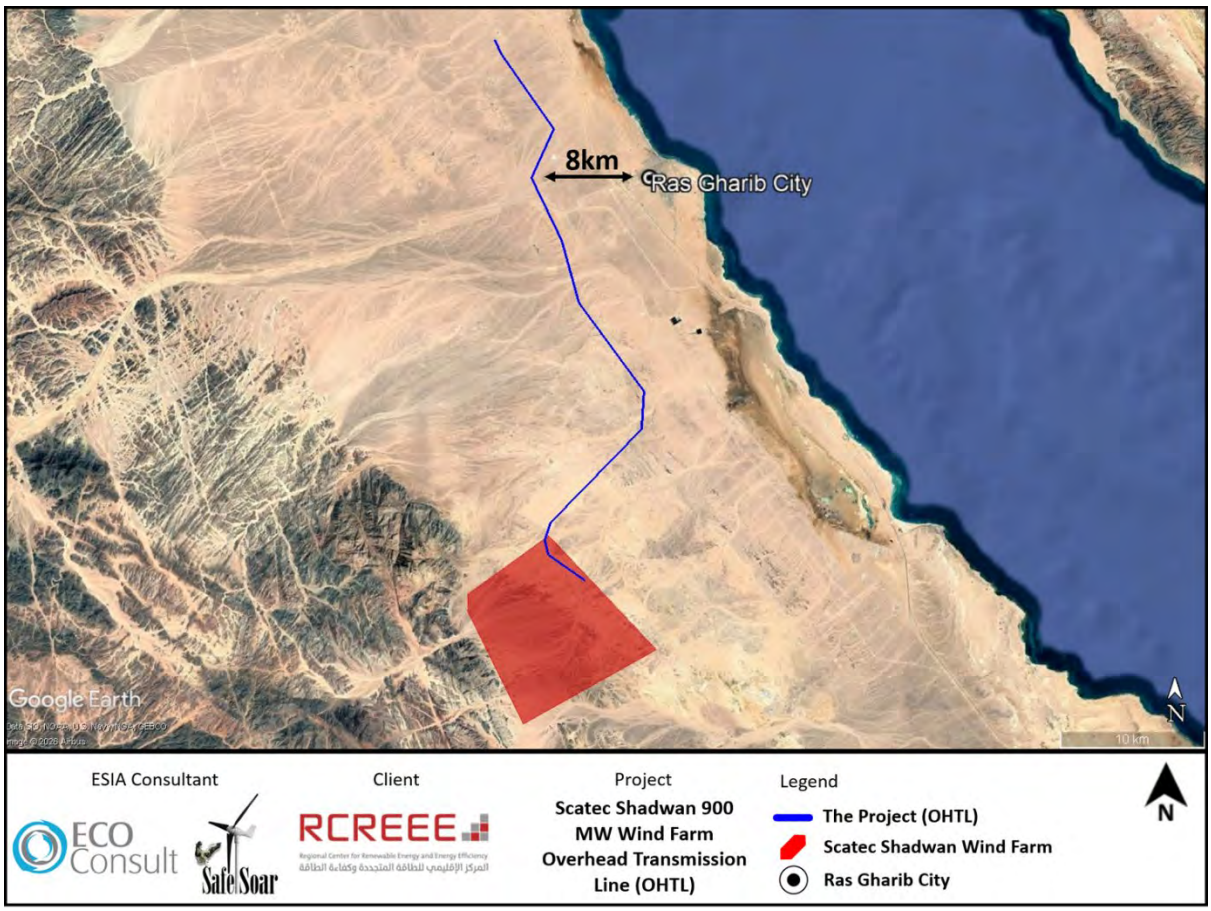


Figure 2: The Project Site in relation to the Nearest Community Settlement

2.2 Local Communities

Throughout the ESIA report, the term local communities will be used. This will refer to the following settlements in particular:

- Ras Gharib city is located around 8km east of the Project site; and
- Wadi Dara village is located around 17km southeast of the Project site. Although it is not considered a residential community area; however, it is an area where local communities engage in economic activities. Community members operate farms within Wadi Dara, and the area plays a significant role in supporting their livelihoods.

The above communities have been selected as affected communities based on the following rationale:

- Administrative Setup: the Project site as explained earlier is located within Ras Gharib District.
- Proximity to Site: the closest settlements were considered as local communities, therefore are the communities that are most likely to be impacted (positivity or negatively) in some way by the Project.

2.3 Project Components

2.3.1 OHTL Project Components

The main component of the OHTL is the transmission tower. Each Transmission Tower will consist of the following:

- Foundations: each tower will be fixed and bolted to the ground through reinforced concrete foundations;
- Steel structure: the foundations will support the steel structure that will carry the conductors, cross-arms and shield wire;
- Conductors: the conductor is the line used to carry electrical energy from one tower to the next until its connection with the High Voltage National Grid.
- Shield Wire (also known as earth wire): positioned above the phase conductors, the shield wire is grounded at each tower to facilitate the safe and rapid dissipation of voltage surges caused by technical issues or external factors (e.g. lightning).
- Cross-Arms: each tower will have six (6) steel beam cross arms (three (3) on each side) which connects the conductors (discussed below) with the towers.
- Insulators: provide electrical isolation and support for the conductors, which are typically made of aluminium or aluminium alloy. Insulators isolate the towers from the live wires that carry the electricity.

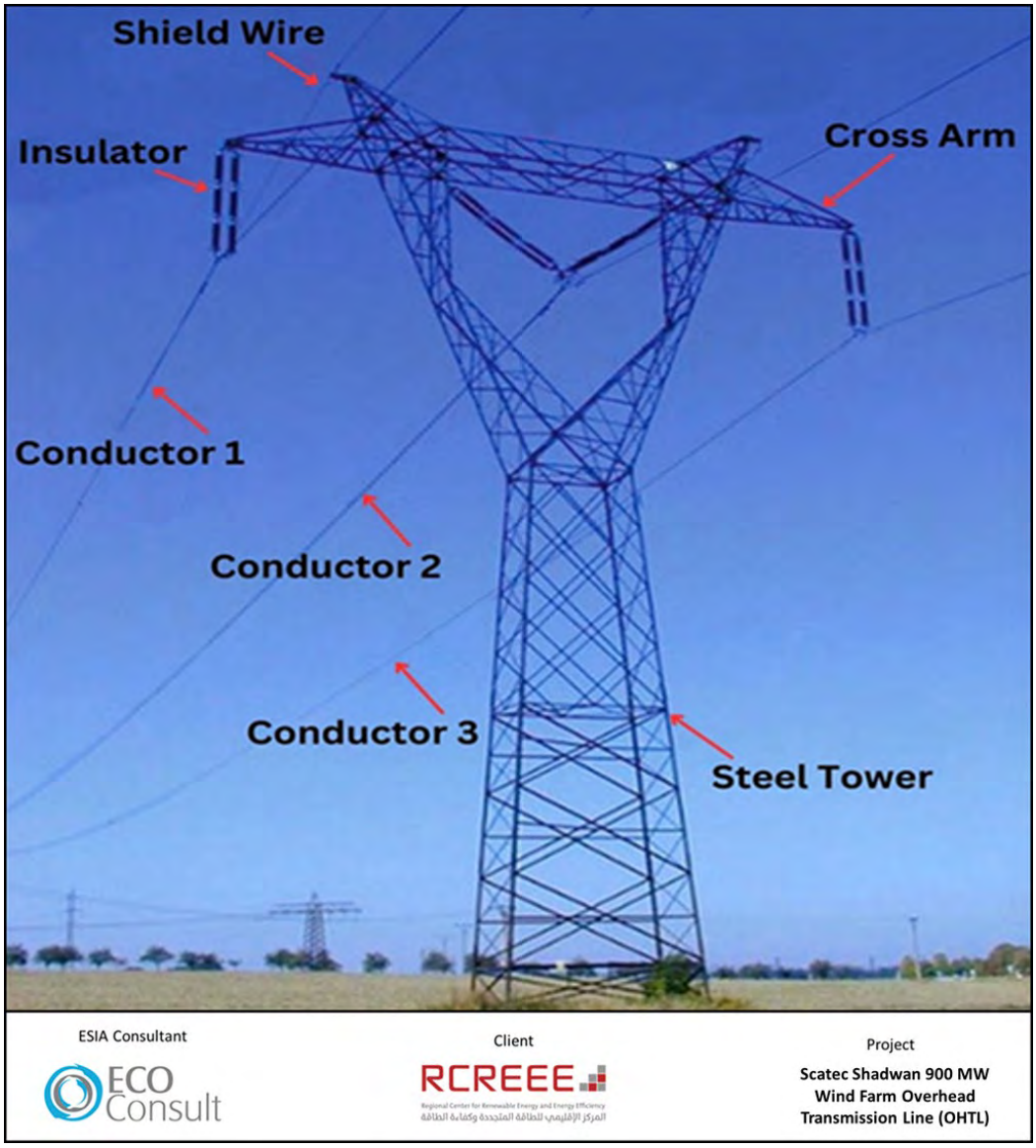


Figure 3: Key Components of a Transmission Tower

2.3.2 *Project Specifications*

- The OHTL for the Shadwan Wind Power Project will operate as a three-phase double-circuit transmission system at 500 kV, with an approximate total length of 44.7 km.
- The OHTL towers will consist of steel lattice structures with an expected height ranging between approximately 66 m and 85 m (maximum height), depending on topography, span length, and engineering requirements. The towers will be spaced at intervals of approximately 400 m to 500 m, resulting in an estimated total of 90 to 111 towers, including both suspension and tension towers. Approximately twelve (12) of the towers are expected to be tension towers.
- Each tower is expected to require a foundation area of approximately 20 m × 20 m. The towers will include six (6) steel cross arms, with three (3) cross arms located on each side of the tower structure.
- In addition, each tower will support six (6) conductors, comprising three (3) conductors on each side of the tower, utilizing 4 × AAAC 506 mm² conductors operating at 500 kV. The conductors are designed

to support high-capacity electricity transmission in accordance with the Project's grid connection requirements.

- A shield wire (earth wire) will also be installed above the phase conductors to provide lightning protection and ensure operational safety and system reliability.

2.3.3 Right of Way (ROW)

Electricity transmission and distribution projects require Rights-of-Way (RoW) to protect the system from windfall, contact with trees, branches, utilities, buildings, and other potential hazards that may result in damage to the system, or power failures, as well as public health and safety concerns. RoW are also utilized to access, service, and inspect transmission and distribution systems.

The IFC EHS Guidelines for Electric Power Transmission and Distribution (2007), states that the RoW width for transmission lines ranges from 15 to 100m depending on voltage and proximity to other RoW, but typical range is between 15 and 30m.

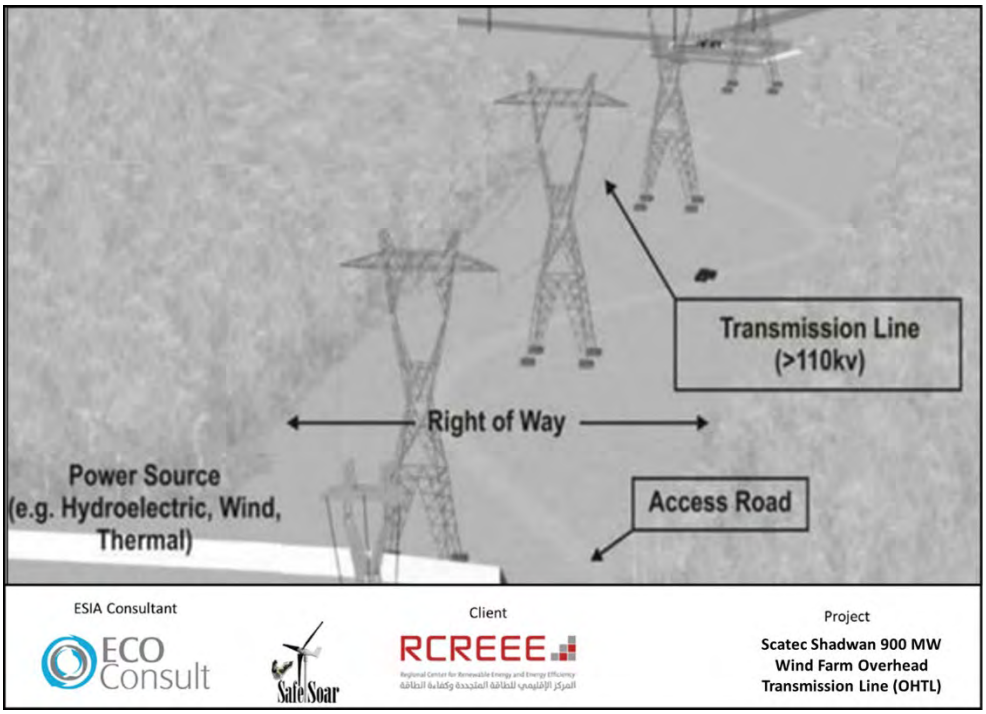


Figure 4: Right-of-Way and Access Road for Overhead Electric Power Transmission Line (International Finance Corporation, 2007)

Within the local requirements, EETC will take into account the requirements of the General Electricity Law No. 87 of 2015, which provides requirements for safe distance between the conductors and the surrounding lands and buildings and other receptors. Based on the law, the requirements of the RoW distances applicable for the 500kV OHTL is 25m horizontal distance from each side. Any successive buildings, structures or other receptors to be built shall take into account this safety distance/ RoW.

2.4 Overview of Project Phases

This section presents the likely activities to take place during the Project development, and which will include three (3) distinct phases: (i) construction, (ii) operation and (iii) decommissioning each of which is summarised below.

2.4.1 Planning & Construction Phase

Typical activities during the construction phase for the OHTL include the following:

- Transportation of various Project components to the Project site. The components are expected to be transported by road to the Project area;
- Site preparation activities for the tower foundations. Such activities are limited to the individual footprint of the towers and therefore the actual area of disturbance is small. Nevertheless, such activities could include land clearing activities, excavations, and levelling;
- Installation of components such as the DCT towers, cross-arms, and conductors;
- Stringing to install the conductor wires and the ground wire which is typically undertaken through using sufficient pulling force on one end and tension capabilities on the other;
- In addition to the erection of each DCT, there is additional construction work (which could include excavations, land clearing activities, etc.) for the road network if required to provide access of equipment and machinery onsite.

Throughout the construction phase, the Project will require XX skilled labour (such as engineers, technicians, surveyors, etc.) and XX unskilled labour. It is likely that the EETC will have his own team to cover such employment opportunities. Construction period will be around XX months, starting in end of QX of XXXX until the end of XX of XXX.

2.4.2 Operation Phase

The OHTL is expected to remain operational throughout the operation period of the Scatec Shadwan 900MW Wind Farm – which is set for 25 years. The operational phase will be mainly limited to maintenance and repair activities for the OHTL when needed. These could also include some routine maintenance activities (based on a set schedule) as well as maintenance in case of failure of any of the Project components. Maintenance activities are generally undertaken by a dedicated team of technicians from EETC and do not normally require any permanent staff to be onsite. The EETC Team would undertake required technical activities during any given day and leave the site.

2.4.3 Decommissioning Phase

Decommissioning activities will depend on the Shadwan 900MW Wind Farm. As discussed earlier, the Shadwan 900MW Wind Farm is expected to remain operational for 25 years after which the Project could be decommissioned. Decommissioning activities will include disassembly of the towers for final disposal. However, most of these materials are salvageable (i.e. recyclable).

2.5 Workforce Requirements

Throughout the construction phase, the Project will require XX skilled labour (such as engineers, technicians, surveyors, etc.) and XX unskilled labour, with a total of XX skilled/unskilled labour during the construction phase. Therefore, the OHTL will create some limited job opportunities for skilled labour (such as engineers, technicians, surveyors, etc.) and un-skilled labour during the construction phase through EETC.

During operation, maintenance activities are generally undertaken by a dedicated team of technicians from EETC and do not normally require any permanent staff to be onsite. The EETC Team would undertake the required technical activities during any given day and leave the site.

3. ESIA APPROACH AND METHODOLOGY

This section presents the overall approach and methodology that was followed throughout the ESIA process for the Project.

3.1 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 analyze 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, including the IFC PS 1.

The analysis of alternatives is presented in "Section 6". The section discusses and compares several alternatives to the Project development in relation to: (i) the Project site, (ii) the Project design, and finally investigated the 'no action alternative' - which assumes that the Project development does not take place.

3.2 Delineation of Study Boundaries and Scope of Assessment

3.2.1 Definition of Spatial Study or Area of Influence (AoI)

Before detailing the methodology of the assessment, it is important to delineate the study boundaries and the scope of the assessment that will be undertaken, both of which are discussed below.

Definition of Spatial Study Area

The overall study area (or AoI) for the ESIA represents the potential Area of Influence (AoI) 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 red in the figure below along with a 100m buffer from each side. This includes the wind farm Project site with a total area of 90km^2.

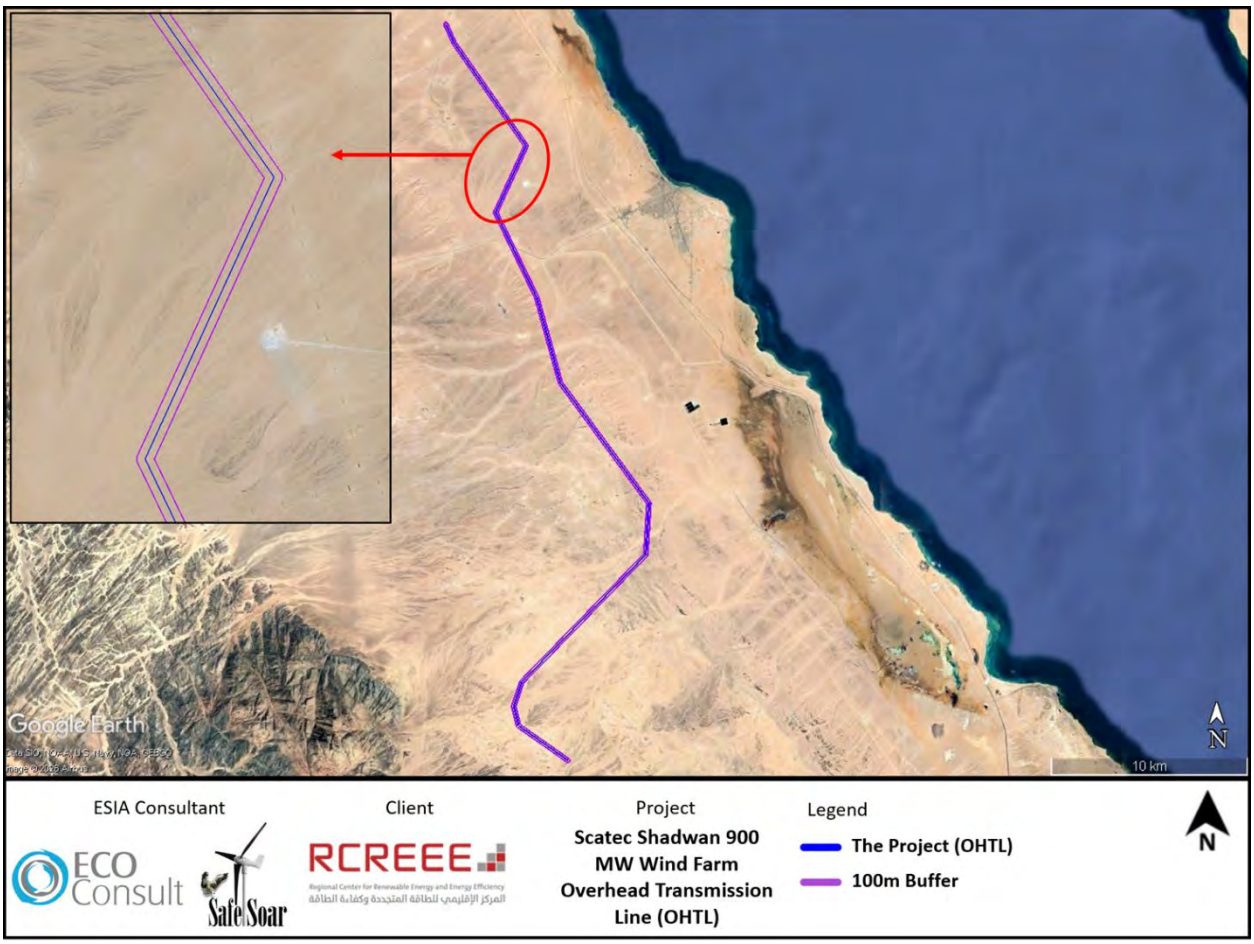


Figure 5: Study Area

However, for certain E&S parameters (such as noise, landscape and visual, socioeconomics, 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 section it relates to throughout this ESIA.

In identifying this thematic study area, 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.

3.2.2 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 "Section 7" to include the following: landscape and visual; land use; geology/hydrology/hydrogeology; biodiversity, avifauna, bats; archaeology and cultural heritage; air quality and noise; infrastructure and utilities; and socioeconomic conditions. Within each section, the methodology which was undertaken throughout 2025. This also included accounting for seasonal factors for biodiversity, avifauna, and bats – refer to "Section 7.5" to "Section 7.7" for additional details on timing of surveys undertaken.

3.3 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 8.1".

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 8.2" to "Section 8.13". The following section provides a description of the approach, methodology and process adopted for the impact assessment presented within this ESIA.

3.3.1 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.

3.3.2 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.

3.3.3 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.

3.3.4 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 3: Determination of Significance

Magnitude of Impact / Sensitivity of Receiving Parameter/Receptor	Low	Medium	High
Low	Not significant	Minor	Minor
Medium	Minor	Moderate	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*: Based on the above methodology such impacts result in high magnitude and affect receptors that are highly sensitive. Those are impacts that are considered to have potentially significant and adverse risks and will be a key factor in the overall decision-making process of the Project. In addition, they will also require detailed considerations for mitigation and monitoring measures.
- *Moderate significance*: Based on the above methodology such impacts either (i) result in medium magnitude and affect receptors that are of medium or high sensitivity; or (ii) result in high magnitude and affect receptors that are of medium sensitivity. Those are impacts that are considered to have potentially limited adverse risks and are unlikely to have a significant effect on the overall decision-making process. In addition, mitigation and monitoring measures require some consideration.
- *Minor significance*: Based on the above methodology such impacts either: (i) result in low magnitude and affects receptors that are of medium or high sensitivity; or (ii) result in medium magnitude and affects receptors that are of low sensitivity; or (iii) result in high magnitude and

affects receptors that are of low sensitivity. Those are impacts that are considered to have minimal risks and unlikely to be of importance for the overall decision-making process. In addition, mitigation and monitoring measures are readily available to address such risks; and

- *Not significant*: Based on the above methodology such impacts result in low magnitude and affect receptors that are of low sensitivity. Such impacts are beneath the level of perception and do not require any mitigation or monitoring measures.

3.3.5 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 assign 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, identify 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; and

- *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. STAKEHOLDER CONSULTATION AND ENGAGEMENT

This section discusses in detail 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 section also discusses the future stakeholder consultation and engagement plans which are to take place at a later stage of the ESIA process as well as the Project development.

4.1 Objectives

The Wind Farm 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 Project development in June 2025.

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

Stakeholders may include: (i) locally affected communities or individuals and their formal and informal representatives, (ii) national or local government authorities, politicians, religious leaders, civil society organizations and groups with special interests, (iii) the academic community, or other businesses.

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 section are to:

- Describe and identify the stakeholders affected and/or with an interest in the Project;
- Summarize 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.

4.2 Stakeholder Consultation and Engagement to Date

4.2.1 Targeted Consultations

Targeted consultations were undertaken with various stakeholder groups as highlighted below. During such targeted consultations, a handout was provided in advance in local language (mainly in Arabic language)

which entailed information on Project, its location, components, overall ESIA process, key impacts anticipated during the various Project phases, contact details, and other.

- National governmental entities; and
- Regional governmental entities.

The detailed minutes of meeting of such consultations along with name/position of person met for each entity is provided in Annex I.

Table 4: Targeted Consultations

Entity	Date	Key Outcomes
National Governmental Entities in Egypt & Regional Governmental Entities in Red Sea Governorate		
Egyptian Electricity Transmission Company (EETC)	5 May 2026	▪ Confirmed the importance of ensuring compliance with applicable environmental requirements throughout Project implementation. ▪ Highlighted the need to integrate environmental considerations into the detailed design, construction and operation of the proposed OHTL. ▪ Emphasized the importance of assessing potential impacts on migratory birds and incorporating appropriate mitigation measures where required.
Egyptian Environmental Affairs Agency (EEAA)	12 May 2026	▪ Recommended incorporating biodiversity mitigation and monitoring measures throughout the Project lifecycle. ▪ Emphasized the importance of assessing potential impacts on migratory birds associated with the proposed transmission line. ▪ Confirmed that separate Environmental and Social Impact Assessment studies should be prepared for each proposed transmission line. ▪ Recommended continued coordination between EEAA and EETC during Project development.
EEAA Hurghada Branch	4 May 2026	▪ Confirmed that the Project is located outside designated protected areas. ▪ Advised that the proposed biodiversity survey methodology is considered adequate for the Project. ▪ Highlighted the ecological importance of Wadi Dara as a bird attraction area and recommended giving particular consideration to migratory bird impacts. ▪ Recommended coordination with the Soaring Birds Project and petroleum companies during Project development. ▪ Confirmed the environmental permitting and monitoring requirements applicable during the construction and operational phases.
General Petroleum Company (GPC)	6 May 2026	▪ Confirmed that the proposed OHTL intersects existing electricity cables, oil pipelines, gas pipelines and petroleum concession areas. ▪ Recommended undertaking detailed coordination with GPC prior to finalizing the Project layout and commencing construction activities. ▪ Confirmed that joint field inspections should be undertaken to verify the locations of existing underground infrastructure. ▪ Advised maintaining the required 6m right-of-way on either side of gas pipelines. ▪ Confirmed that formal coordination prior to construction is mandatory and that the coordination meeting minutes will constitute the Company's no-objection.
Local Unit of Wadi Dara	28 April 2026	▪ Confirmed that Ras Gharib City is the nearest permanent settlement to the Project area. ▪ Confirmed that Wadi Dara is occupied primarily by seasonal workers, agricultural activities and petroleum company accommodation. ▪ Identified existing community infrastructure, including farms, groundwater wells, agricultural facilities and community services.

		▪ Recommended engaging farm owners, workers and Bedouin representatives throughout the stakeholder engagement process. ▪ Highlighted the importance of maximizing employment opportunities for local communities and supporting local services where feasible.
Radio and Television Unit Ras Gharib and Red Sea Governorate - National Media Authority	4 May 2026	▪ Confirmed that the proposed Project is not expected to generate electromagnetic interference affecting radio or television broadcasting. ▪ Identified the locations of existing microwave transmission stations within the wider Project area. ▪ Recommended undertaking joint site inspections during the detailed design stage to confirm that the OHTL does not obstruct line-of-sight communication. ▪ Advised maintaining an appropriate buffer from key broadcasting facilities.
Ras Gharib City Council	30 April 2026	▪ Confirmed that the Project falls within the administrative boundaries of Ras Gharib City. ▪ Confirmed that no conflicts with existing land use plans were identified. ▪ Recommended coordinating with utility providers, emergency services and other relevant authorities throughout Project implementation. ▪ Recommended disseminating employment opportunities through the City Council and Labour Office to maximize local employment. ▪ Highlighted the importance of implementing coordinated CSR initiatives to address community priorities.
Ras Gharib Drinking Water and Wastewater Company	30 April 2026	▪ Confirmed that Ras Gharib receives potable water from the Al-Kureimat pipeline, while Wadi Dara is supplied by water tankers. ▪ Recommended coordinating potable water supply with the Company or the Local Unit of Wadi Dara during construction and operation. ▪ Confirmed that licensed contractors should be used for potable water supply and wastewater management services. ▪ Advised obtaining the necessary permits for contractors and service providers prior to Project implementation. ▪ Confirmed that continued coordination with the Company will be required throughout Project implementation.
Bedouin Families (Al-Hamadin Tribe)	4 May 2026	▪ Confirmed that the wider Project area is used seasonally by Bedouin communities for livestock grazing, temporary settlement, and camel watering following rainfall events. ▪ Identified the presence of seasonal tents and nearby water wells (Shokeir Well and Wadi Shajara Well) within the wider Project area. ▪ Confirmed that no cultural or historical sites of significance occur within the proposed OHTL corridor. ▪ Recommended coordinating future stakeholder engagement through tribal representatives and providing advance notice of consultation activities. ▪ Highlighted the importance of clearing landmines prior to construction and prioritizing local employment opportunities, particularly for security services. ▪ Recommended implementing community development initiatives to support low-income households within the surrounding communities.

5. REGULATORY AND POLICY FRAMEWORK

This section presents the environmental clearance process in Egypt, the key E&S legislations that are applicable for the Project, and the relevant international E&S standards and requirements.

5.1 Egypt E&S Regulatory Context

This section lists those legislations that are directly related to E&S 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 to each of the environmental and social parameter being studied and assessed within the ESIA.

Table 5: National Legislation and Guidelines Governing the E&S Compliance for the Project

Legislation
Landscape and Visual
Environmental Law No. 4 of 1994 (amendments in Environmental Law No. 9 of 2009)
Land Use
Expropriation of Real Estates for Public Interest Law - Law 10/1990
Civil Code 131/1948
Building Law No. 119 of year 2008
Law 557/1954
Unified Building Law – Article 39
Geology, Hydrology, Hydrogeology
Environment Law 4/1994
Biodiversity
Environment Law 4 of 1994
Natural Protectorates is Law 102/1983
Archaeology and Cultural Heritage
Archaeology Law 117/1983
Air Quality and Noise
Environment Law 4/1994 amended by Environment Law 9/2009 and Executive Regulations (ER)710/2012
ERs (amended by Decree 1095/2011 amended by Decree 710/2012) which include maximum limits of ambient air pollutants and noise emissions
Modified ERs (710/2012) of Environment Law 4/1994
Environment Law 4/1994 and its modified ERs
Infrastructure and Utilities
Traffic Law 66/1973, amended by Law 121/2008
Electricity Law No. 87 of year 2015
Petroleum pipelines Law 4/1988
Telecommunication Regulation Law 10/2003
Management of Solid Waste, Hazardous Waste and Wastewater
Environment Law 4/1994 amended by Environment Law 9/2009 and ER 1095/2011 amended by Decree 710/2012)
Ministerial Decree 44/2000 The Executive Regulations of Law No. 93/1962 on the Drainage of Liquid Wastes, Decree of Law 93/1962
Solid Waste Management Law - Law 202/2020
Socioeconomics

Law 94/2003 on Establishing the National Council for Human Rights
EEAA EIA guidelines
Occupational Health and Safety
Environment Law 4/1994 amended by Environment Law 9/2009 and ER 1095/2011 amended by Decree 710/2012)
Labour Law No. 14 of 2025
Labour Law No. 12 of 2003 and its amendments by Labor law No. 14 of 2025[7]
Law 12/2003 on Labor and Workforce Safety and Book V on Occupational Safety and Health (OSH) and assurance of the adequacy of the working environment
Labor Law - Law 137/1981
Decree 458/2007 - defining maximum limits for criteria and requirements necessary for drinking water and domestic use.
Law 73/2021: Occupational Safety and Health Law
Labor and Working Conditions
Labour Law No. 14 of 2025
Labour Law No. 12 of 2003 and its amendments by Labor law No. 14 of 2025[8]
Law No. 148 of 2019, which came into force on January 1, 2020

5.2 International Agreements

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

Table 6: Relevant International Conventions and Agreements

Name of Multilateral E&S Agreement	Year
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

[7] It is important to clarify that while Labor Law No. 12 of 2003 remains in force, the Egyptian Parliament approved Labor Law No. 14 of 2025, which was published in the Official Gazette on May 3, 2025. Under its issuance provisions, it will enter into effect 90 days later, on August 1, 2025, and will be followed by the launch of specialized labour courts on October 1, 2025.

[8] It is important to clarify that while Labor Law No. 12 of 2003 remains in force, the Egyptian Parliament approved Labor Law No. 14 of 2025, which was published in the Official Gazette on May 3, 2025. Under its issuance provisions, it will enter into effect 90 days later, on August 1, 2025, and will be followed by the launch of specialized labour courts on October 1, 2025.

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
Name of Multilateral Environmental Agreement	
Kyoto Protocol	1997
Paris Agreement under the United Nations Framework Convention on Climate Change	2015
Health and Worker Safety	
International Labor Organization Core Labor 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
Human Rights	
UN Convention on the Elimination of All forms of Discrimination against Women	1981
UN International Covenant on Economic, Social and Cultural Rights	1982
UN Convention on the Rights of a Child	1990
UN Convention on the Rights of Persons with Disabilities	2008
UN International Covenant on Civil and Political Rights	1982

5.3 Requirements for Project Financing

The Project will be seeking financing from International Financing Institutions (IFIs). Therefore, the Wind Farm Developer wishes to design and manage the project in accordance with international E&S standards and requirements. For the ESIA, it will be based on the requirements of the following entities, each of which is discussed in further details below:

- International Finance Corporation (IFC) Policy on Environment and Social (E&S) Sustainability (2012), IFC Performance Standards (2012), and IFC Environment, Health and Safety (EHS) Guidelines including the IFC EHS Guidelines for the Wind Sector;
- European Bank for Reconstruction and Development (EBRD) Environmental and Social Policy

(2024) and associated Performance Requirements (PR);

- African Development Bank (AfDB).Integrated Safeguards System Policy Statement and Operational Standards (2023);

5.3.1 International Finance Corporation (IFC)

The IFC of the World Bank provides a range of guidance documents related to the assessment and management of E&S issues in project development. Not only does IFC guidance provide a generally accepted basis for good practice, but it also provides the technical cornerstone for the Equator Principles which set out the E&S requirements of banks for project finance. The IFC requirements have become the *de facto* international E&S performance benchmark for project financing.

The IFC policy on E&S Sustainability puts into practice IFC's overall commitments to E&S sustainability. The policy seeks to: (i) enhance the predictability, transparency, and accountability of IFC's actions and decision making; (ii) help clients manage their environmental and social risks and impacts and improve their performance; and (iii) enhance positive development outcomes on the ground. In addition, the Policy identifies IFC's commitments, its roles and responsibilities and other as applicable.

The IFC Performance Standards (PS) on Social and Environmental Sustainability set out a framework for managing and improving project performance from planning and assessment, through construction and operations to closure. The Performance Standards requirements are summarized in the table below.

Table 7: IFC Performance Standard Requirements

IFC PS	Key Points	Applicability for ESIA
PS 1: 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.	Applicable and considered for this ESIA
PS 2: Labor and Working Conditions	The requirements set out in the PS have been in part guided by a number of international conventions negotiated through the International Labor 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 labor and employment laws; ▪ To promote the workforce by addressing child labor and forced labor; and ▪ To promote safe and healthy working conditions, and to protect and promote the health of workers.	Applicable and considered for this ESIA

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.	Applicable and considered for this ESIA
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.	Applicable and considered for this ESIA
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.	Not applicable, Refer to "Section 7.2"
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.	Applicable and considered for this ESIA
PS 7: Indigenous Peoples	Indigenous peoples may be particularly vulnerable to the adverse impacts associated with project development, including risk of impoverishment and loss of identity, culture, and natural resource-based livelihoods. PS7 seeks to ensure that business activities minimize negative impacts, foster respect for human rights, dignity and culture of indigenous populations, and promote development benefits in culturally appropriate ways. PS 7 (Indigenous Peoples) is not considered to be applicable to this Project. The Indigenous World 2018 Report (IWGIA, 2018) states that Egypt is not classified as a country with indigenous people.	Not applicable,
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.	Applicable and considered for this ESIA

In addition, to the Performance Standards, the IFC have sector-specific EHS guideline documents. With regards to the ESIA the following are applicable:

- IFC General EHS Guidelines (2007): identifies detailed EHS management and technical recommendations which are applicable for all development projects; 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 sections that discuss the environmental attributes they relate to where national legislations are not available.

EHS Guidelines for Electric Power Transmission and Distribution (IFC, 2007): Provide guidance's and information to users on EHS issues related to transmission and distribution lines. The Guideline provides a summary of EHS impacts associated with transmission and distribution lines 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 sections that discuss the environmental attributes they relate to where national legislations are not available.

5.3.2 European Bank for Reconstruction and Development

EBRD's 2024 Environmental and Social Policy seeks to ensure, through its E&S 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.

Under EBRD's Environmental and Social Policy Annex B identifies large scale wind power projects are classified as "Category A" and which therefore have significant risks and require an ESIA.

To translate this objective into successful practical outcomes, EBRD has adopted a comprehensive set of E&S Requirements (ESR) covering key areas of environmental and social impacts and issues. EBRD expects clients to assess and manage the environmental and social issues associated with their projects so that projects meet their E&S Requirements. The E&S Requirements applicable are summarized in the table below.

Table 8: Overview of Key Points of EBRD Performance Requirements of Relevance to the Project

EBRD PR	Key Points Relevant to the Project	Applicability
ESR 1: Assessment and Management of E&S Risks and Impacts	This requirement outlines the process of appraising, managing and monitoring environmental and social issues associated with a project to include E&S management systems, E&S assessments, ESMP, organizational capacity, monitoring and reporting, etc.	Applicable and considered for this ESIA
ESR 2: Labor and Working Conditions	This requirement assures that human resources policies, procedures and standards will meet the following minimum requirements during the life of the Project with regards to labor and working conditions. This includes issues related to management of worker relationships to include HR policies and procedures, conditions of work, migrant workers, workers' organization, forced labor, child labor, non-discrimination and equal opportunity, grievance mechanism, contracted and supply chain workers, etc.	Applicable and considered for this ESIA

EBRD PR	Key Points Relevant to the Project	Applicability
ESR 3: Resource Efficiency and Pollution Prevention and Control	This requirement ensures that resources are utilized efficiently and impacts associated with polluting activities are controlled. This includes issues related to resource efficiency and circular economy, water, waste, pollution prevention and control, greenhouse gas emissions, safe use and management of hazardous substances and materials, pest management, and noise and vibration.	Applicable and considered for this ESIA
ESR 4: Health. Safety and Security	While bringing many positive benefits to local communities, projects can also increase the potential for community exposure to risks and impacts arising from temporary or permanent changes in population; transport of raw and finished materials; construction, operations and decommissioning; accidents, structural failures, and releases of hazardous materials. This performance requirement addresses the project proponent's responsibility to identify and to avoid or minimize the risks and adverse impacts to community health, safety and security as well as occupational health and safety.	Applicable and considered for this ESIA
ESR 5: Land Acquisition, Restrictions on Land Use 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. The requirement includes issues related to avoidance or minimization of displacement, forced eviction, negotiated settlements, socioeconomic surveys, inventory assessments and cut-off dates, valuations, eligibility and compensations, temporary land use restrictions, stakeholder engagement, grievance mechanism and other.	Not applicable
ESR 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	EBRD recognizes the need for the protection and conservation of biodiversity in the context of projects in which it invests. In pursuing these aims, this includes requirements related to assessment of risks and impacts, protection and conservation of biodiversity/Priority Biodiversity Features (PBF)/Critical Habitats (CH), legally protected areas, invasive alien species, sustainable management of natural resource, and supply chains.	Applicable and considered for this ESIA
ESR 7: Indigenous Peoples	Indigenous peoples may be particularly vulnerable to the adverse impacts associated with project development, including risk of impoverishment and loss of identity, culture, and natural resource-based livelihoods. The requirement seeks to ensure that business activities minimize negative impacts, foster respect for human rights, dignity and culture of indigenous populations, and promote development benefits in culturally appropriate ways.	Not applicable
ESR 8: Cultural Heritage	Cultural heritage is important as a source of valuable historical and scientific information, as an asset for economic and social development, and as an integral part of a people's cultural identity, practices, and continuity. EBRD requires the protection of cultural heritage from project activities to include archeological sites, built heritage, cultural landscape with natural features, movable cultural heritage, etc.	Applicable and considered for this ESIA

EBRD PR	Key Points Relevant to the Project	Applicability
ESR 9: Financial Intermediaries	This Requirement applies exclusively to projects where the EBRD provides funding through financial intermediaries (FIs) such as commercial banks, private equity funds, or microfinance institutions. In this case, the EBRD is providing direct financing to the project developer for the implementation of the Project. Since no financial intermediary is involved in the structure or disbursement of funds, the provisions of PR 9 are not applicable to this project.	Not applicable
ESR 10: Stakeholder Engagement	EBRD considers stakeholder engagement as an essential part of good business practice and corporate citizenship. In particular, effective community engagement is central to the successful management of risks and impacts on communities, as well as central to achieving enhanced community benefits. The requirement entailed identifying people or communities that are or could be affected by the Project, as well as other interested parties; ensure that such stakeholders are appropriately engaged on environmental and social issues that could potentially affect them through a process of information disclosure and meaningful consultation; and maintain a constructive relationship with stake holders on an ongoing basis through meaningful engagement during project implementation.	Applicable and considered for this ESIA

5.3.3 AfDB Requirements

The AfDB's had an Integrated Safeguards System (2015) to manage environmental and social risks, this ISS was updated by the ISS 2023. The Integrated Safeguards System (ISS) is a cornerstone of its strategy to promote growth that is socially inclusive and environmentally sustainable. The ISS is a powerful tool for identifying risks, reducing development costs and improving project sustainability, thus benefiting affected communities and helping to preserve the environment.

The Integrated Safeguards System not only promotes best practices in these areas but also encourages greater transparency and accountability. It upholds the voices of people who are affected by Bank-funded operations, especially the most vulnerable communities, by providing, for example, project-level grievance and redress mechanisms—a structured, systematic and managed way of allowing the voices and concerns of affected people to be heard and addressed during project planning and implementation.

The AfDB ISS 2023 includes the following Operational safeguards:

- E&S OS 1 (OS1): Assessment and Management of Environmental and Social Risks and Impacts

It addresses how the borrower will address the environmental and social risks and impacts of the project throughout the project life cycle to meet the requirements of the Environmental and Social Safeguards (ESSs) in a manner and within a time frame acceptable to the Bank.

This safeguard is applicable to most projects and applies to the current one.

- E&S OS 2 (OS2): Labor and Working Conditions

It recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth. Also, the importance of treating workers in the project fairly and providing safe and healthy working conditions and respect of workers 'rights to promote sound worker-management relationships and enhance the development benefits of a project.

This safeguard is applicable to the proposed project during the construction and operation phases.

- E&S OS 3 (OS3): Resource Efficiency and Pollution Prevention and Control

It recognizes that economic activities often cause air, water, and land pollution and consume finite resources that may threaten people, ecosystem services, and the environment at the local, regional, and global levels. It sets out the requirements to address resource efficiency and pollution prevention and management throughout the project life cycle in a manner consistent with GIIP.

This safeguard is applicable on the construction and operation phases of the project.

- E&S OS 4 (OS4): Community Health, Safety and Security

It recognizes that projects, activities, equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience an acceleration or intensification of impacts due to a project or activities. It addresses the health, safety, and security risks to and impacts on project affected communities and the corresponding responsibility of the Borrower to avoid or minimize them.

This safeguard is applicable on the construction and operation phases of the project.

- E&S OS 5 (OS5): Land Acquisition, Restrictions on Access to Land and Land Use, and Involuntary Resettlement

It recognizes that involuntary resettlement should be avoided, and where involuntary resettlement is unavoidable, it will be minimized, and appropriate measures to mitigate adverse impacts on displaced persons (and on host communities receiving displaced persons) will be carefully planned and implemented.

This safeguard does not apply to the proposed project since the activities will not involve any involuntary resettlement or change in the land use.

- E&S OS 6 (OS6): Habitat and Biodiversity Conservation and Sustainable Management of Living Natural Resources

It recognizes that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development. Also, recognizes the importance of maintaining core ecological functions of habitats, including forests, and the biodiversity they support in a changing climate, and the need to consider the livelihoods of project-affected parties. Also, addresses the sustainable management of primary production and harvesting.

This safeguard is applicable to the construction of most project components as they are located within a natural desert environment.

- E&S OS 7 (OS7): Vulnerable Groups

OS7 requires assessment and mitigation of impacts on vulnerable groups, including women, children, the elderly, and indigenous peoples. It contributes to poverty reduction and sustainable development by ensuring that projects supported by the Bank enhance opportunities for vulnerable groups to participate in, and benefit from, the development process in ways that do not threaten their unique cultural identities and well-being.

This safeguard is applicable on the construction and operation phases of the project.

- E&S OS 8 (OS8): Cultural Heritage

It sets out measures designed to protect cultural heritage throughout the project life cycle.

In case of chance finds, the procedures outlined in the Egyptian Antiquities Law No. 117 of 1983 will be followed.

Although no cultural heritage components are anticipated within the project site, the archaeological sites near the proposed project location will be addressed in the ESIA.

- E&S OS 9 (OS9): Financial Intermediaries

It recognizes that strong domestic capital and financial markets, and access to finance are important for economic development, growth, and poverty reduction. Also, it addresses the environmental and social (E&S) requirements associated with intermediated financing through financial and nonfinancial institutions.

This safeguard is not applicable to the present project.

- E&S OS 10 (OS10): Stakeholder Engagement and Information Disclosure

It recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice.

This safeguard is applicable on the construction and operation phases of the project.

In specific, the following AfDB policies and standards have been adopted:

- The Gender Policy (2001) and Bank Group Gender Strategy (2013)
- AfDB Civil Society Engagement Framework (2012)
- Disclosure and Access to Information Policy (2012)
- Policy on Poverty Reduction (2001)
- Policy for Integrated Water Resources Management (2000)
- Environmental and Social Assessment Procedures (ESAP)
- AfDB ISS Guidance Materials
- AfDB ISS Sector Key sheets
- The Presidential Directive on Exploitation, Abuse and Sexual Harassment (PD. 2021.02)

5.3.4 Other

There are additional international E&S standards and requirements that were considered throughout the ESIA study. Those are identified in the table below along with their applicability.

Table 9: Other International E&S Requirements and Standards

Requirement	Applicability for ESIA

IFC Good Practice Note – Addressing Grievances from Project-Affected Communities & IFC Good Practice Manual – Doing Better Business Through Effective Public Consultation and Disclosure	Those identify additional requirements that should be considered and taken into account as part of the planned stakeholder engagement activities as well as the SEP that is provided as a standalone document.
IFC Good Practice Note: A Good Practice Handbook for Companies Doing Business in Emerging Markets	The note identifies key concepts and principles of stakeholder engagement and how to integrate stakeholder engagement with the project cycle. This has been considered for the SEP that is provided as a standalone document.
EBRD and IFC Guidance Note on Worker's accommodation	Identify key issues of concern that should be addressed as well as best practice requirements to be taken into account in relation to worker accommodation
IFC Good Practice Note on Non- Discrimination and Equal Opportunity IFC Good Practice Note – Managing Retrenchment IFC Handbook for Labor and Working Conditions - Measure & Improve Your Labor Standards Performance Good Practice Note: Managing Risks Associated with Modern Slavery International Labor Organization (ILO) Conventions. This will include all ILO conventions signed and ratified by the Government of Egypt and at a minimum all ILO conventions covering core labour standards and all ILO conventions covering the basic terms and conditions of employment	Those are related to workforce management as applicable within the ESIA and associated management plans.
Good Practice Note (GPN) IFC's Use of Security Forces: Assessing and Managing Risks and Impacts	The handbook provides practical, project-level guidance for companies to better understand and implement the requirements outlined in PS 4. Sections focus on risk assessment, managing private security, managing the relationship with public security, preparing a security management plan, and assessing allegations or incidents related to security personnel.
UN Voluntary Principles on Security and Human Rights	Promotes implementation of a set of principles on providing security for their operations in a manner that respects human rights
Addressing Gender-Based Violence and Harassment (GBVH): Emerging Good Practice for the Private Sector	The note prevents the physical, sexual, emotional and financial harm GBVH causes to individuals, as well as the financial, reputational and legal risks it poses to businesses and investors
UNESCO Guidance and Toolkit for Impact Assessments in a World Heritage Context (2022)	Outstanding Universal Values (OUVs) (receptors of biological significance) identified in UNESCO nomination text and associated documents. Baseline surveys to identify the presence of OUVs and subsequent assessment of likely ecological impact of the project (construction and operation) on OUVs. Assessment should include a 'futures' assessment should the baseline ecological value of the WHS (and surrounding area) improve with wider conservation efforts.

6. ANALYSIS OF ALTERNATIVES

This section presents the alternatives that were considered for the Project development to date. This includes site alternatives as well as design alternatives, both of which are discussed in further details below.

6.1 Site Alternatives

The GoE has allocated land to NREA for the development of renewable energy projects along with their associated facility. Which is applicable to the 900MW Wind Farm and its associated facility (the Project) through usufruct rights pursuant to Prime Ministerial Decree No. (37/4/15/14) of 2015, as subsequently regulated and amended by Cabinet Decree No. 54 of 2023 and Prime Minister's Decree No. 55 of 2024. 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 7,600 km² in the GoS, east and west of the Nile, Benban, and Kom Ombo regions, of which about 5,700 km² (75% share) were designated for wind projects and 1,900 km² (25%) for solar energy projects (25% share). These projects are being developed through usufruct rights, which grant the government the right to use the land while retaining ownership.[9]

As discussed earlier under "Section 1.1", the Wind Farm Developer signed a MoU with the Government of Egypt. The Project is located inside an area of land allocated to NREA for the development of renewable energy development projects, as shown in the figure below.

In general, the key factors considered by the GoE and NREA for selection of such areas included the following:

- Areas to be under governmental ownership and therefore do not require any land acquisition measure;
- Areas to be mostly free from competing uses such as agricultural or housing developments to avoid resettlement and livelihood restoration requirements;
- The access to the areas should be easy requiring only limited road construction measures.

Based on the above, NREA granted the Wind Farm Developer full access rights to the specific Project for the development of a 900MW wind farm Project and its associated facilities (the Project). Therefore, taking the above into account, there are no site alternatives that were considered by the Wind Farm Developer in this case.

It is important to note that the Wind Farm Developer had no authority, influence or decision in the site selection process as land allocation was handled by the Ministry of Electricity for the Project. In addition, the entire Gulf of Suez area is now planned for new and additional wind farm and/or green hydrogen developments further restricting availability of any alternative lands within the area. The above information has been included within the section as well.

It is important to emphasize that the development process of the Overhead Transmission Line (OHTL) falls entirely under the responsibility of the Egyptian Electricity Transmission Company (EETC), without any influence or authority from the Wind Farm Developer over this process. This includes all stages of route planning, site identification, planning, construction, operation, and maintenance. This provides details about the selection process for the proposed OHTL route, to the maximum extent possible, based on

[9] Renewable Energy Incentives (IRENA, 2018)

information obtained from EETC through the Wind Farm Developer. EETC clarified that the route selection process was based on:

- A survey and analysis of the route conducted for the area.
- The technical requirements stated in the "Electrical Grid Stability of the Suez Gulf Region" study issued by EETC.

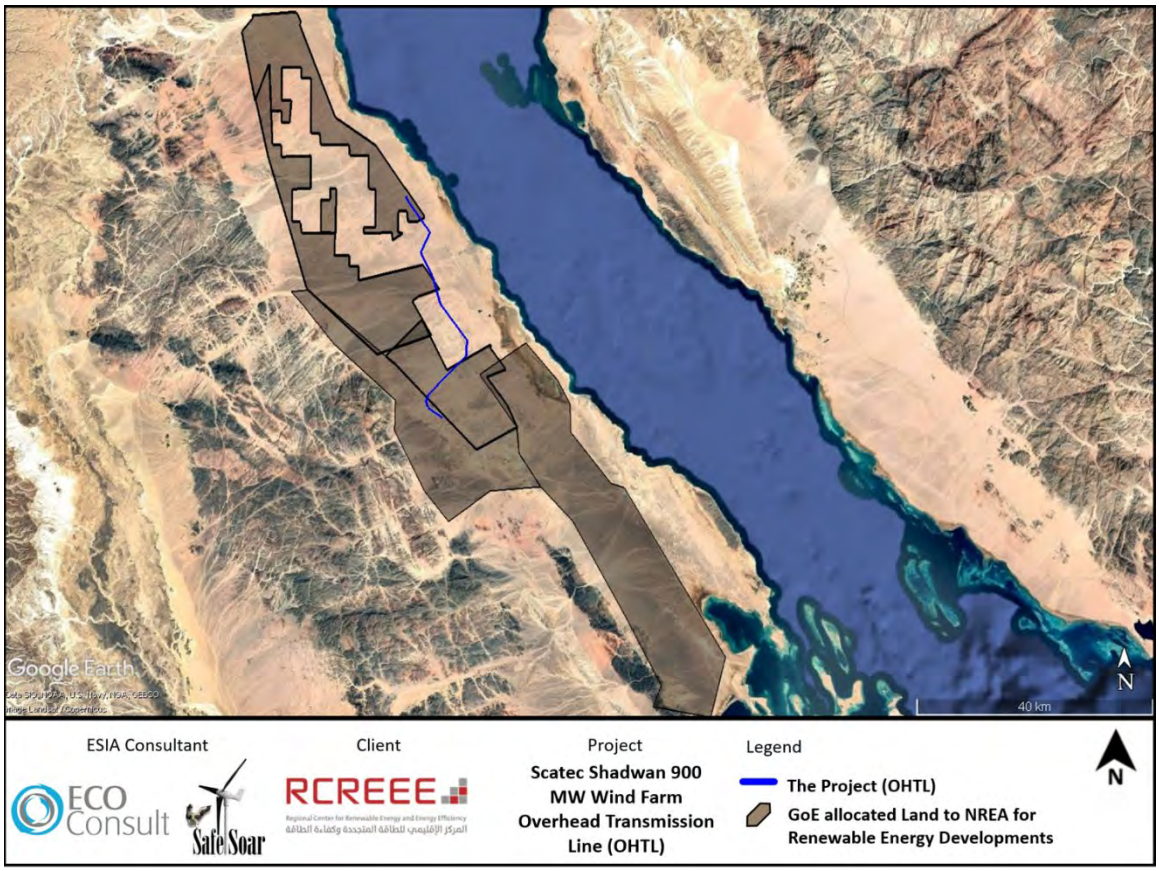


Figure 6: The Project in relation to NREA land

6.1.1 Technical Requirements for the Transmission Network

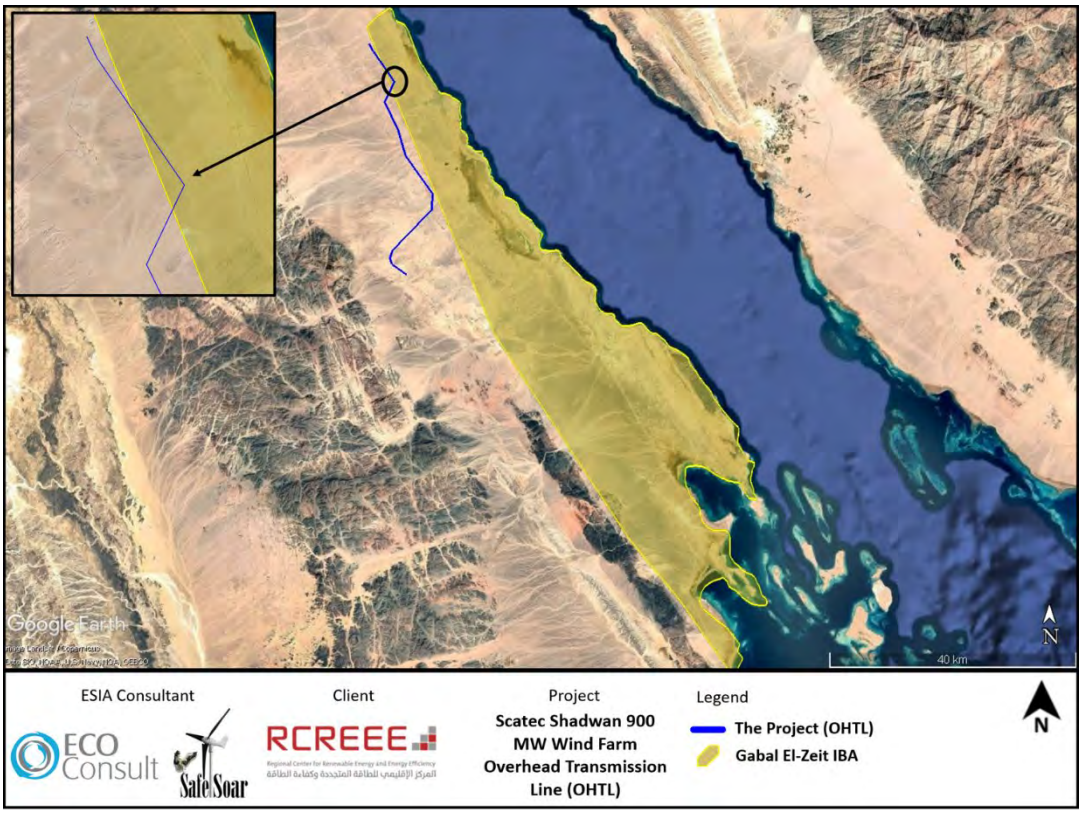
Selection of the proposed OHTL route was informed by the electrical network stability studies undertaken for the Gulf of Suez area by EETC. These studies identified the principal technical and engineering requirements governing route selection, including the following:

- Required separation distances and right-of-way (ROW) requirements between transmission lines.
- Optimal connection points at the substation.
- Electrical and mechanical coordination requirements.
- Engineering constraints associated with terrain conditions and prevailing wind directions.

Collectively, these criteria played a key role in identifying the technically preferred route alignment for the proposed transmission infrastructure.

6.1.2 Overhead Transmission Lines and Important Bird Areas (IBAs)

As part of efforts to avoid and minimize potential impacts on the Gebel El-Zeit Important Bird Area (IBA), the Developer engaged in extensive consultations with the Egyptian Electricity Transmission Company (EETC) to explore opportunities for optimizing the Overhead Transmission Line (OHTL) alignment. During these discussions, the Developer requested that the OHTL route for the Shadwan Wind Power Project be modified to reduce its interaction with the IBA to the greatest extent practicable.



However, the assessment concluded that the proposed alignment represents the most suitable option, as it traverses only a limited section of the IBA (approximately 800m), whereas the alternative alignment would extend to approximately 8.5 km along the northwestern boundary of the IBA, thereby increasing the overall interaction with this environmentally sensitive area.

Furthermore, the route selection and design process was informed by environmental considerations, including the presence of migratory bird pathways and areas of bird congregation. The alignment was reviewed and refined, where practicable, to avoid and minimize potential impacts, and appropriate mitigation and design measures were incorporated into the final OHTL design in accordance with Good International Industry Practice (GIIP) and applicable environmental requirements.

6.2 Design Alternatives

The Wind Farm Developer is committed to ensuring that all identified E&S constraints identified throughout the ESIA process are considered fully throughout the Project design, specifications and layout.

6.2.1 OHTL Alignment Configurations

In sections where the Project runs in parallel with an existing OHTL, a staggered tower configuration has been adopted rather than an opposite alignment arrangement. This configuration was selected as part of the Project's design optimization process to minimize potential environmental and operational impacts to the extent practicable.

The staggered arrangement is expected to improve the visibility of the transmission infrastructure and reduce the concentration of structural elements within a single visual corridor from both human and avifauna perspectives. In addition, the adopted configuration is anticipated to reduce the potential risk of bird collisions, particularly for migratory species, while also providing greater design flexibility and enhancing overall operational safety and reliability.

6.3 No-Project Alternative

The 'No Project' alternative assumes that the 900MW 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 – vast barren desert grounds with very limited vegetation with no particular land use.

Should the Project not move forward, then the Project-related negative E&S 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 mitigations discussed throughout this ESIA. Nevertheless, should the Project not move forward; the significant and crucial positive economic and E&S benefits would not be realized. Such benefits include the following:

- This development allows for more sustainable development and shows the commitment of the Government of Egypt to realizing 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 project development. In the case of this Project, it is important to weigh the significant positive economic and E&S impacts incurred from the Project development, against the negative E&S impacts anticipated at the site-specific level – in which generally the ESIA concludes that they can be mitigated, managed and controlled to acceptable levels. The comparison in this Section clearly concludes that the 'no Project' alternative is not a preferable option.

7. EXISTING PHYSICAL, BIOLOGICAL AND SOCIAL ENVIRONMENT

7.1 Landscape and Visual

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

7.1.1 Methodology for Assessment

A. Secondary Data Review

Prior to the undertaking of any site-related surveys, a full and detailed review of up-to-date high-quality satellite images for the Project area was undertaken. The objective was to aim to understand site topography and landscape character, and more importantly identify any potential visual receptors within the entire Project footprint and boundary so that it can be inspected during the site survey.

The definition of key critical visual receptor was based on the "Guidelines for Landscape and Visual Impact Assessment (GLVIA)" (Landscape Institute, 2013) as defined below.

Critical Receptors definition per GLVIA
Residents at home.
People engaged in outdoor recreation, whose attention/interest is likely to be focused on the landscape or particular views, including from public rights of way.
Communities where views contribute to landscape setting enjoyed by residents.
Visitors to heritage assets or other attractions, where views of the surroundings are an important contributor to the experience.
Travelers on scenic routes

B. Site Survey

A detailed site survey for the Project area was undertaken in March 2026 to characterize the general topography and landscape of the Project area as well as any potential visual receptors onsite.

7.1.2 Results and Outcomes

A. Landscape and Topography

The proposed OHTL is located within the western side of the Gulf of Suez, one of Egypt's principal renewable energy development corridors. The wider area is characterized by an expansive desert landscape that has undergone substantial renewable energy and petroleum development over recent decades, while largely retaining its natural arid character. The visual setting is defined by broad open desert plains, limited vegetation cover, distant mountain backdrops, and extensive views across the surrounding landscape.

The OHTL alignment extends through predominantly undeveloped desert terrain situated between the Red Sea Mountains to the west and the Gulf of Suez coastline to the east. Throughout most of the corridor, the landscape is characterized by open gravel plains with sparse natural vegetation, intersected by existing access roads serving renewable energy facilities, and associated utilities. These existing developments are generally dispersed across the wider landscape and do not dominate the overall visual character of the Project area.

A detailed walkover survey was undertaken along with the proposed OHTL alignment and within an approximate 100 m buffer to characterize the existing landscape setting and identify the principal landscape units. The survey confirmed that the OHTL traverses a predominantly open desert landscape with extensive visibility along much of the corridor and limited natural screening.

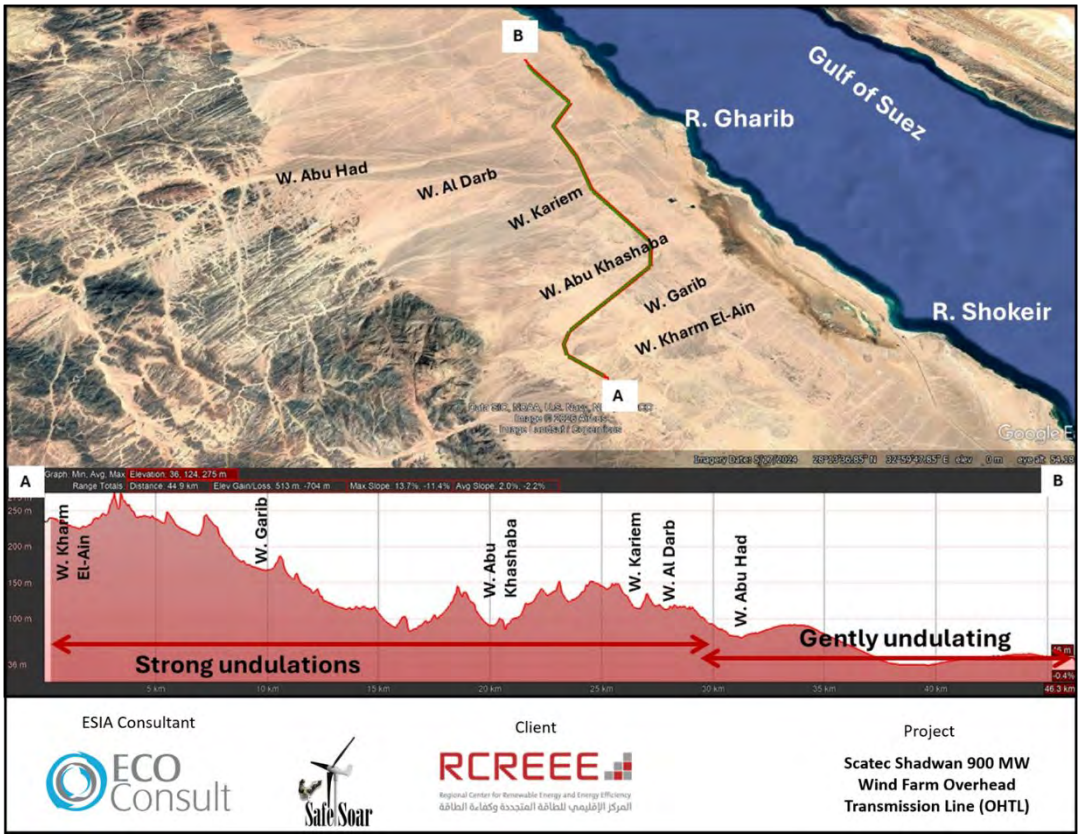


Figure 7: Topographic Elevation Profile along the OHTL Route

Based on observations made during the field survey, two principal landscape character zones were identified along the OHTL alignment:

- A southern strongly undulating landscape, characterized by variable relief, rocky hills, gravelly plains and numerous shallow drainage corridors, resulting in a more visually diverse landscape with greater local variation in landform.
- A northern gently undulating landscape, characterized by relatively uniform gravel plains, broad open terrain, minor gravel ridges and isolated low rises, creating a simpler and more homogeneous landscape with extensive long-distance views.

The broader landscape is traversed by numerous drainage systems (wadis) originating from the Red Sea mountainous massif and draining eastward toward the Gulf of Suez. These wadis form an integral component of the regional geomorphological setting and contribute to the transport and deposition of sediments derived from the granitic mountain terrain onto the coastal plain. In addition, these drainage systems provide localized groundwater recharge through seasonal runoff and infiltration processes.

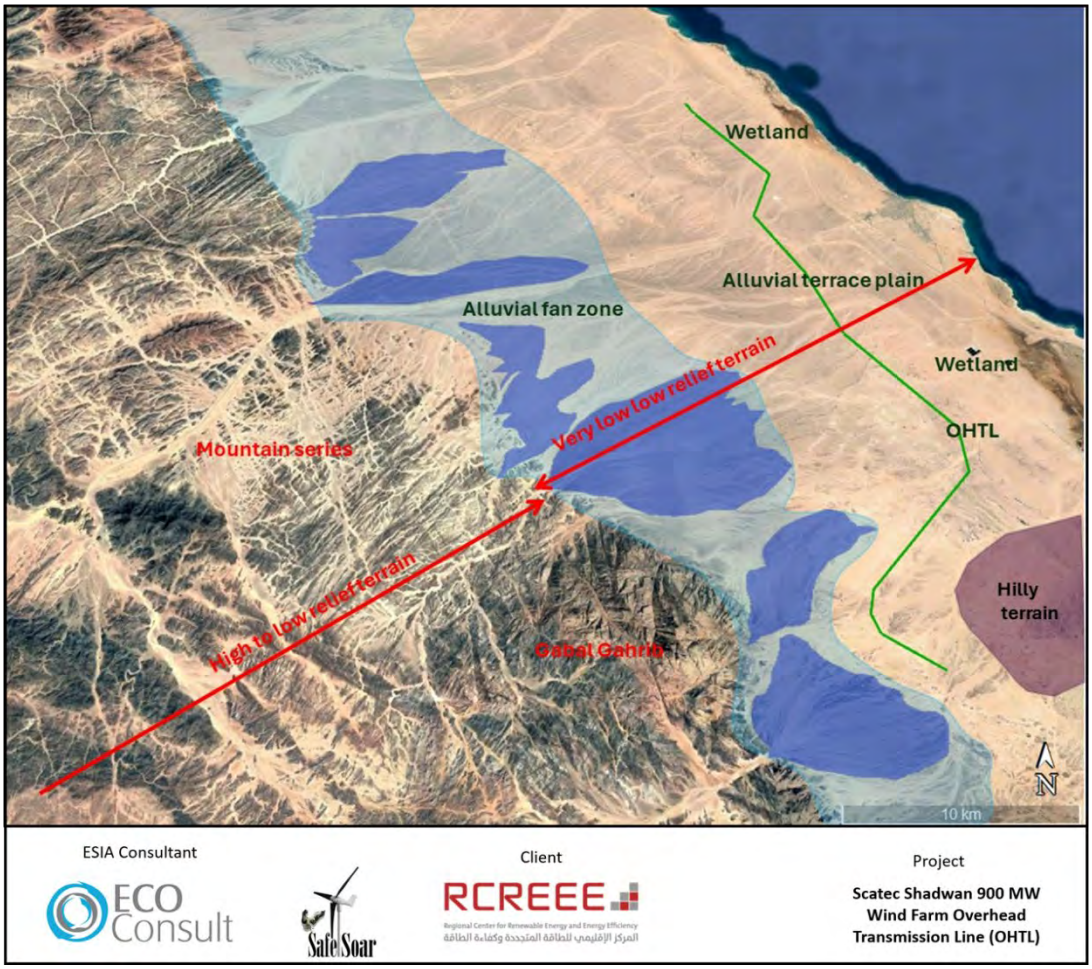


Figure 8: The Landforms

Although these two landscape character zones differ in terms of local relief and visual complexity, both retain a distinctly natural desert character that is typical of the western Gulf of Suez coastal plain. The transition between the more rugged southern section and the flatter northern section is gradual, with the overall landscape remaining largely devoid of permanent settlements, intensive land uses, or substantial natural vegetation.

B. Visual Receptors

Based on the field survey and desktop review undertaken, no sensitive visual receptors were identified within or immediately adjacent to the proposed OHTL alignment. The field assessment, which included a walkover survey along the OHTL route and within an approximate 100 m buffer, confirmed that the Project traverses predominantly desert terrain with no visually sensitive receptors that could be directly affected by the Project.

A desktop review extending to a 50 km radius from the Project identified a number of visual receptors within the wider study area. These comprise predominantly natural landscape features, including the Red Sea Mountains, alluvial plains, coastal sabkhas, and the Gulf of Suez coastline, together with existing anthropogenic features such as petroleum facilities, renewable energy developments, and associated infrastructure.

Table 10: Visual Receptors within 50km of the Project Site

Receptor ID	Type	Coordinates	Area (m^2)	Description
G. Gharib	Elevated mountains	28.131048°N 32.907536°E	Mountain series Slope = 27%	mountainous peaks of granitic rocks
Alluvial fan	Wadi deposits	28.082967°N 32.986407°E	Unlimited number and areas Slope = 1.1%	Spread out of sediments and accumulate in a fan-like shape.
Alluvial terrace	Outlet of drainage basins	28.196547°N 33.051211°E	Unlimited number and areas Slope = 1.1%	Low relief to gently sloping surfaces with slope gradients commonly <2%
Wetlands	Coastal sabkha	28.154691°N 33.207754°E	65 km2	flat, saline, poorly drained terrain with shallow groundwater,
Gebel El Zeit	Topographical landmark	27.951809°N, 33.497824°E	≈26,000,000	An ancient mining area in Egypt. It is a bottle neck for migratory birds in both spring and autumn seasons
El Zeit Bay	Topographical landmark	27.790730°N, 33.519752°E	≈74,000,000	is one of the most important oil-bearing fields in the Gulf of Suez
Quaternary deposits	Coastal Plain Deposits	28.105185°N 33.027232°E	Wide unlimited areas	Unconsolidated sands, gravels, and alluvial deposits
		28.262306°N 33.034561°E		
		28.411478°N 32.982931°E		
Tertiary Sediments	Sabkha and Saline Flats	28.154691°N 33.207754°E	65 km2	Low-lying coastal depressions contain sabkhas (salt flats) and saline mudflats
	Sandstone, Shale, Evaporites Conglomeratic horizons		Isolated hills	Remnants of structure controlled Isolated hills dissected by drainage channels
Scattered desert vegetation	Sparse halophytic and xerophytic plants	28.343927°N, 33.110482°E	≈28,000,000	One of the major oil-producing regions on the Gulf of Suez
Ras Gharib	Residential area	28.343927°N, 33.110482°E	≈28,000,000	One of the major oil-producing regions on the Gulf of Suez
Ras Shukeir	Residential area	28.129873°N, 33.267633°E	≈11,000,000	It is a key transit hub for crude oil exports and domestic energy infrastructure on the Gulf of Suez
Wadi Dara village	Residential area	27.995772°N, 33.237264°E	≈21,000,000	The most important agricultural project in the Red Sea
Small Oasis	Sheikh Shager	28.162835°N 33.072830°E	650,000	A small groundwater-fed oasis inhabited by one Bedouin family and sustained through irrigation from a hand-dug well
Al Hamd oil treatment station		28.450022°N, 33.012978° E	≈184,500	treat oils, and optimize production of GPC and other companies operating in the Ras Gharib
General petroleum company		28.402197°N, 33.049159°E	≈468,000	is the national arm of the Egyptian petroleum sector
Gharib gas collection station		28.347579°N, 33.098277°E	≈184,000	Collects gas and piped to a treatment system to remove moisture and other contaminants

Ras Gharib port	Natural Oil and gas facilities	28.331644°N, 33.111392°E	≈15,000	It serves as a pivotal maritime facility, particularly for the oil and gas.
SUCO petroleum company		28.325291°N, 33.109204°E	≈ 45,000	Producers of crude oil and gas in Egypt
		27.801517°N, 33.568003°E	≈230,000	
AMAL Petroleum Co		28.029749°N, 33.403058°E	≈80,000	
AMAPETCO oil and gas C		28.020962°N, 33.421375°	≈100,000	
PetroGulf Petroleum Co.		27.814157°N, 33.563792°E	≈150,000	
Gas plant		28.052956°N, 33.336625°E	≈140,000	Process natural gas to make it suitable for use in various applications
Ras Shukeir gas plant		28.049569°N, 33.341940°	≈300,000	
Pyramids for Poultry	Poultry Farms	27.957525°N, 33.242339°E	≈50,000	Grandparent farms, hatcheries and a feed mill
Farms	Agricultural farms	27.962490°N, 33.185435°E	≈200,000	Palm
		27.966122°N, 33.187222°E	≈70,000	
		27.976700°N, 33.215792°E	≈200,000	
Ras Shukeir airport	Infrastructure	28.189001°N, 33.210691°E	≈450,000	Is Small airports serving the city of Ras Gharib
Gebel El Zeit airport	Infrastructure	27.827433°N, 33.533652°E	≈900,000	

The nearest permanent residential receptor is Ras Gharib City, located approximately 8km east of the northern section of the OHTL alignment. In addition, several dispersed agricultural farms, petroleum facilities, and renewable energy projects occur throughout the wider study area. However, these receptors are generally separated from the OHTL by considerable distances and are located within a landscape that already accommodates extensive linear infrastructure, including existing transmission lines, access roads, wind farms, and oil and gas facilities. Consequently, the existing visual character of the area has already been influenced by utility and energy-related development.

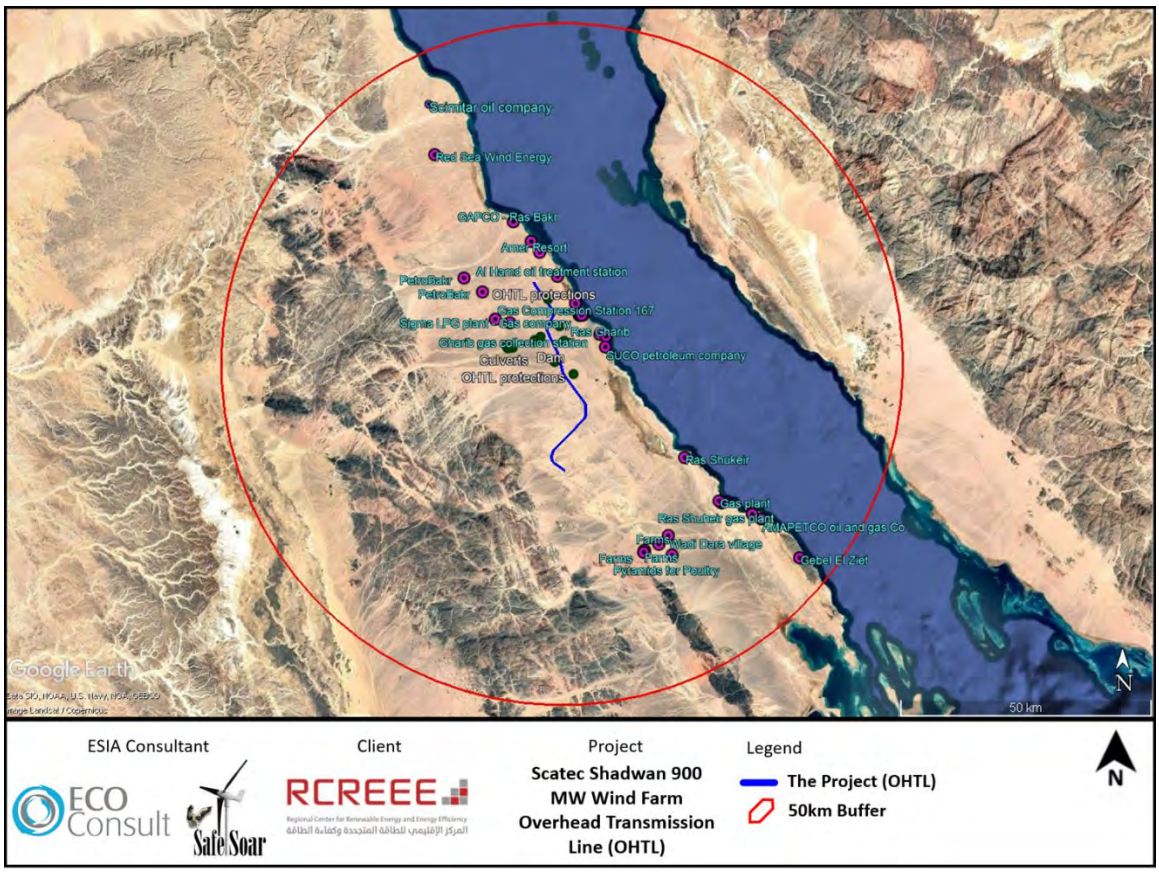


Figure 9: The Location of Visual Receptors within the 50km Buffer

In addition, based on the desktop review undertaken for a 50km radius, no other visual receptors were noted as shown in the figure and table above – all are not defined as key critical visual receptors based on the "Guidelines for Landscape and Visual Impact Assessment (GLVIA)" (Landscape Institute, 2013) as defined above.

7.2 Land Use

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

7.2.1 Methodology for Assessment

Assessment of baseline conditions was based on a site visit by the 'E&S Team' to the Project site and surrounding areas. The site visit aimed to understand in detail any land use activities undertaken onsite. In addition, consultations were undertaken with key stakeholders to better understand and characterize the land use activities onsite as discussed further throughout this section.

7.2.2 Land Ownership

The Government of Egypt has allocated to NREA the development of wind power projects. The Wind Farm Developer had no authority, influence or decision in the site selection process as the site was handed over by the Government to the Wind Farm Developer for development of the Project. In addition, the entire Gulf of Suez area is now planned for new and additional wind farm and/or green hydrogen developments. In general, key factors considered for selection of such areas required that areas had to be under governmental ownership in order not to require any land acquisition measures.

During consultations with NREA and Ras Gharib City Council, the 900MW Wind Farm and its associated facilities (the Project) site is located within a designated renewable energy development zone by NREA and is therefore under governmental ownership. NREA has a dedicated department responsible for land allocation for energy investments, which coordinates with several government entities, including the Ministry of Antiquities, Urban Planning, and the military authorities, among others.

NREA also confirmed that the land allocated for the proposed Project is not designated for any other development purposes, such as housing, industrial activities, or agricultural reclamation. The Project site lies within an NREA designated renewable energy development zone next to an existing windfarm, therefore there are no land acquisition measures considered for the Project development.

7.2.3 Results and Outcomes

Based on the site survey undertaken, no key land uses were identified to include: (i) physical structures (e.g. houses, tents, structures, etc.) and/or (ii) economic activities (e.g. grazing, agriculture, etc.). The Project site is located in a non-residential zone and does not overlap with any current residential, agricultural, or environmentally sensitive land uses.

- No physical structures were noted onsite (such as human settlements of structures). In addition, no man-made features appearing above ground were noted such as roads, electricity lines, pipelines, transmission lines, etc.
- No evidence of any economic activities to include in particular agriculture activities or grazing activities which are common practices undertaken by local communities. In particular, no ploughing marks were noted within the Project area (which would be indicative of agricultural activities) nor any livestock fecal remains (which could be indicative of grazing activities).
- No nomadic or Bedouin activity was noted within the Project site or evidence of such activities.

7.3 Geology, Hydrology and Hydrogeology

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

7.3.1 Assessment of Baseline Conditions

Baseline assessment was based on secondary data as available from desktop review as well as a standalone assessment undertaken by the Wind Farm Developer (through technical consultant) to include a geotechnical and hydrology assessment. In addition, a site assessment was undertaken to confirm and verify the outcomes of the literature review and document conditions on the ground.

The above entailed collecting information on the following:

- Geological conditions within the Project site include formations, soil types, and geomorphology along with illustrative maps.
- Hydrology conditions of the Project site to include catchment within which the Project is located along with maps as appropriate. This includes drainage patterns, runoff volumes and surface water resources; and
- Hydrogeology conditions of the Project site along with maps as appropriate. This includes groundwater resources, groundwater quality, etc.

7.3.2 Geology

Regionally, the Project area is located within the Gulf of Suez Rift Basin, which forms the northwestern arm of the Red Sea Rift System and represents one of Egypt's most prominent tectonic provinces. The Gulf of Suez is characterized by a series of northwest-southeast trending normal faults that have resulted in the formation of tilted fault blocks, horsts, grabens, and associated structural features, giving the region its distinctive rifted morphology. The Project site is situated within the Gharib Plain, a broad coastal plain extending parallel to the Gulf of Suez coastline and bounded by the Red Sea Mountains to the west and the Gulf of Suez to the east.

The geological succession within and surrounding the Project area comprises rock units ranging in age from the Late Paleozoic to recent Quaternary deposits. The oldest geological units are represented by Precambrian basement rocks, which crop out approximately 6 km west of the OHTL alignment along the foothills of Gabal Gharib (as displayed in figure below). These basement rocks consist predominantly of granitic intrusive rocks of varying composition, locally intersected by igneous dykes, and form the principal watershed of the surrounding mountainous terrain.

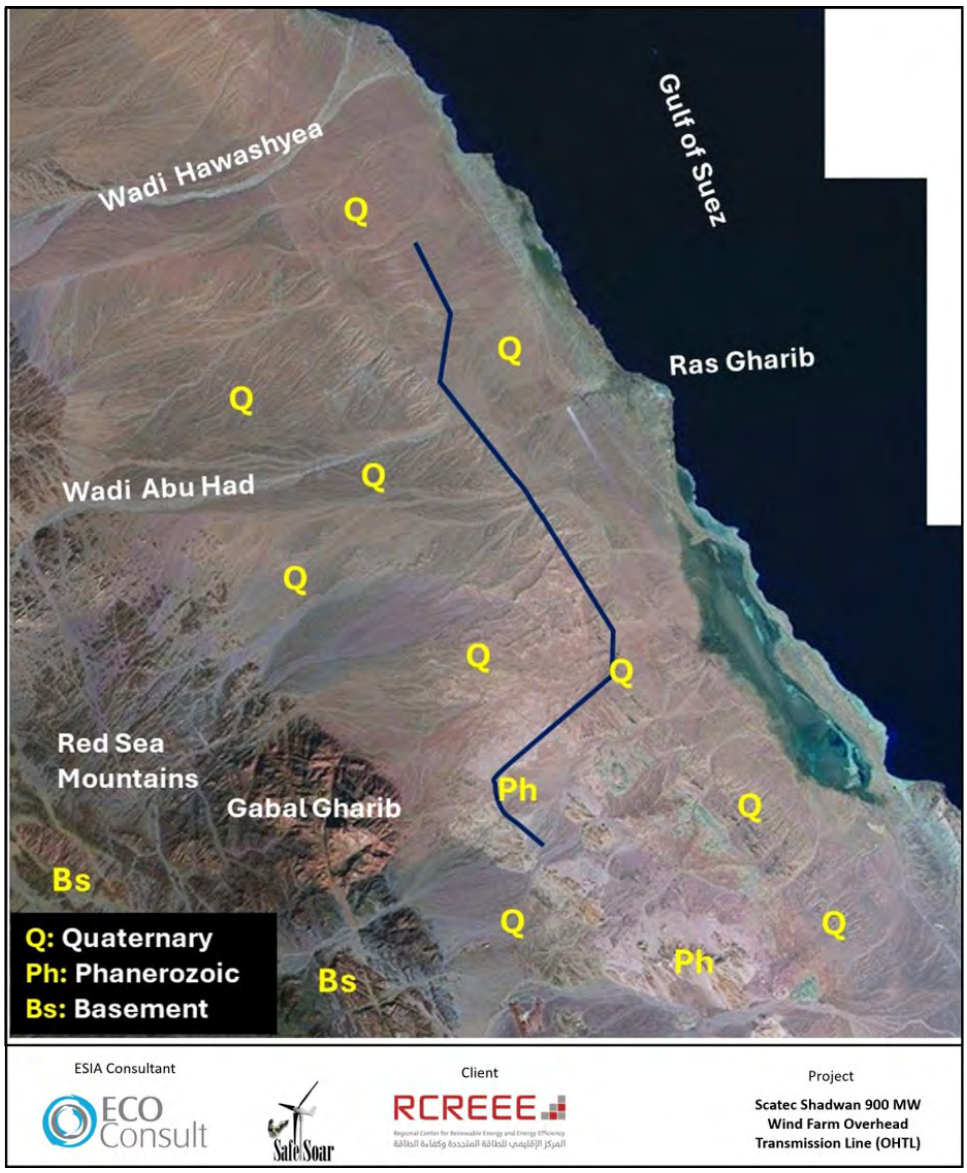


Figure 10: Land sat image showing the location of the OHTL. Q: Quaternary deposits, Ph: Phanerozoic rocks including all pre-rift sediments, and Bs Basement rocks (Precambrian igneous and metamorphic rocks).

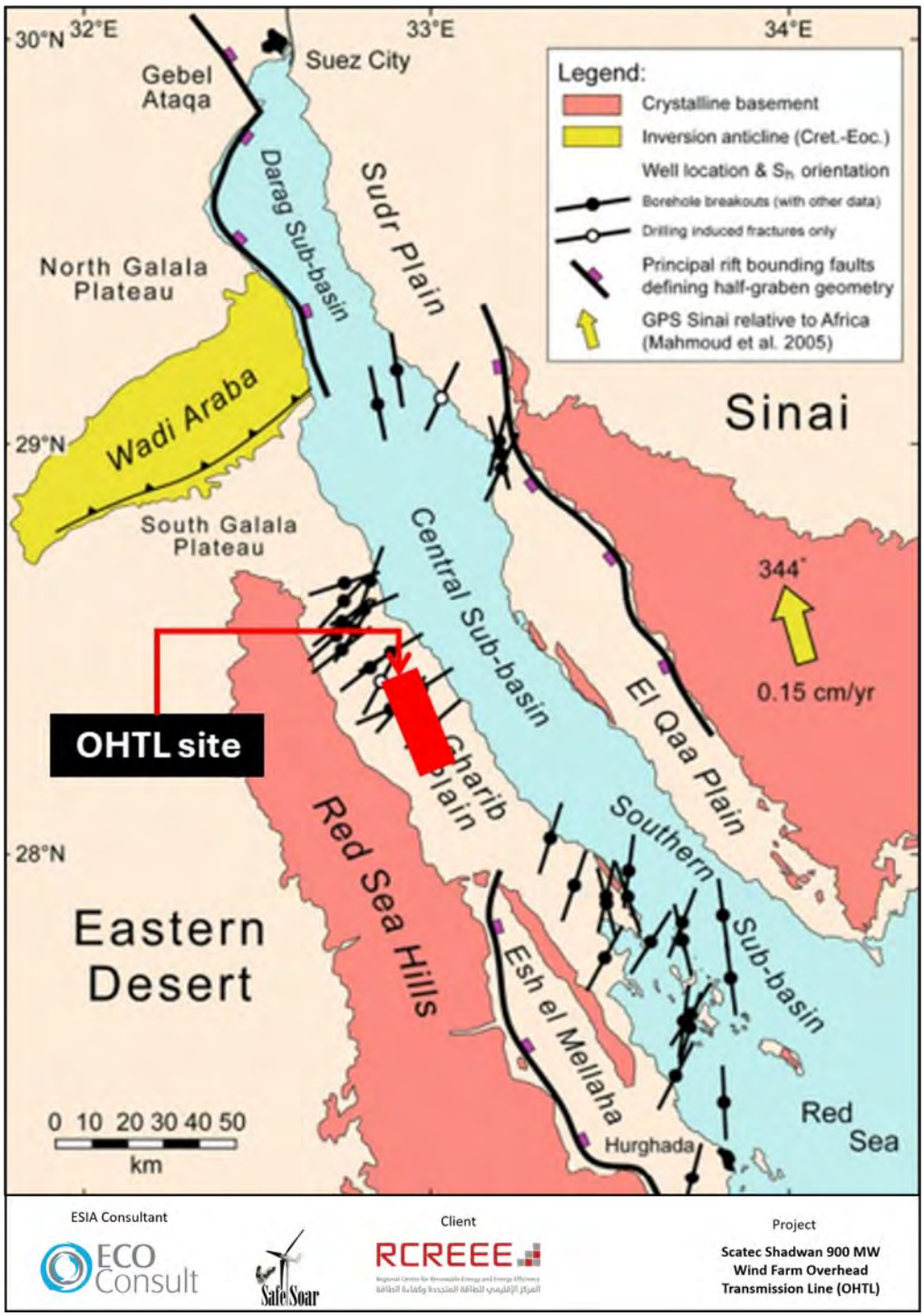


Figure 11: The Structure Domains of the Gulf of Suez (Bosworth and Durocher 2017).

Overlying the basement complex are Upper Cretaceous and Tertiary sedimentary successions, which are exposed within the hilly terrain crossed by the OHTL corridor. These formations comprise predominantly sandstone units together with carbonate and evaporitic deposits of Miocene age. The sedimentary sequence reflects the complex tectonic and depositional history associated with the evolution of the Gulf of Suez Rift Basin and forms isolated hills and ridges that are distributed along sections of the Project corridor.

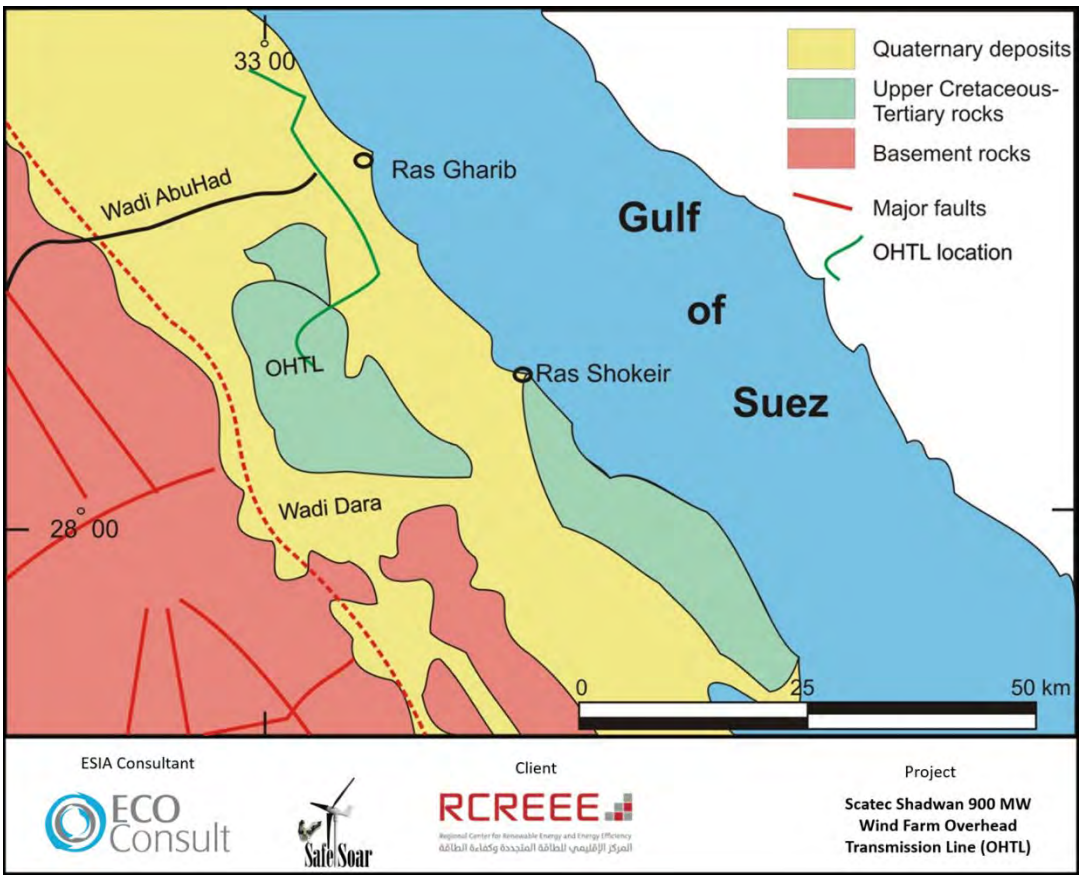


Figure 12: Regional Geological Map of the Area

Quaternary deposits constitute the dominant surficial geological unit across the majority of the Project area. These deposits comprise unconsolidated to semi-consolidated alluvial sediments derived from erosion of the adjacent Red Sea Mountains and transported eastwards through episodic wadi systems during flash flood events. The deposits consist primarily of gravel, cobbles, pebbles, sand and silt, with occasional clayey interbeds, and are distributed as extensive alluvial plains, sheet deposits and channel-fill sediments across the Gharib Plain. Grain size generally decreases away from the active drainage channels, with coarse gravel and cobble deposits concentrated within proximal wadi systems and elevated interfluves, whilst finer sandy and silty sediments occur within gently sloping terraces and distal depositional environments. These Quaternary deposits define the present-day ground surface across much of the OHTL corridor.

Overall, the geological setting of the Project area is representative of the western Gulf of Suez coastal plain, where Quaternary alluvial deposits overlie older sedimentary formations and are bounded to the west by Precambrian crystalline basement rocks associated with the Red Sea Mountains. The distribution of these geological units reflects the structural evolution of the Gulf of Suez Rift Basin together with long-term erosional and depositional processes that continue to shape the present-day landscape.

Stratigraphy

The geology of the Project area and its surroundings (Figure 12) comprises a succession of lithological units ranging in age from the Late Paleozoic to recent Quaternary deposits. Based on the desktop review and

field investigations undertaken, the principal geological units and surficial deposits identified within the Project area are described below in stratigraphic order, from the oldest to the youngest.

Basement Rocks

Precambrian basement rocks are exposed west of the proposed OHTL alignment, with the nearest outcrops located approximately 6 km from the Project corridor. These rocks are composed predominantly of older and younger granitic intrusions that are intersected by igneous dykes of varying composition and orientation (Figure below). The basement complex forms the elevated mountainous terrain of Gebel Gharib and represents the oldest geological unit within the wider Project area.

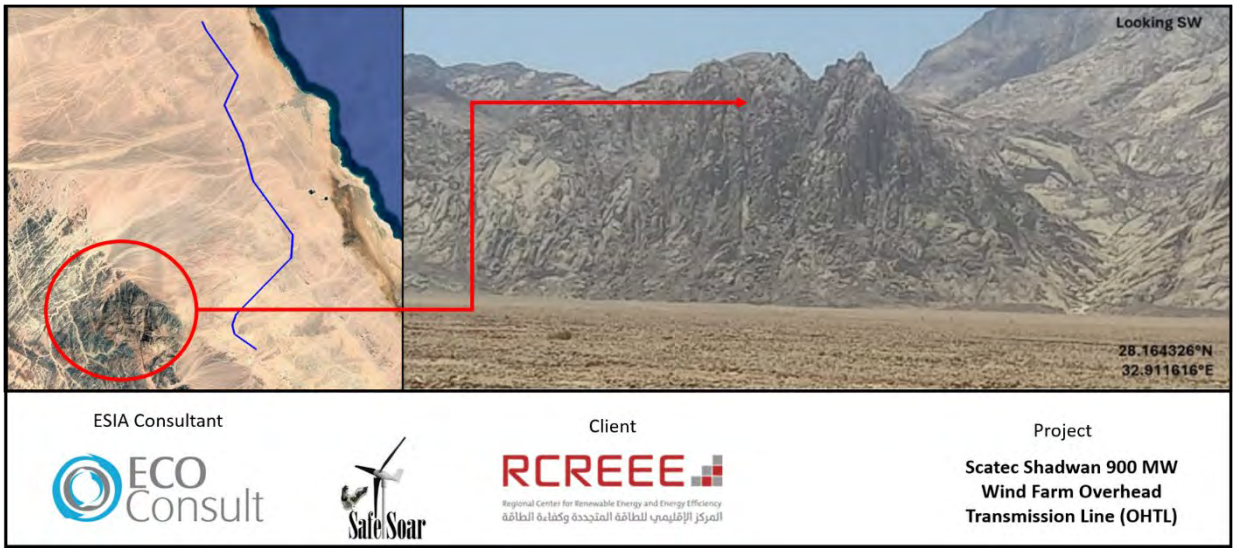


Figure 13: Basement rocks exposed at the foot slope of Gabal Gharib

Upper Cretaceous deposits (Sandstone and carbonates)

Upper Cretaceous sedimentary rocks are well exposed within the hilly sections of the OHTL corridor and are represented primarily by sandstone units together with locally developed carbonate horizons. These deposits are associated with the Upper Cretaceous–Tertiary succession and, owing to the weathering characteristics of sandstone, marl and evaporitic materials, are readily distinguished on satellite imagery by their relatively light-toned appearance compared with the surrounding Quaternary deposits and darker Precambrian basement rocks (Figure 13).

Field investigations confirmed the distribution of these units through direct observations supported by geological mapping and aerial imagery interpretation. Representative outcrops encountered during the field survey are presented in Figure below.

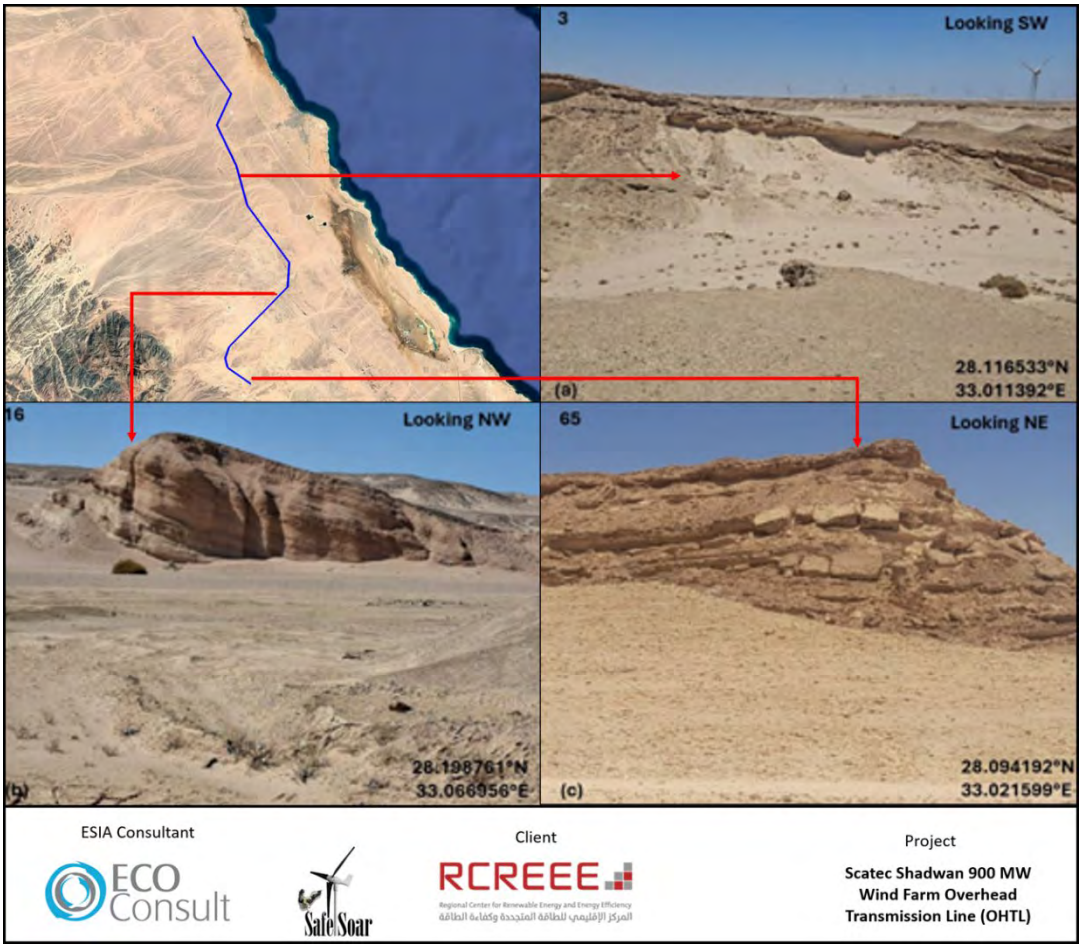


Figure 14: Field Photographs of the Upper Cretaceous sandstone

The Upper Cretaceous deposits typically occur as structurally controlled hills and ridges aligned with the regional tectonic framework of the Gulf of Suez Rift Basin. Their present-day morphology reflects the combined influence of faulting, differential erosion and weathering. Lithologically, the succession is dominated by sandstone, which commonly forms resistant outcrops, low escarpments and rocky ridges. Locally, carbonate interbeds occur within the sequence, forming more resistant horizons that contribute to variations in slope morphology and surface texture across the hilly terrain.

Miocene deposits

Miocene deposits are exposed predominantly within the central and southern sections of the OHTL corridor. These deposits generally form gently to moderately elevated hills and comprise shallow marine shale sequences underlain by conglomeratic beds. The shale units are typically weakly to moderately indurated and weather to form relatively gentle slopes, whereas the conglomeratic horizons exhibit greater resistance to weathering and commonly form more prominent topographic features.

The basal conglomerates comprise coarse gravels and pebbles embedded within a sandy to calcareous matrix, reflecting deposition within high-energy marginal marine and nearshore environments during the early stages of Miocene sedimentation. These units are commonly overlain by evaporitic deposits that form isolated low-relief hills distributed throughout the Project area. At the ground surface, the evaporitic units are expressed as resistant mounds displaying distinctive weathering characteristics.

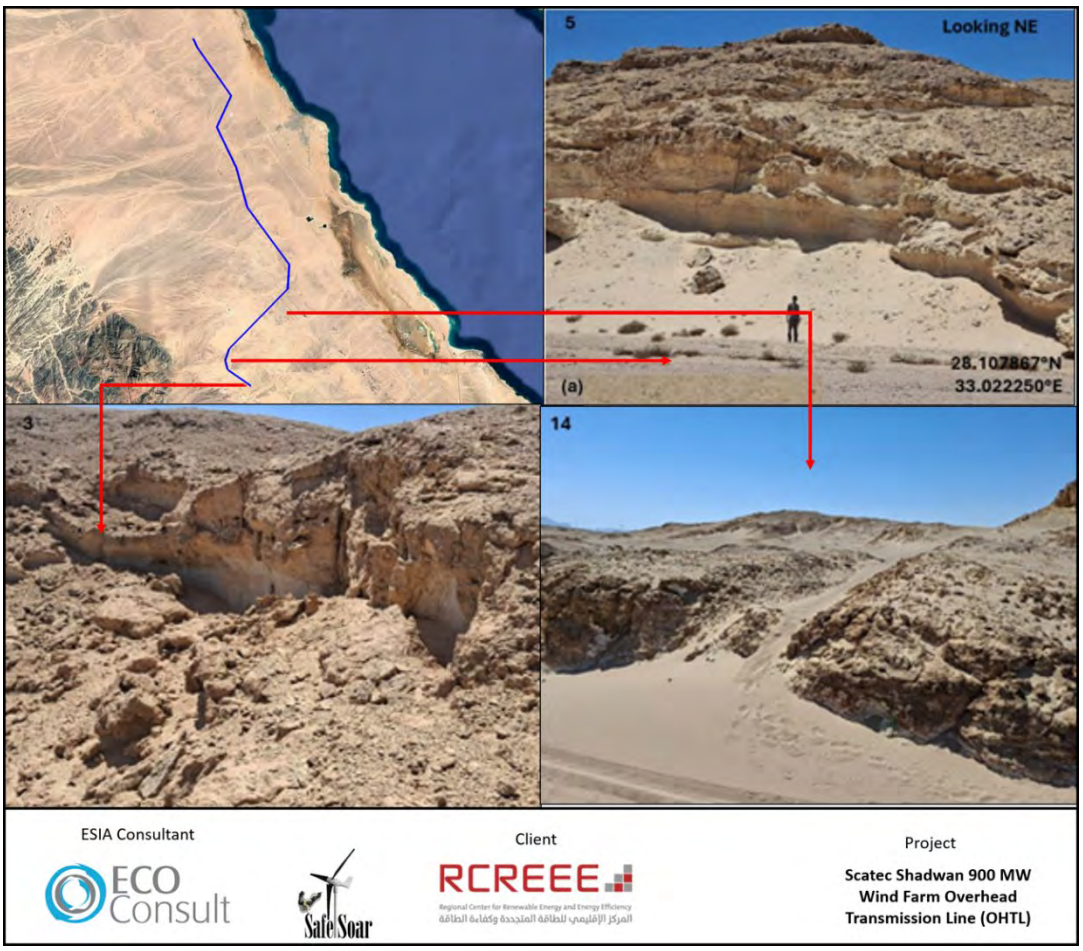


Figure 15: Field photograph of the Miocene Evaporite

Collectively, the Miocene shale, conglomeratic and evaporitic deposits contribute to the characteristic landscape of the OHTL corridor. Their present-day distribution and morphology have been shaped by lithological variability, differential weathering processes and tectonic deformation associated with the evolution of the Gulf of Suez Rift Basin.

Quaternary deposits

Quaternary deposits constitute the dominant surficial geological unit across the Project area and are represented primarily by extensive alluvial sediments. These deposits are unconsolidated to semi-consolidated and have been derived from erosion of the adjacent Red Sea Mountains, with subsequent transport and deposition occurring through episodic wadi systems during short-duration, high-intensity rainfall events and associated flash flooding.

The alluvial deposits are heterogeneous in composition, comprising poorly sorted gravels, sands, silts and occasional clay interbeds. Their texture, thickness and spatial distribution vary considerably according to local topography, drainage characteristics, transport distance and depositional environment. In general, sediment grain size decreases with increasing distance from active drainage channels and sediment source areas.

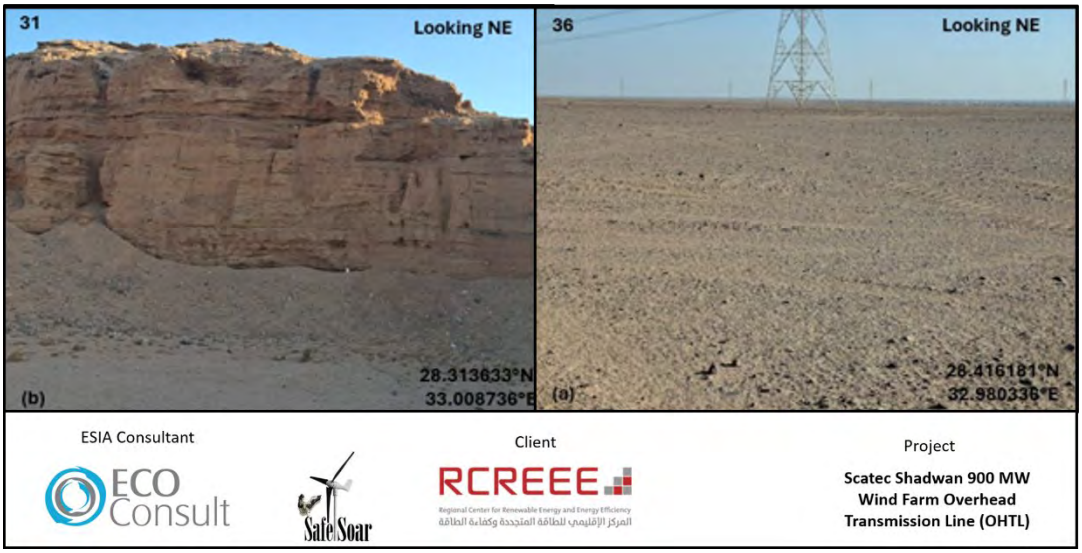


Figure 16: Field Photographs of the Quaternary deposits which Cover most of the Project Site

Coarse-grained deposits, including angular to sub-rounded gravels, cobbles and occasional boulders, are concentrated within elevated interfluve areas between drainage channels and along dissected hillslopes, reflecting deposition under relatively high-energy flow conditions. In contrast, finer-grained sandy and silty sediments occur predominantly on gently sloping terraces, shallow depressions and distal depositional, where reduced flow velocities facilitate the deposition of finer suspended materials.

These Quaternary alluvial deposits define the present-day land surface across much of the Project area and exert a significant influence on local topography, surface drainage patterns and near-surface ground conditions.

For the OHTL corridor, the Quaternary alluvial deposits are important because they:

- provide the main founding material for many tower locations,
- create variable geotechnical conditions depending on grain size and compaction,
- influence excavation difficulty due to gravel and cobble content,
- control wadi drainage and flood related erosion risk, and
- affect accessibility for construction equipment across the corridor.

7.3.3 Hydrogeology

The Project area is located within the central western margin of the Gulf of Suez, a region that has been extensively investigated with respect to its geological, structural, hydrological and hydrogeological characteristics. Groundwater occurrence within the region is associated with several geological units, including the weathered and fractured Precambrian basement rocks, Paleozoic to Lower Cretaceous sandstone formations, karstified Upper Cretaceous–Eocene carbonate sequences, and Quaternary alluvial deposits.

The occurrence, storage and movement of groundwater are primarily controlled by lithology, structural features, and the distribution of low-permeability clay horizons, which locally act as confining or semi-confining layers. According to the Hydrogeological Map of Egypt, the Project area is underlain by a groundwater reservoir of low to moderate productivity (Figure below).

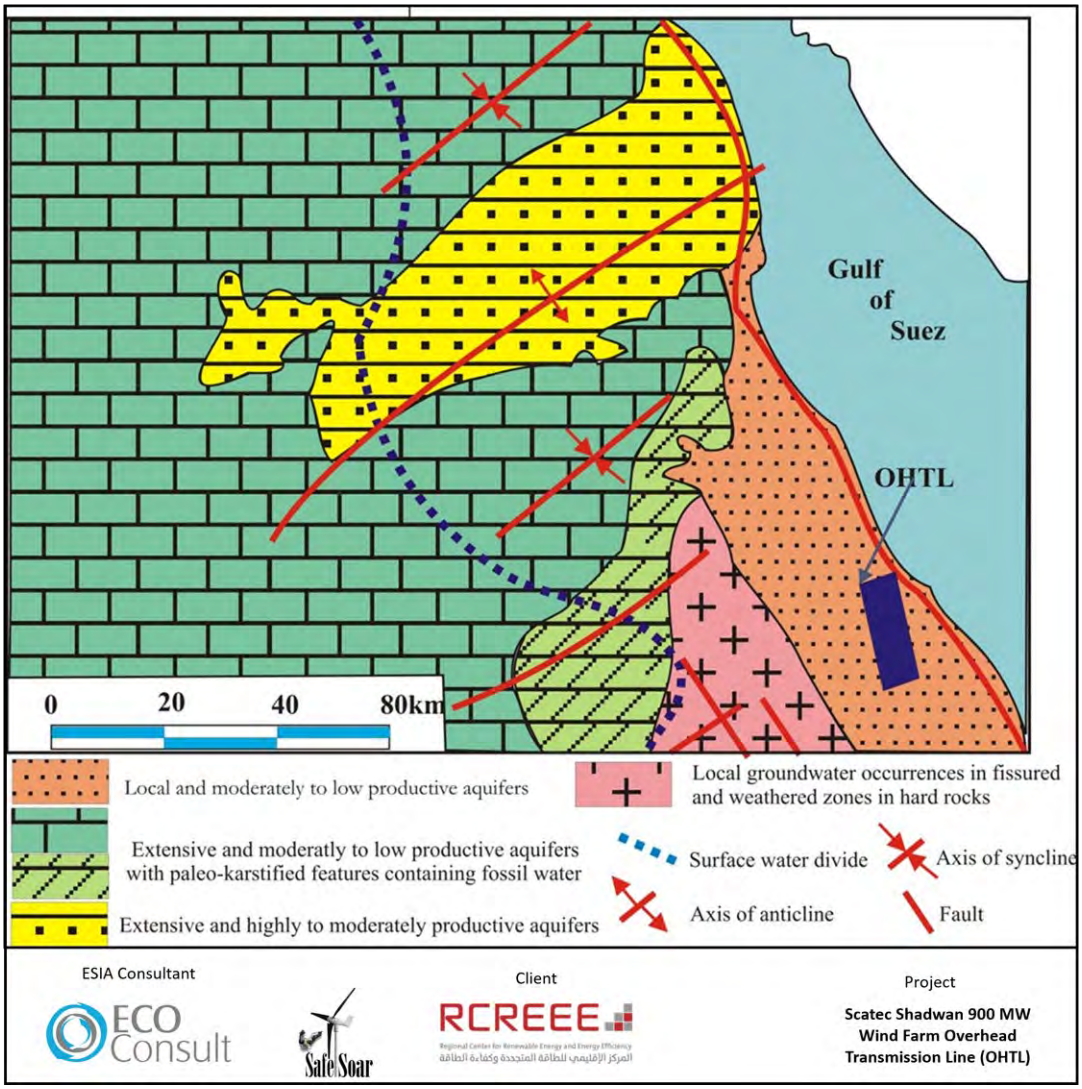


Figure 17: The Hydrogeological Map of the Project Site and Wider Area

The principal regional aquifer comprises predominantly sandstone interbedded with shale layers resting unconformably on the Precambrian basement complex. Available borehole data indicate that the aquifer thickness generally ranges from approximately 100 m to 300 m, decreasing westwards towards the uplifted basement terrain (Figure 33). Groundwater depth within the aquifer varies considerably, ranging from approximately 9 m to 120 m below ground level. Groundwater quality is generally brackish, reflecting the combined influence of lithological conditions, evaporitic deposits and limited natural recharge under the prevailing hyper-arid climatic conditions.

Within Wadi Dara, located approximately 17 km southeast of the proposed OHTL alignment, groundwater has historically been abstracted to support agricultural development and land reclamation activities. However, elevated total dissolved solids (TDS) concentrations generally limit its suitability for potable and domestic uses.

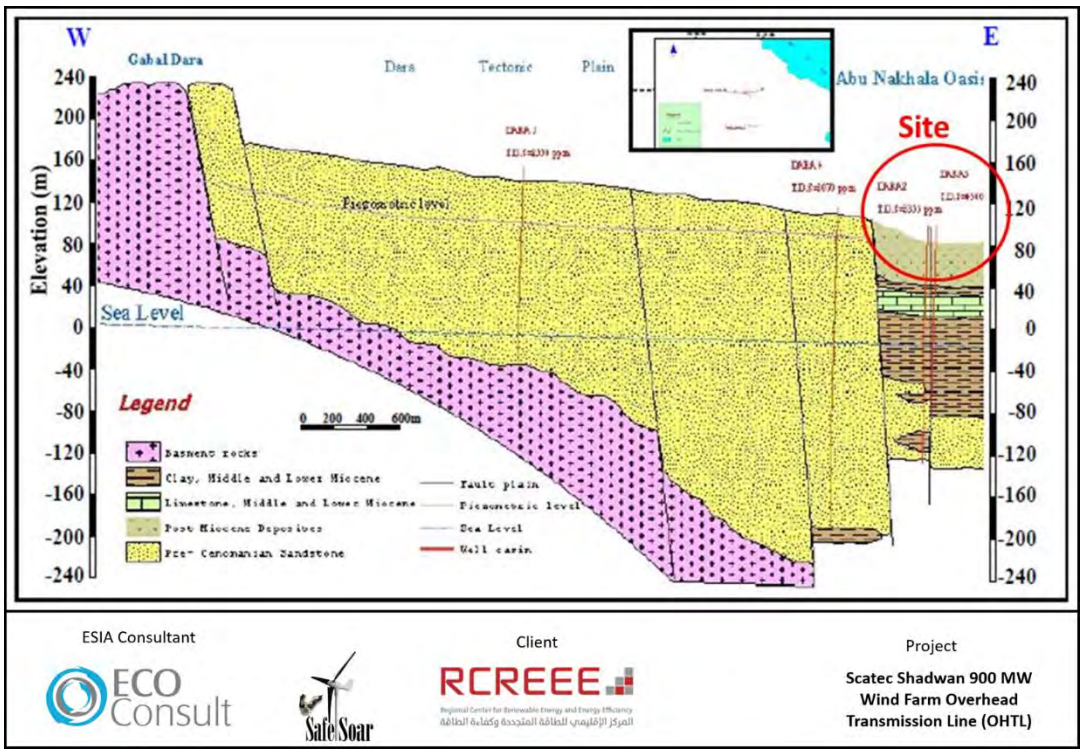


Figure 18: Hydrogeological Cross Section Along Wadi Dara based on Drilled Wells (Nasr, 1990)

Overall, hydrogeological conditions within the Project area indicate that groundwater resources are limited and spatially discontinuous. The absence of a laterally extensive shallow freshwater aquifer, together with the hyper-arid climate and limited annual rainfall, restricts natural groundwater recharge across the Project area. Although the Quaternary alluvial deposits exhibit relatively high permeability, their limited thickness and discontinuous distribution constrain groundwater storage, while the regional geological structure promotes groundwater drainage rather than long-term accumulation.

7.3.4 Hydrology

The Project area is located within the arid western coastal plain of the Gulf of Suez and is not associated with any permanent surface water resources, including rivers, streams, lakes or freshwater bodies. Surface drainage is limited to ephemeral wadi systems that convey runoff generated during infrequent, high-intensity rainfall events from the Red Sea Mountains eastwards towards the Gulf of Suez.

The OHTL corridor is crossed by a series of short, wide and generally shallow drainage channels that form part of the regional drainage network of the Gharib Plain. These wadis originate from the elevated mountainous terrain to the west and flow eastwards across the coastal plain before discharging into the Gulf of Suez. Field investigations confirmed that the drainage channels are normally dry, with surface flow occurring only during episodic storm events associated with flash flooding.

Figure 19: The direction of surface water flow through major drainage lines originating from the high mountains and small tributaries from the hilly zone around the OHTL track

The assessment undertaken for the Project identified six principal drainage basins intersecting the proposed OHTL alignment, comprising Wadi Abu Had, Wadi Al Darb, Wadi Karim, Wadi Abu Khashaba, Wadi Gharib and Wadi Kharm El Ain. In addition to these principal wadis, numerous smaller tributaries and sheet-flow pathways occur throughout the Project area, contributing locally to runoff generation during heavy rainfall events.

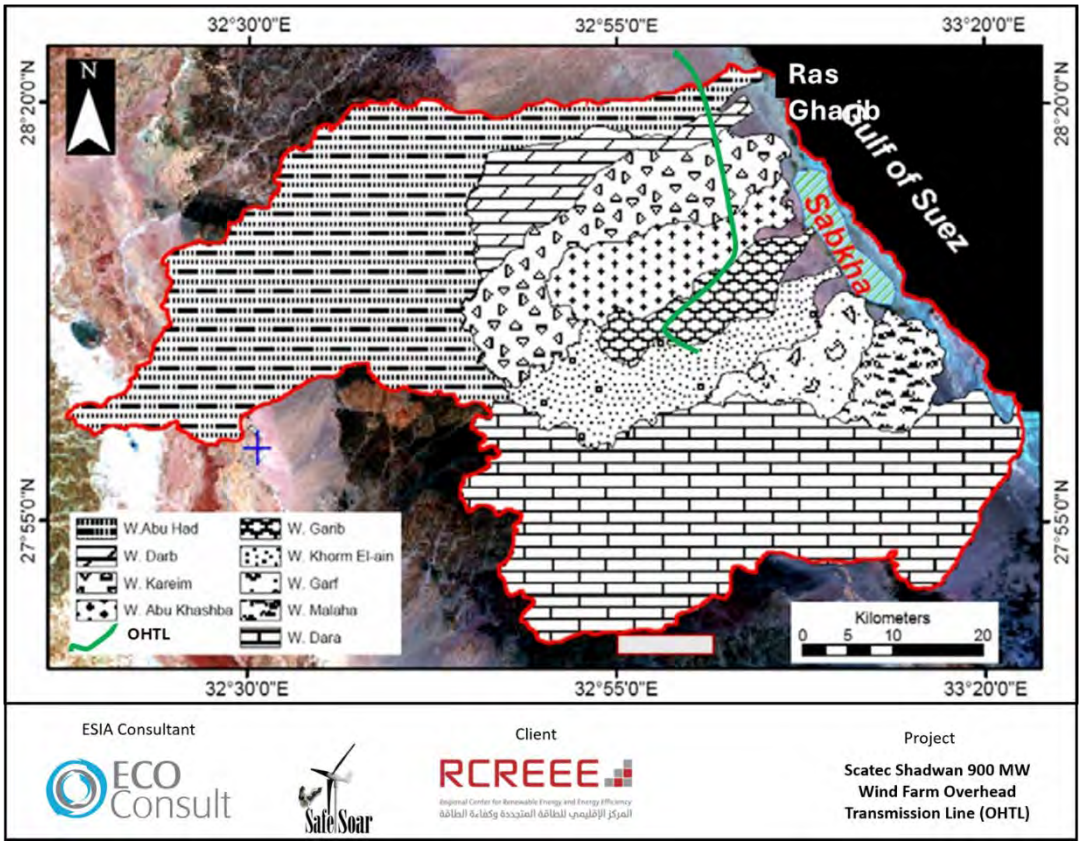


Figure 20: The Drainage Basins Delineated in the Area in Relation to the Project Site

Surface runoff within the Project area is strongly influenced by the prevailing topography, drainage morphology and surficial geological conditions. The predominantly coarse-grained alluvial deposits promote relatively high infiltration rates, while the gently sloping coastal plain generally limits prolonged surface water ponding. Nevertheless, active wadi channels may convey substantial runoff during extreme rainfall events, resulting in localized flash flooding and sediment transport.

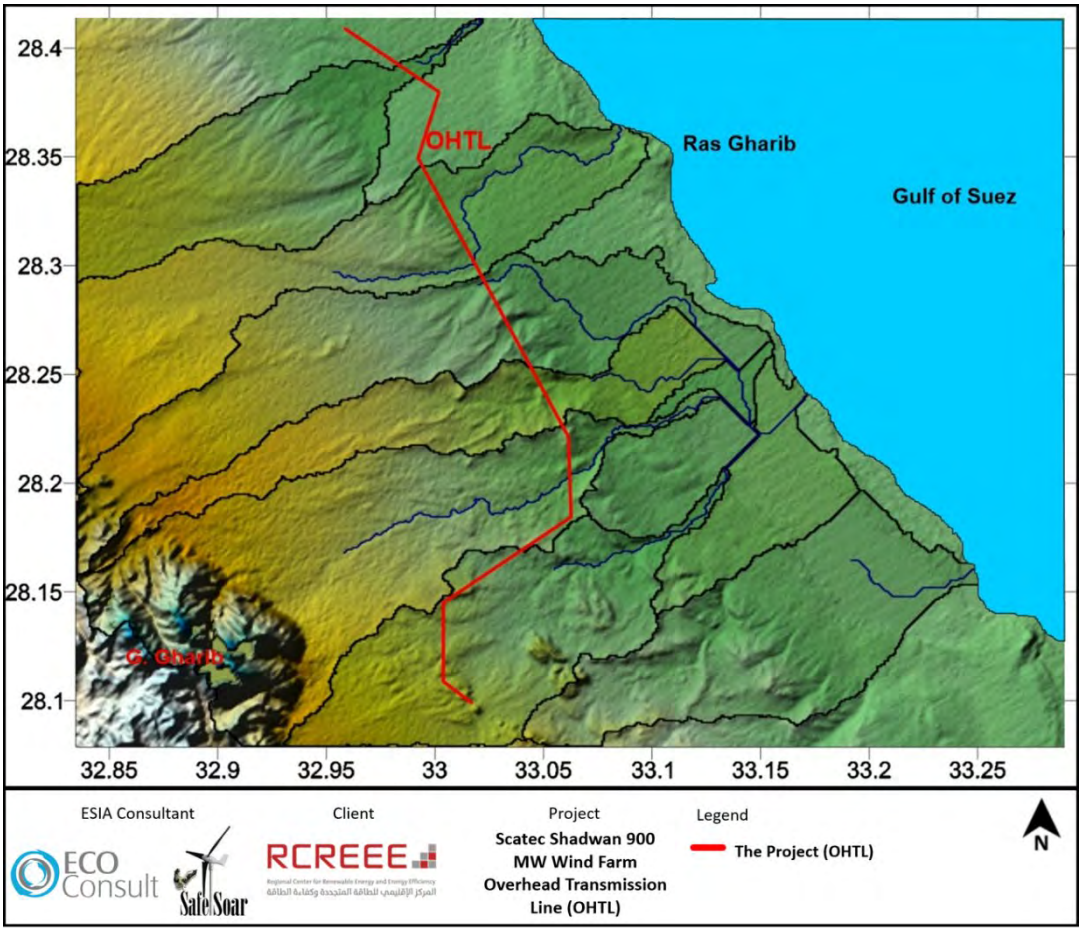


Figure 21: The OHTL crosses the mainstream of many drainage basins displayed through a DEM Model

Historical records indicate that flash floods have periodically affected parts of the Gulf of Suez region, including the wider Ras Gharib area. Consistent with the regional hydrological setting, the principal flood pathways within the Project area are confined to the main wadi channels and their associated floodplains, whereas the intervening interfluve areas are generally subject to limited runoff accumulation.

Field observations confirmed the absence of permanent surface water bodies or standing water within the OHTL corridor at the time of the survey. Active drainage was restricted to the natural wadi systems, with no evidence of artificial drainage networks, irrigation canals or water storage structures identified along the proposed alignment.

Overall, the hydrological regime of the Project area is characteristic of the hyper-arid environment of the western Gulf of Suez, where surface water occurrence is limited to short-duration runoff generated during infrequent rainfall events and conveyed through the existing ephemeral drainage network.

7.4 Climate and Meteorology

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

7.4.1 Assessment of Baseline Conditions

(i) Methodology of Assessment

The methodology was based on secondary data available through online resources on key climate and meteorological conditions. This includes temperature, wind speeds, humidity, rainfall, sand/snowstorms and other as applicable. The assessment provided below is for Ras Gharib, which is considered representative of the Project site and the local communities.

(ii) Results

Temperature

The figure below presents the annual temperature variations in Ras Gharib based on historical information throughout the past 30 years. The average daily maximum temperature presents the peak temperature on an average day each month, while the average daily minimum temperature presents the average minimum temperature.

As shown in the figure below, the hottest months are typically June – August, with averages reaching a maximum of 34°c. The coldest months are typically December – February with averages reaching a minimum of 10°C.

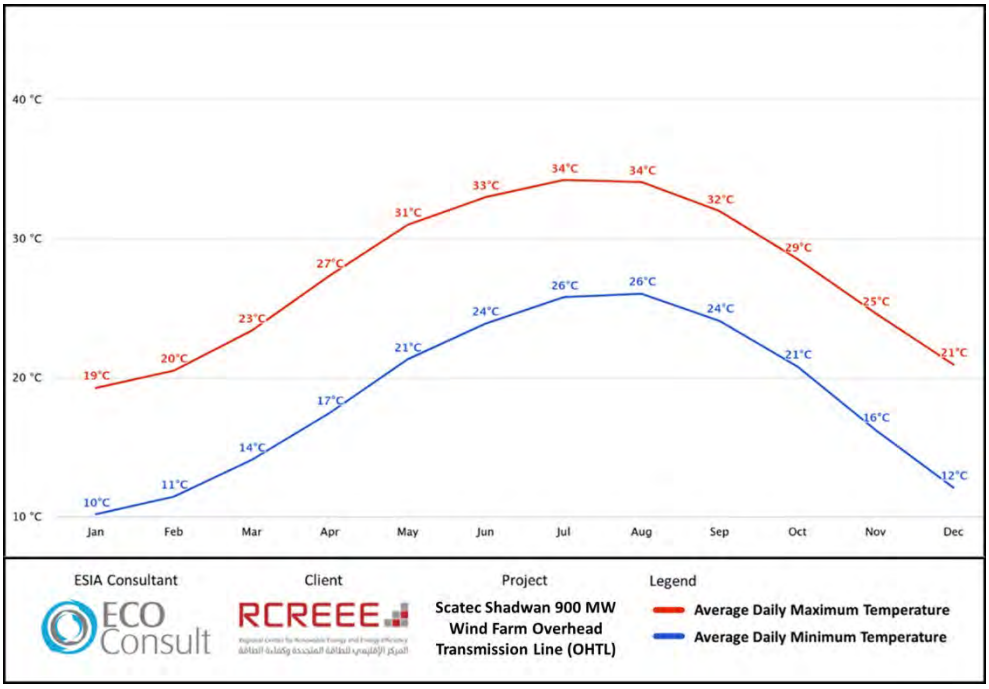


Figure 22: Average Monthly Maximum and Minimum Temperatures for the Past 30 Years

Wind Speed and Direction

The figure below presents the windspeed patterns across Ras Gharib. As noted below, there is a distinct seasonal variation, with higher wind speeds prevalent during the warmer months. June is the month with the highest wind speeds, ranging from a minimum of 18 km/h to a maximum of 30 km/h, with an average speed of 24 km/h. The lowest wind speeds occur during January, ranging from a minimum of 10 km/h to a maximum of 22 km/h, with an average wind speed of 16 km/h.

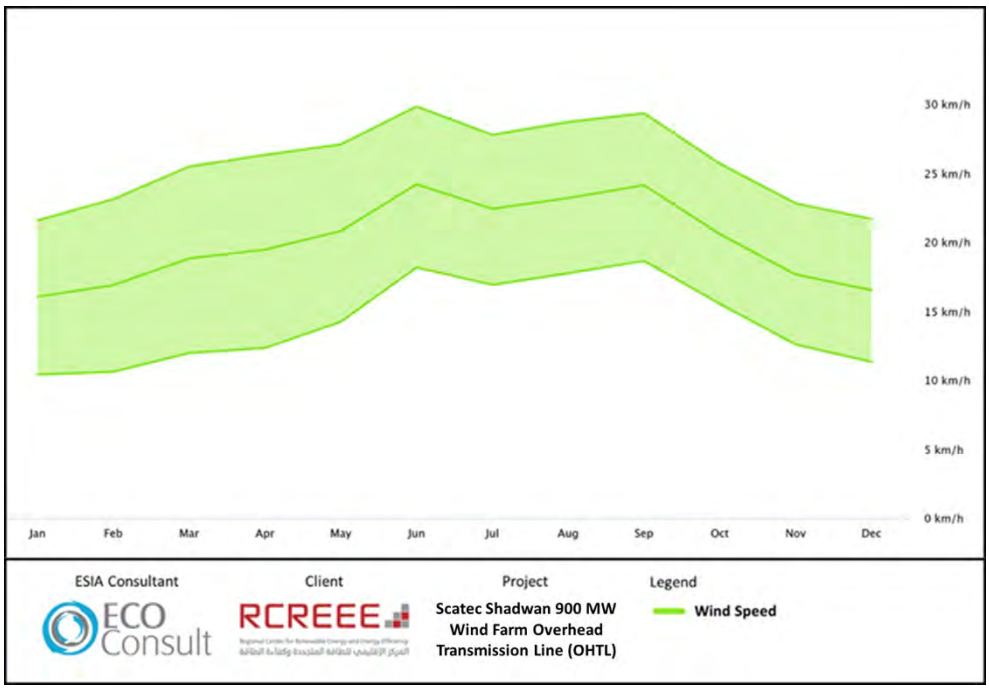


Figure 23: Average Monthly Wind Speeds for the Past 30 Years

The figure below categorizes the months based on the frequency of different wind speeds, whereas noted the months March until September witnessed the highest speeds exceeding 40 km/h. Generally, wind speeds in Ras Gharib predominantly fall within the range of 20 km/h to 30 km/h.

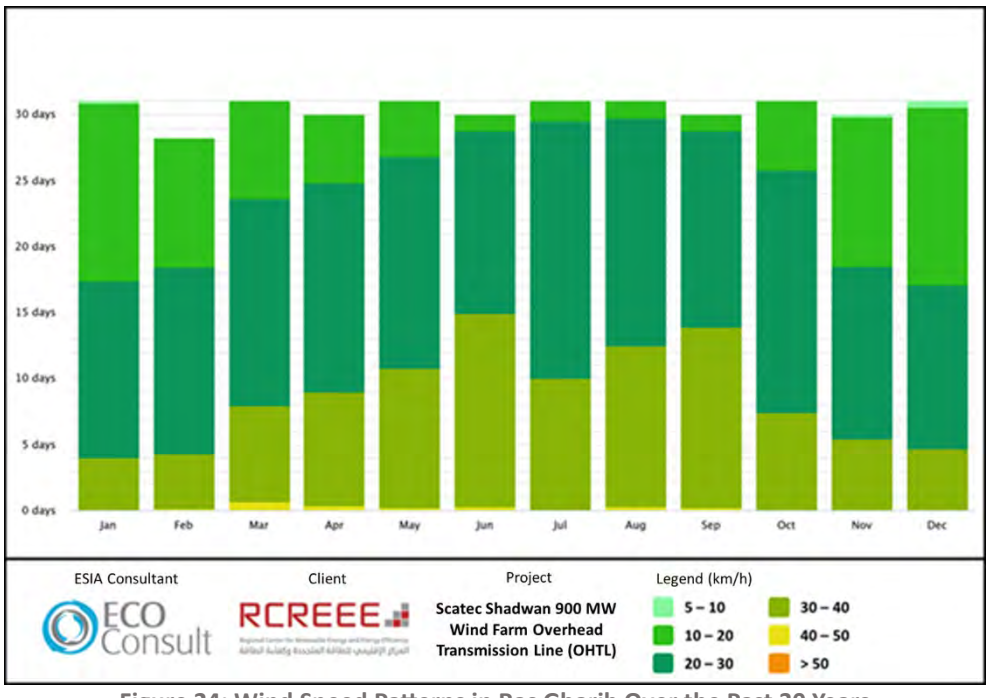


Figure 24: Wind Speed Patterns in Ras Gharib Over the Past 30 Years

The figure below presents a wind rose with distinctive patterns in wind direction. The prevailing wind direction is predominantly from the northwest (NW) to the north-northwest (NNW). Conversely, the sector with the least occurrence of wind direction spans from the northeast (NE) to the southwest (SW).

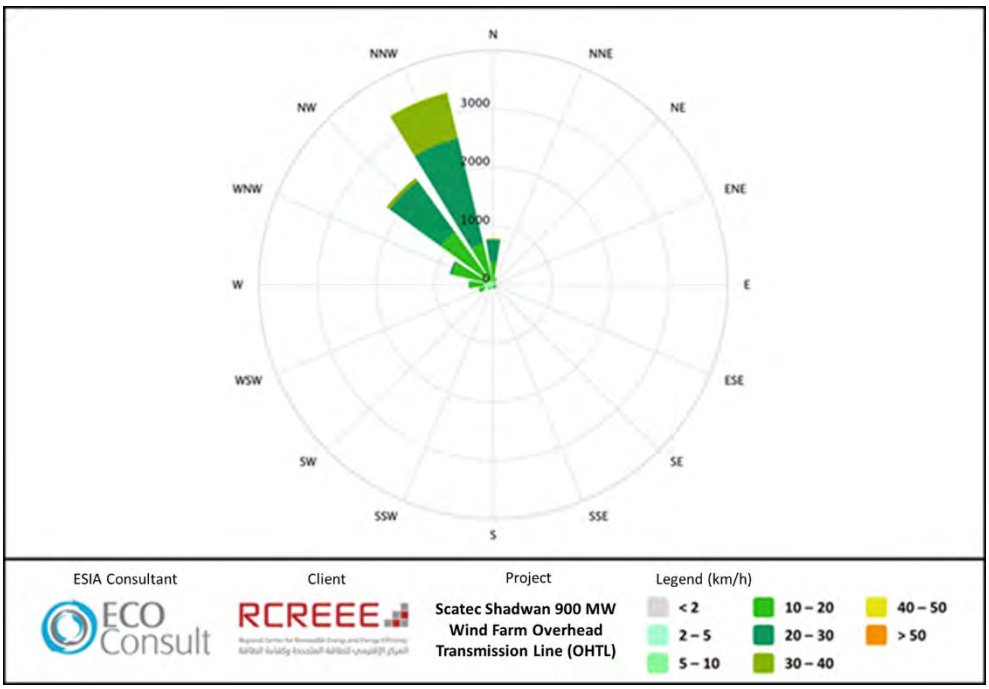


Figure 25: Wind Rose of Ras Gharib

Rainfall

The figure below presents the amount of rainfall and number of rainy days across the year in Ras Gharib. As noted, January has the highest number of rainy days (at around 1.1 days). June, July and August have zero rainy days.

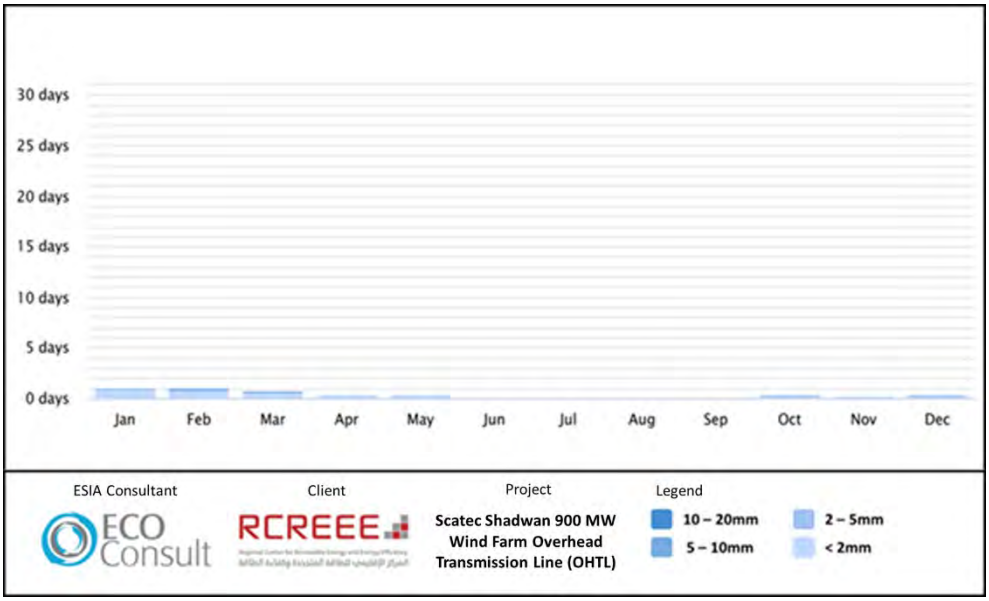


Figure 26: Average Monthly Rainfall Distribution in Ras Gharib for the Past 30 Years

Humidity

In Ras Gharib, there is a seasonal fluctuation in average humidity levels. October registers the highest average relative humidity at 62.0%, highlighting a relatively more humid condition during autumn. The lowest average humidity levels in Ras Gharib are during the months of late spring and early summer,

ranging between 44.2% and 43.8% in May and June. The data suggests a gradual rise in humidity from August onward, reaching its peak in October, after which it starts to decline. This pattern reflects the distinct humidity variations between the drier summer months and the more humid autumn and winter seasons.

Table 11: Average Humidity Levels

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Humidity (%)	57.7	54.4	50.5	47.1	44.2	43.8	45.7	47.5	52.5	62.0	59.1	60.2

Heat/ Cold Waves

The frequency of heat waves in Egypt varies across its territories, with the desert areas experiencing the highest risk due to maximum air temperature norms nearing 40°C. In these regions, the occurrence of heat waves poses a significant threat to human health. The number of days with high air temperatures serves as an index for assessing the likelihood of dangerous heat waves. In accordance with the criteria established by economic entities and design institutes, any instance where the air temperature exceeds or equals 40°C, irrespective of its duration, is considered a hazardous phenomenon in Egypt.

Specifically, within the Project site, the frequency of air temperatures equal to or exceeding 40°C is considered rare, as shown in the figure below. The temperature generally falls between 30-35°C.

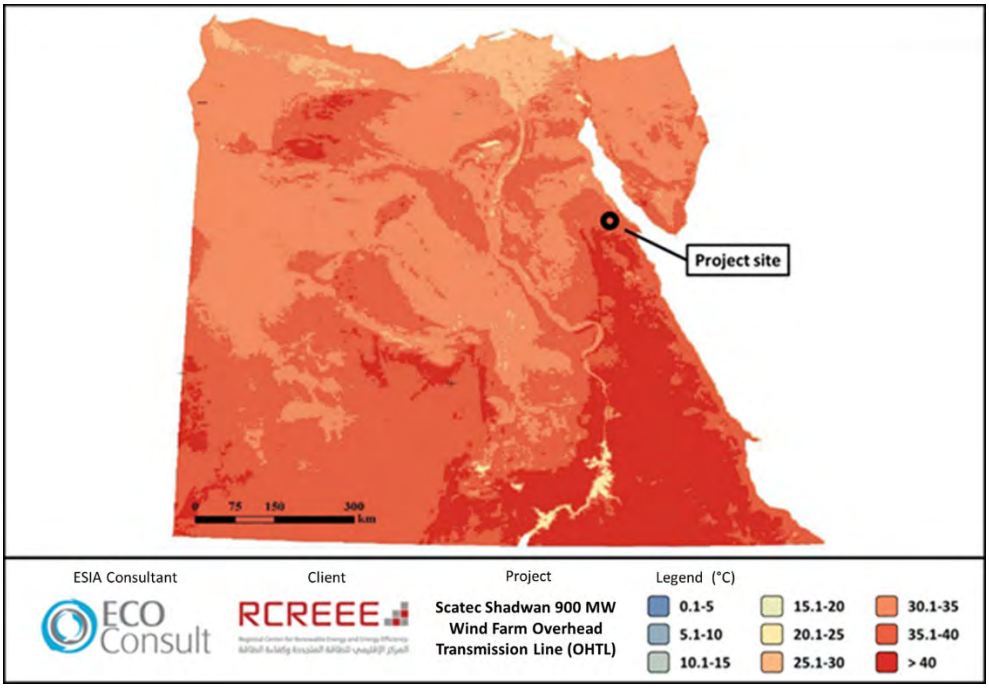


Figure 27: Temperature within Egypt

The figure below illustrates that the months characterized by temperatures surpassing 40°C are primarily from May through July. This suggests anticipation of increased heatwave occurrences during these months, with particular emphasis on the month of June. The data indicates a heightened likelihood of extreme heat events, emphasizing the need for attention and preparedness during this period to mitigate potential adverse effects. Contrarily, there are no days where temperature falls below 0°C.

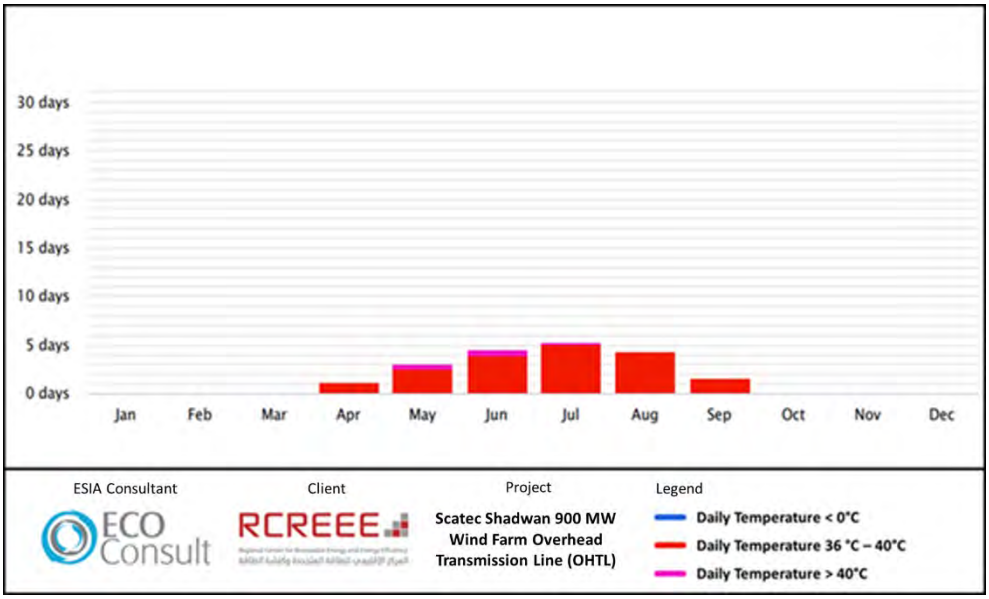


Figure 28: Number of Days in Egypt with Temperatures <0°C and >40°C

7.5 Biodiversity – Excluding Birds and Bats

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

7.5.1 Methodology

This section contains the methodology that was conducted for the Project's biodiversity assessment of baseline conditions within and around the Project area. This includes flora and fauna.

This section contains the methodology that was conducted for the Project's biodiversity assessment of baseline conditions within and around the Project area. This includes flora and fauna.

According to Kassas (2003) and Harhash et al. (2015), the Project area is situated within the Egyptian Red Sea coastal desert, which is characterized by a mosaic of Hamada desert, wadis, and low hills intersected by ephemeral drainage channels formed by seasonal rainfall and flash flood events. The biodiversity survey covered the entire 45 km OHTL corridor, with particular consideration given to the main drainage wadis, which represent the principal ecological features within the Project area and were therefore incorporated into the baseline assessment and subsequent Biodiversity Management Plan (BMP). The conservation status of all recorded species was assessed against the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (IUCN, 2024).

A total of 45 sampling locations were established systematically along the proposed OHTL alignment at approximate 500 m intervals to provide representative coverage of the study area. In addition, walkover surveys were undertaken along the remainder of the alignment, extending 50 m on either side of the proposed OHTL corridor to capture ecological features between sampling locations and address any spatial data gaps. Stratified sampling was not applied, as the study area was considered sufficiently homogeneous from both ecological and topographical perspectives.

Flora surveys were undertaken using the quadrat method within circular plots of 50 m diameter, where all plant species present were identified and recorded. Small mammals were surveyed using active search techniques, while reptiles were assessed through a dedicated transect survey. At each sampling location, 200 m transects were established in the four cardinal directions (north, south, east and west) to maximize survey coverage. Particular attention was given to the Egyptian Spiny-tailed Lizard (Uromastyx aegyptia), a species classified as Vulnerable on the IUCN Red List and considered one of the key terrestrial biodiversity receptors within the Project area.

Figure 29: Typical Site Landscape

A. Field Survey and Assessment

The primary objective of the field surveys was to assess the biodiversity of the Project area and identify any important habitats occurring within the proposed OHTL corridor. The surveys were undertaken to establish baseline information on the current status and distribution of flora and fauna species, assess the potential for Project interactions with these species, and determine whether mitigation measures may be required to avoid or minimise potential impacts.

The site surveys were informed by internationally recognized survey methodologies to identify and verify habitat characteristics that may support a range of terrestrial species. A comprehensive survey approach was adopted to evaluate the ecological function of different habitat types within the Project area, including their suitability for foraging, shelter, breeding, and movement of terrestrial fauna. In addition, data on species occurrence and relative abundance were collected through standardized survey techniques to assess the ecological importance of the habitats present. The field surveys comprised two principal components:

- A detailed inventory and assessment of terrestrial flora and fauna using a spatially balanced sampling design to ensure representative coverage of the study area. This enabled the identification of species, assessment of their distribution and relative abundance, and provided baseline information to support the evaluation of potential Project impacts and the need for any additional mitigation measures.
- Targeted surveys for threatened species known to occur within the wider Project area, with particular emphasis on the Egyptian Spiny-tailed Lizard (Uromastyx aegyptia) (Nagy et al., 2022).

A standardized sampling methodology was implemented across the study area, comprising 45 systematically distributed sampling locations along the proposed OHTL alignment at intervals of approximately 500 m. This approach ensured representative coverage of the Project area while maintaining sufficient separation between sampling locations to preserve sample independence. The survey methodology was designed to assess terrestrial flora and fauna, including mammals (volant and non-volant), herpetofauna (reptiles and amphibians), and terrestrial invertebrates. The same sampling locations were also used to collect vegetation and flora data. Details of the survey methodology applied to each taxonomic group are provided in the following sections.

A combination of complementary survey techniques was employed, including walkover transects, drive transects, and active search methods, to document habitats and associated flora and fauna throughout the Project area. Species presence was confirmed through direct observations where possible, or indirectly through evidence such as tracks, burrows, dens, and droppings. Photographic documentation of habitats, species, and field evidence was undertaken wherever practicable. Particular attention was given to habitats with the potential to support species of conservation concern, including protected and threatened species.

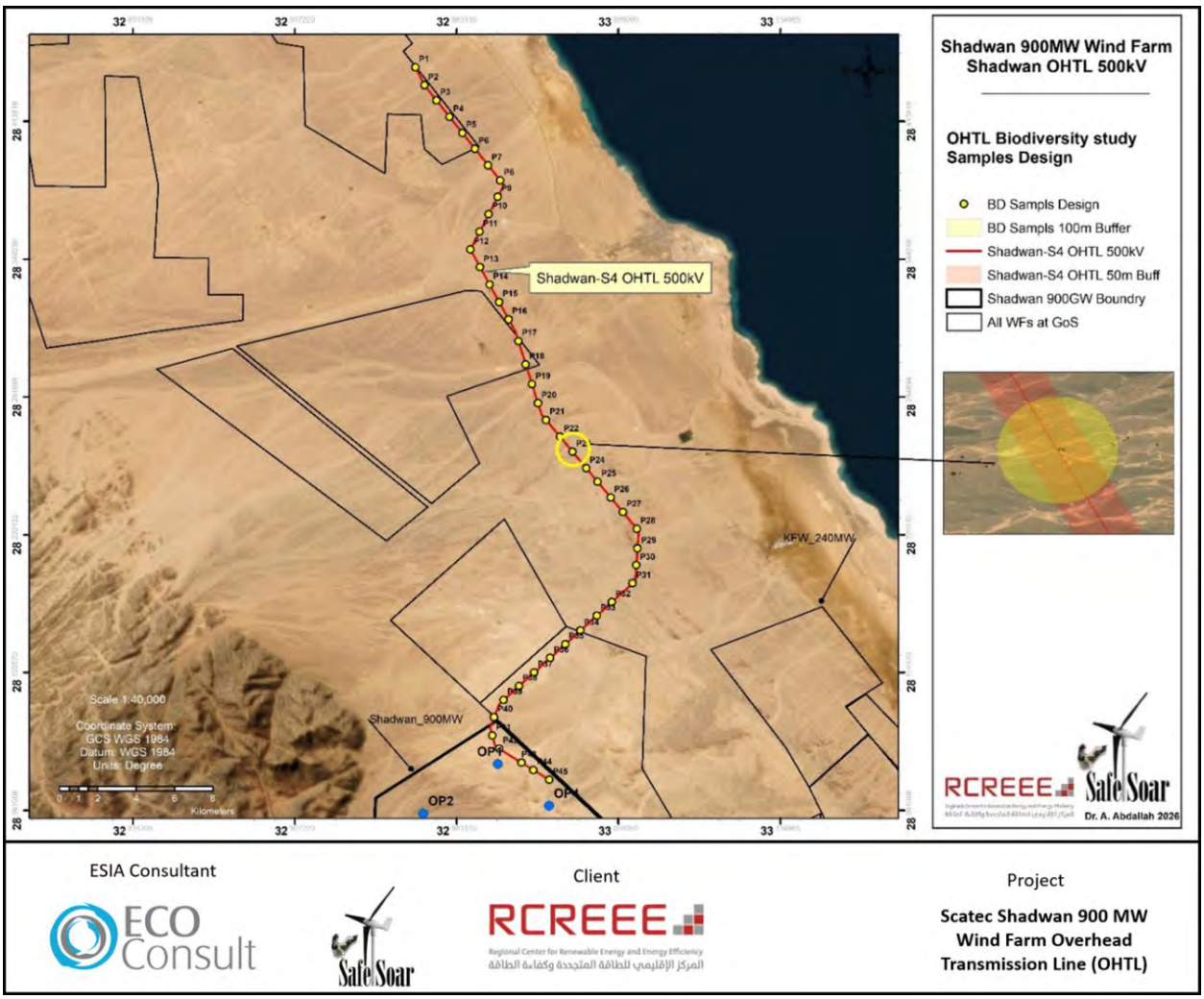


Figure 30: Sampling Design and Site Influence area

Table 12: Sampling Site Coordinates

ID	Latitude	Longitude	ID	Latitude	Longitude	ID	Latitude	Longitude
St1	28.43919	32.9638	St16	28.321105	33.007546	St31	28.197404	33.06576
St2	28.430796	32.968094	St17	28.310876	33.012156	St32	28.188563	33.055987
St3	28.423725	32.973684	St18	28.29997	33.015595	St33	28.182168	33.048972
St4	28.415945	32.979883	St19	28.290667	33.018528	St34	28.175204	33.041233
St5	28.408497	32.985818	St20	28.281805	33.021318	St35	28.168788	33.034157
St6	28.401013	32.99178	St21	28.273944	33.025134	St36	28.162373	33.027058
St7	28.393301	32.997917	St22	28.266086	33.031698	St37	28.155587	33.019532
St8	28.386136	33.003622	St23	28.259045	33.037578	St38	28.149199	33.012424
St9	28.378569	33.002452	St24	28.251336	33.044016	St39	28.142712	33.005277
St10	28.370381	32.998201	St25	28.244983	33.049339	St40	28.134596	33.000749
St11	28.362128	32.993918	St26	28.237581	33.05549	St41	28.126034	32.99996
St12	28.353849	32.989613	St27	28.230783	33.061169	St42	28.119818	33.00314
St13	28.345575	32.994138	St28	28.222918	33.067734	St43	28.113325	33.013608
St14	28.33736	32.998638	St29	28.213664	33.068045	St44	28.109867	33.019144
St15	28.329212	33.003103	St30	28.205905	33.067466	St45	28.105253	33.026636

B. Flora Survey

Flora survey was conducted from the specified sampling point as shown in map (2) where the observer will survey four 10m X 10m plots allocated in the four quarters of a 50m diameter circle around the sampling point in addition to the central plot around the point making a total of 5 quadrates in each sampling point as displayed in figure. The observer recorded the species and abundance of each species present in the quadrates. Later calculations were done to account vegetation cover of the floral species per site and then pooled for the whole study site. Refraction curves or species-Area accumulation curves were created to account for the comprehensiveness and coverage of the survey in accounting for the flora in the site.

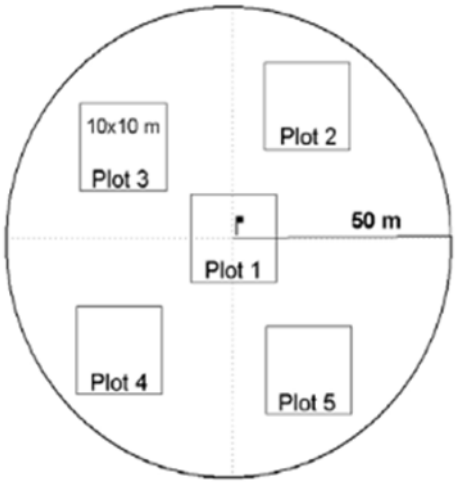


Figure 31: In the circular plot of 50m diameter, 5 plots of 10x10m are to be sampled for plant species

C. Fauna Survey

Mammalian Species Survey

Large, medium-sized and small mammals were surveyed adopting different methods including active search, and line transects from each of the sampling points.

- Line transects in many areas of the project site of over 200m long, one in each cardinal direction (E, W, S. &N.) will be conducted to provide detailed assessment of fauna species. Observed species will be recorded and photographed when possible.
- Active search: during the active search, within 50 meters in both directions around the OHTLs and along the path, which will be carried out all over the different parts of the area, animal signs such as markings, urine, faces, dens, tracks, trails, carcasses, remains of preys or even direct observation of mammals were recorded and documented, when present.

Herpetofauna (Reptiles and Amphibians)

Reptiles use habitats that offer exposure to the sun, cover from predators, suitable food and safe refuges. Diurnal active searching was used for reptiles survey (no amphibian species are known to inhabit the area), which involve searching for suitable basking spots, searching particular microhabitats, turning over rocks

and logs, raking soil and leaf litter, and searching soil cracks and holes. Trees (especially acacia trees) and large shrubs – if any - and surroundings were checked for the presence of snakes. Results were reported separately for reptiles and ground dwelling arthropods.

A GIS-based survey design is prepared taking into OHTLs lengths and accounting for the hydrology of the landscape to create 45 sampling stations as square-shaped line transects across the landscape with 500 m per transect. That line transects are evenly distributed across all the habitats and landscapes along the proposed power line length. The lines take square-shape to increase the detectability of Uromastyx aegyptia and its burrows. This survey design is going to reveal the spatial distribution, and abundance of mammals, especially large and medium sized, as well as Uromastyx aegyptia in the study area.

During the navigation time between stations the team conducted a drive transects, in which each surveyor was covering both side of the path, and any wildlife observations were recorded.

Figure 32: The Egyptian spiny tailed Lizard Uromastyx aegyptia lizard was spotted directly during Line transect

7.5.2 Baseline Results

A. Flora Biodiversity

Flora in the project area was extremely sparse, restricted to single drainage channels. Vegetation within the project area generally has low species richness and density, and a very patchy distribution. The wadis tend to support most vegetation due to generally higher soil moisture levels. According to the 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).

Forty-five sites were surveyed as described in the methodology sections. The floral community of the study area comprises about 8 species only, which follow seven genera and four families, and include three dominant species: *Haloxylon salicornicum*, *Zygophyllum arabicum* and *Caroxylon imbricatum*. Except for the main drainage channels or wadis, which have better vegetation cover than elsewhere in the Project area, the rest of the study is sparsely vegetated. The collective Average of Vegetation cover for the study area was 0.063 % while the minimum value of 0.00 % in 21samples, and a maximum of 0.728 %. Species richness was also exhibiting a similar trend.

Table 13: Sites and vegetation measurements (Species and vegetation cover)

ID	No. of Species	No of Individual	Vegetation Cover/m²	V. Cover %
St1	1	12	1.155	0.0147
St2	2	5	0.932	0.0119
St3	1	2	0.098	0.0013
St4	2	6	1.460	0.0186
St5	2	0	0.000	0.0000
St6	2	5	0.356	0.0045
St7	1	3	0.766	0.0098
St8	1	4	1.912	0.0243
St9	2	7	4.653	0.0592
St10	3	8	0.776	0.0099
St11	2	7	1.824	0.0232
St12	1	15	4.827	0.0615
St13	2	9	2.298	0.0293
St14	2	17	21.875	0.2785
St15	0	0	0.000	0.0000
St16	0	0	0.000	0.0000
St17	0	0	0.000	0.0000
St18	2	8	40.833	0.5199
St19	2	20	57.182	0.7281
St20	0	0	0.000	0.0000
St21	0	0	0.000	0.0000
St22	1	4	15.211	0.1937
St23	0	0	0.000	0.0000
St24	0	0	0.000	0.0000
St25	0	0	0.000	0.0000
St26	0	0	0.000	0.0000
St27	0	0	0.000	0.0000
St28	0	0	0.000	0.0000
St29	1	2	4.278	0.0545
St30	2	8	21.108	0.2688
St31	0	0	0.000	0.0000
St32	1	2	0.664	0.0085
St33	0	0	0.000	0.0000

St34	0	0	0.000	0.0000
St35	0	0	0.000	0.0000
St36	0	0	0.000	0.0000
St37	0	0	0.000	0.0000
St38	0	0	0.000	0.0000
St39	0	0	0.000	0.0000
St40	0	0	0.000	0.0000
St41	2	16	11.045	0.1406
St42	5	14	3.394	0.0432
St43	3	51	20.901	0.2661
St44	4	38	4.298	0.0547
St45	3	5	0.319	0.0041

The observed species richness for the study area was a collective 8 species, while the individual site species richness ranged from a minimum of 0 species to a maximum of 5 species in one site. The average species richness recorded over the observed sites was 2 species. *Haloxylon salicornicum* is the species with the highest species richness in the study area. Species richness shows very limited spatial variation. The areas outside the Wadis and their channels are completely barren and have no plants.

A species refraction curve was constructed (below) and it shows that a plateau is reached at about 8 species by sampling 60 sites. Thus, it is concluded that the current sampling plan recording 8 species at 45 sites sampled is very suitable to account for the flora in the study region.

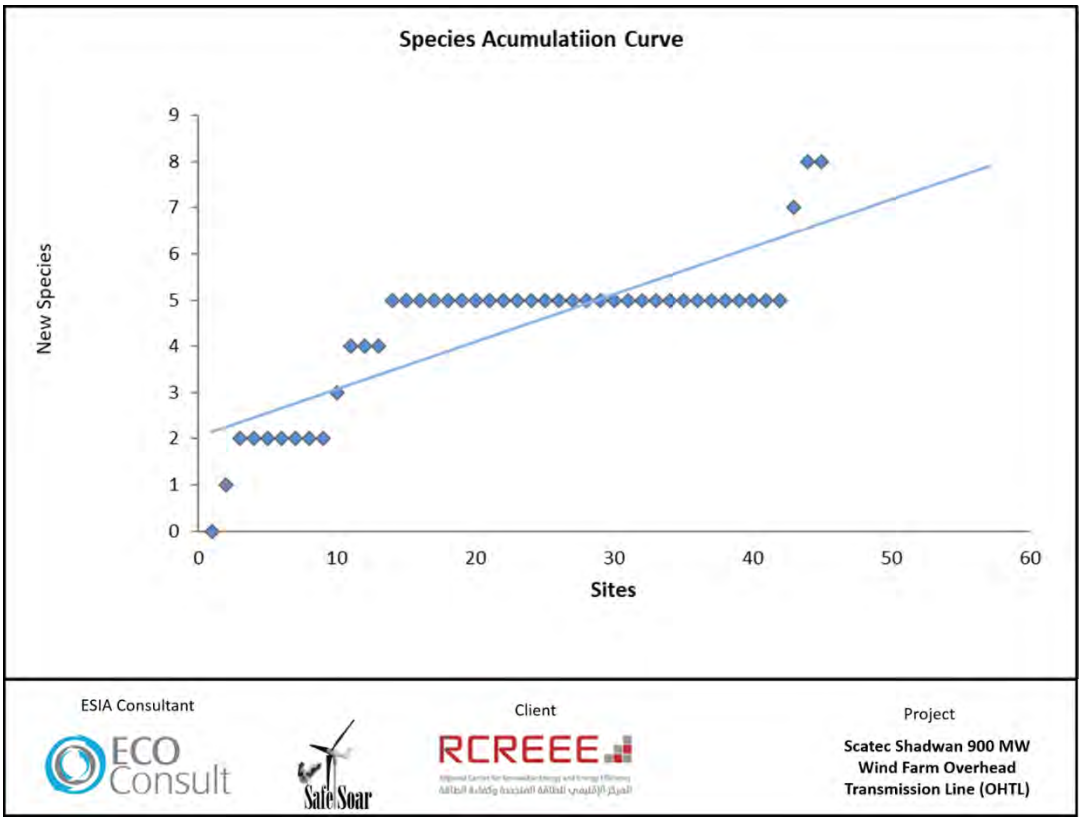


Figure 33: Species refraction curve showing the species accumulation with new sampled sites

Table 14: list of the Plants recorded Species showing total abundance and Total of Individual

Species	Sum of Abundance	Total of individual
Caroxylon imbricatum (Forssk.) Moq.	8	24
Haloxylon salicornicum (Moq.) Bunge ex Boiss.	13	87
Morettia philaeana (Delile) DC.	2	10
Ochradenus baccatus Delile.	1	1
Tetraena coccinea (L.) Beier & Thulin	7	96
Zilla spinosa (L.) Prrantl in Engl. & Prantl.	5	8
Zygophyllum arabicum (L.) Christenh. & Byng	11	40
Zygophyllum molle (Delile) Christenh. & Byng	1	2
Caroxylon imbricatum (Forssk.) Moq.	8	24

None of the floral species recorded in the study region is known to be neither endemic nor of a special conservation value as being endangered or threatened according to (IUCN) Red List of Threatened Species (IUCN, 2026). Some of the commonly observed species are known to be palatable species and of importance as grazing species for the local livestock and wildlife. Specially the *Haloxylon salicornicum*, *Caroxylon imbricate, Zilla spinosa* and the *Zygophyllum arabica L.*

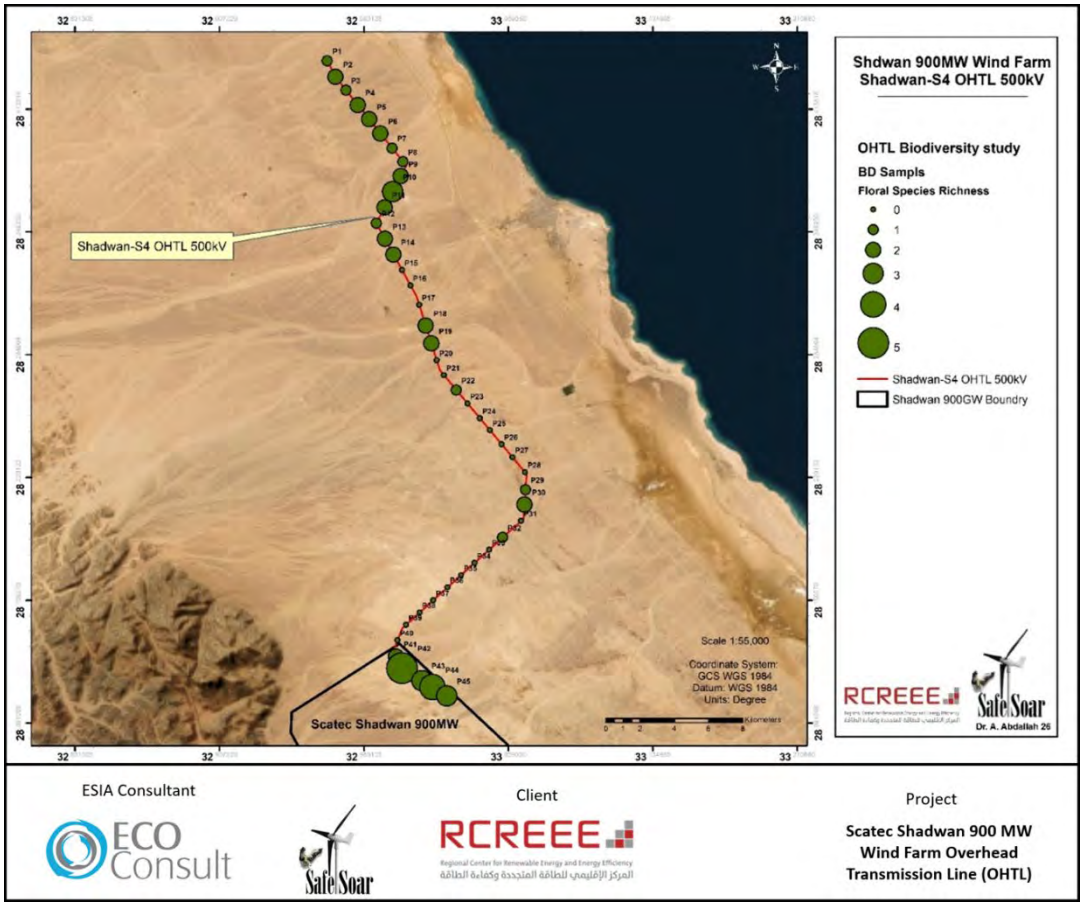


Figure 34: Floral Species Richness per site values in the study region

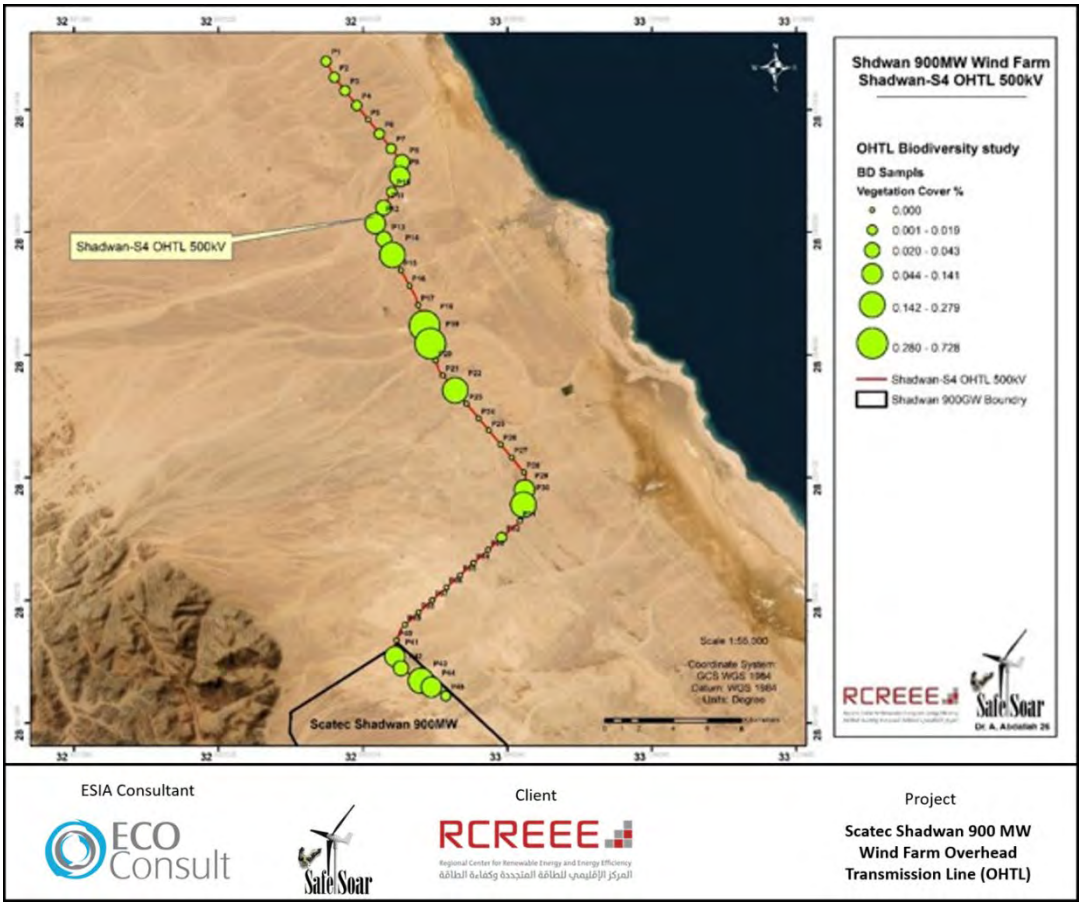


Figure 35: Vegetation Cover % per site values in the study region

Figure 36: Some of the Recorded Plants (from left to right: *Caroxylon imbricatum, Haloxylon salicornicum, Ochradenus baccatus*)

B. Fauna Biodiversity

Fauna species richness for the study area was a collective 6 species, while the individual site species richness ranged from a minimum of 0 species in thirty-three sites to a maximum of 3 species in one site. The average species richness recorded over the observed sites was less than 1 species. Rodent and Lizard (Burrow and tracks) is the highest species richness in the study area.

Table 15: Sites and Fanna (Species and Observations)

ID	No. of Species	Observation (Individuals, Burrow and Tracks)
St1	0	0
St2	0	0
St3	0	0
St4	0	0
St5	0	0
St6	0	0
St7	1	1
St8	0	0
St9	2	2
St10	0	0
St11	1	1
St12	2	2
St13	3	7
St14	0	0
St15	1	1
St16	0	0
St17	0	0
St18	2	10
St19	1	1
St20	0	0
St21	0	0
St22	0	0
St23	0	0
St24	0	0
St25	0	0
St26	0	0
St27	0	0
St28	0	0
St29	0	0
St30	0	0
St31	0	0
St32	0	0
St33	0	0
St34	0	0
St35	0	0
St36	0	0
St37	0	0
St38	0	0
St39	0	0
St40	1	1
St41	1	1
St42	2	2

St43	0	0
St44	1	1
St45	0	0

A species refraction curve was constructed below and it shows that a plateau is reached at about 8 species by sampling 60 sites. Thus, it is concluded that the current sampling plan recording 6 species at 45 sites sampled is suitable to account for the fauna a in the study region.

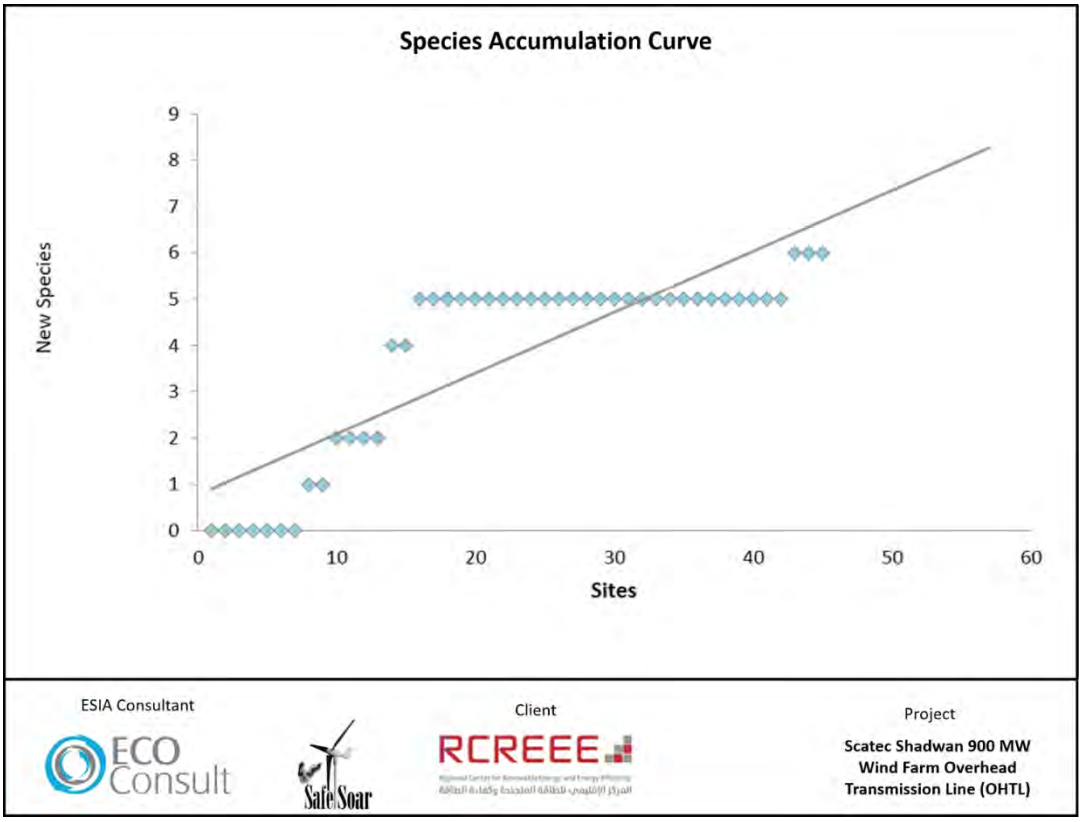


Figure 37: Fauna Species refraction curve showing the species accumulation with new sampled sites

C. Reptiles

The reptile taxa detected during our investigation included 2 lizard species, namely: Spiny-tailed Lizard *Uromastyx aegyptia*, and Red-spotted Lizard *Mesalina rubropunctata*. Many other lizards and snakes almost certainly occur in the region but have not been recorded by the team during the survey.

Figure 38: Some Recorded Reptile Species (from left to right: Red Spotted Lizard *Mesalina rubropunctata*, Rodent Burrow, Lizard Burrows)

The Spiny-tailed Lizard is the only reptile species that is on the IUCN Red List (regarded as Vulnerable), all the others are Least Concern (IUCN 2026).

The survey for these endangered taxa resulted in detecting about 3 burrows (1 active and 2 inactive), in 45 sampling stations, and along the path of the OHTLs. This yields an average density of about 0.07 Uromastyx aegyptia / km. These burrows showed variable spatial distribution over the site. Although Spiny-tailed Lizard presence was observed all over the study region, the southern portion of the study site is relatively highly populated with Spiny-tailed Lizard burrows and presence signs compared to the rest of the study site. In addition, the big wadis running east to west along the OHTL are remarkably void of burrows or other presence signs. This is probably because this lizard would avoid very low grounds and seek higher grounds for burrows to avoid potential flooding in Wadis. Also, avoid the highest mountains and the deepest wadis to avoid harsh and unsuitable soil for burrowing.

Overall, the Spiny-tailed Lizard is considered to be a Vulnerable species (IUCN Red List, 2024), which is exhibiting a high presence in the site. According to the IUCN Red List assessment, there has been a suspected population decline of over 30% over the past 15 years (3 generations), and this is expected to continue. It is recommended that this be addressed as a priority for the Biodiversity Management Plan of the project. Avoiding or translocating this population is a must to mitigate the expected impact of the project on local Biodiversity.

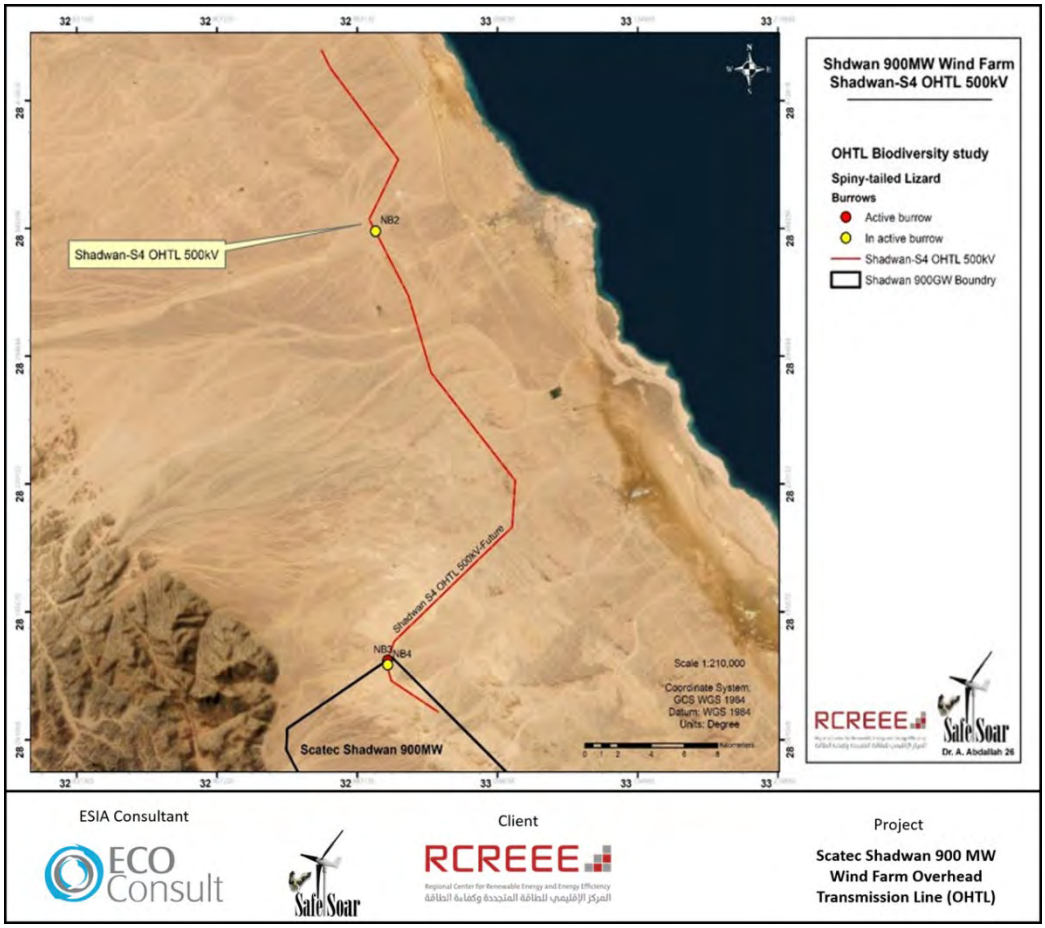


Figure 39: Recorded Spiny-tailed Lizard (Burrows along the proposed OHTL)

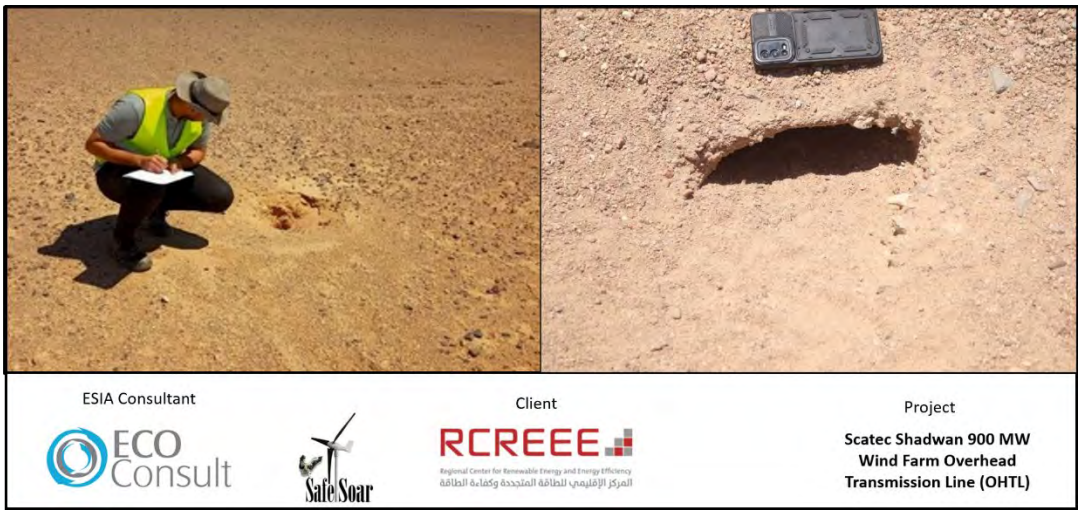


Figure 40: Pictures showing The Spiny-tailed Lizard and Its Burrows

D. Mammals

Only one mammal species was recorded in the study region during our investigations, namely, Arabian Red Fox (*Vulpes vulpes*), the species is quite common species in the red sea coast ecosystem and is categorized as Least Concern.

Many burrows and tracks belonging to smaller rodents mostly belong to *Gerbillus gerbillus* and *Acomys caherinus*. Most of these rodent species are typical species of the Gulf of Suez coastal ecosystem and are commonly encountered. Rodent specie recorded in study area are all Least Concern.

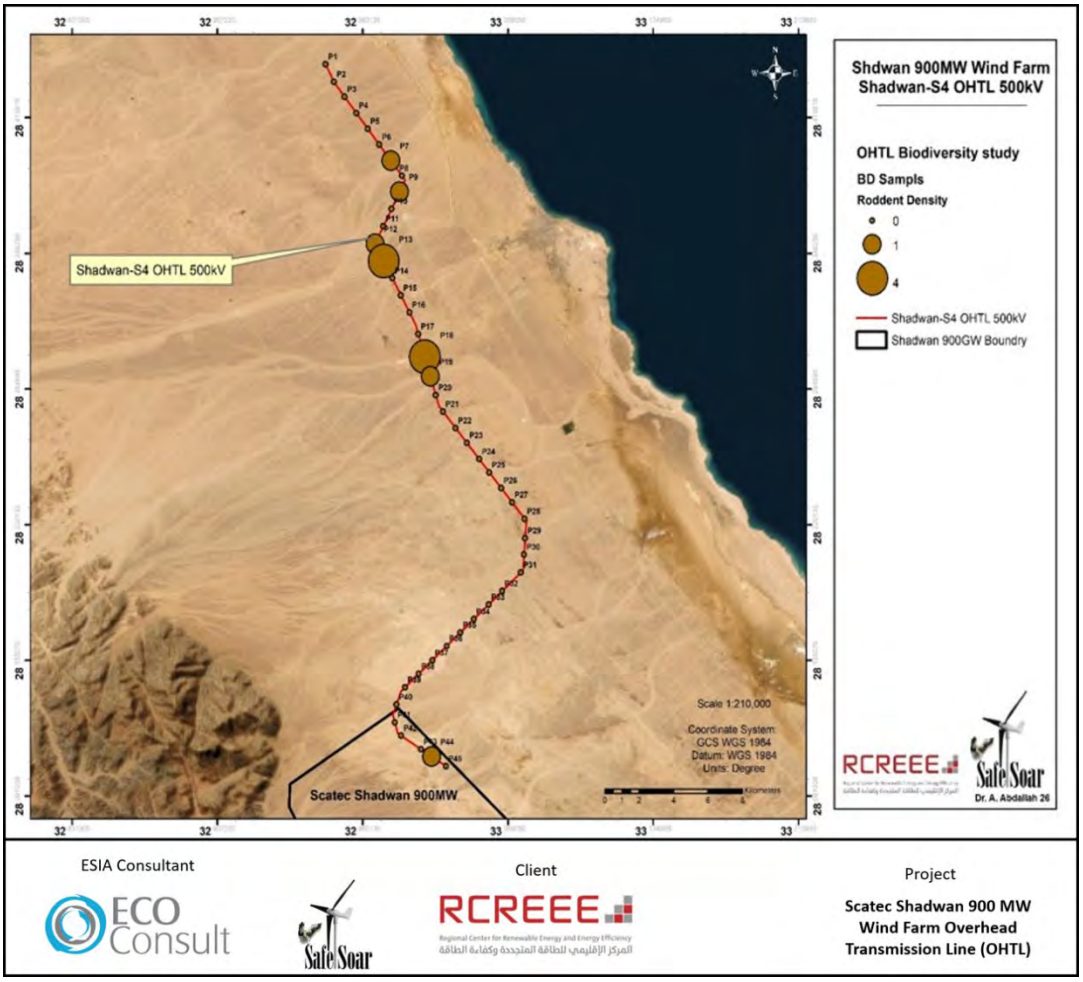


Figure 41: Distribution of Rodent Density (Burrows along the proposed OHTL).

7.6 Avifauna

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

Powerlines pose potential risks to birds through collisions during flight and from electrocution. In the study region extending north to south along the western coast of the Gulf of Suez, the main risks are from collision with powerlines and wind turbines. Birds are at risk of colliding with power lines during flights, especially when lines are not clearly visible or intersect with important bird flight paths. Factors influencing collision risk include line visibility, bird species behavior, and the proximity of power lines to critical habitats.

According to the Guidelines for Addressing Risks to Soaring Birds from Overhead Transmission Lines in Egypt (Baha El Din, 2022), as shown in the Figure below, the proposed Shadwan OHTL (Scatec- S4) alignment traverses the western sector of the Gebel El-Zeit Important Bird Area (IBA). The route directly intersects the IBA boundary and remains within the designated bird area for part of its length.

Consequently, the minimum distance between the OHTL route and the IBA is zero metres at the point of intersection. Given the international importance of the Gebel El-Zeit IBA for migratory soaring birds and other avifauna, the crossing represents a key environmental sensitivity requiring detailed assessment of collision risk, disturbance effects, and cumulative impacts in combination with existing and planned wind energy developments within the Gulf of Suez region. . The Guidelines recommend conducting high-intensity pre-construction monitoring of migratory soaring birds for all new OHTLs proposed in High-Risk zones.

To ensure that conclusions are representative of the proposed Shadwan OHTL, the assessment is based on three complementary lines of evidence. Firstly, site-specific observations collected along the proposed 45 km OHTL alignment and associated flight corridor during the Spring and Autumn 2025 migration seasons were used to characterize bird movements directly within the Project area. Secondly, project-specific datasets collected for the Shadwan Wind Farm ESIA and associated biodiversity studies were used to assess bird activity within the wider Project footprint and adjacent habitats. Thirdly, regional ornithological datasets from existing and proposed renewable energy developments and OHTLs within the Gulf of Suez were used to provide contextual information, calibration of collision-risk estimates, and cumulative impact assessment. Site-specific data were used as the primary basis for impact assessment, while regional datasets were used only to supplement the assessment where direct long-term monitoring data for the proposed OHTL were not yet available.

Therefore, the avifaunal assessment does not rely solely on the pre-construction surveys conducted during spring 2025 (20 February – 20 May) and autumn 2025 (10 August – 10 November) Approximately 35% of the OHTL alignment lies within the WPPs boundaries, and therefore benefits from extensive ornithological monitoring for ESIA, ATMP, SESA-CIA Projects in GoS. Field surveys were conducted during daylight hours (from one hour after sunrise until one hour before sunset) on a daily basis throughout the spring and autumn 2025 seasons. A total of fourteen field teams carried out observations across the OHTL routes and within a 5 km buffer extending along the length of the on either side of proposed OHTL alignment. The buffer was adopted to ensure that bird movements approaching, crossing, or diverging from the proposed OHTL corridor were adequately represented. These teams monitored the MSBs from fixed vantage points (VPs [Shadwan {1,4}, RGWE {S,M,E}, SESA CIA {17,22}, Alcazar NIAT {3,6}, AMUNET 6,7,8,9,10}], Figure 8), ensuring that each location is surveyed approximately most monitoring days in spring and autumn seasons, thereby providing robust spatial and temporal coverage of bird movements. Monitoring locations were selected specifically to provide coverage of the proposed Shadwan OHTL alignment and the surrounding collision-risk airspace. All observations used in the site-specific assessment represent bird movements either directly above, adjacent to, or immediately approaching the proposed OHTL corridor. The observation points used in the assessment, the Shadwan {1,4}, RGWE S, NIAT 6, AMUNET {8,10} Vantage Points (VPs) are located directly adjacent to the proposed OHTL alignment and provide site-specific data. The remaining observation points RGWE {E,M}, SESA CIA {17,22}, NIAT Alcazar 3 and AMUNET {6,7,9} locations are external reference VPs used to characterise wider spatial patterns of migration within the Gulf of Suez and support cumulative assessment.

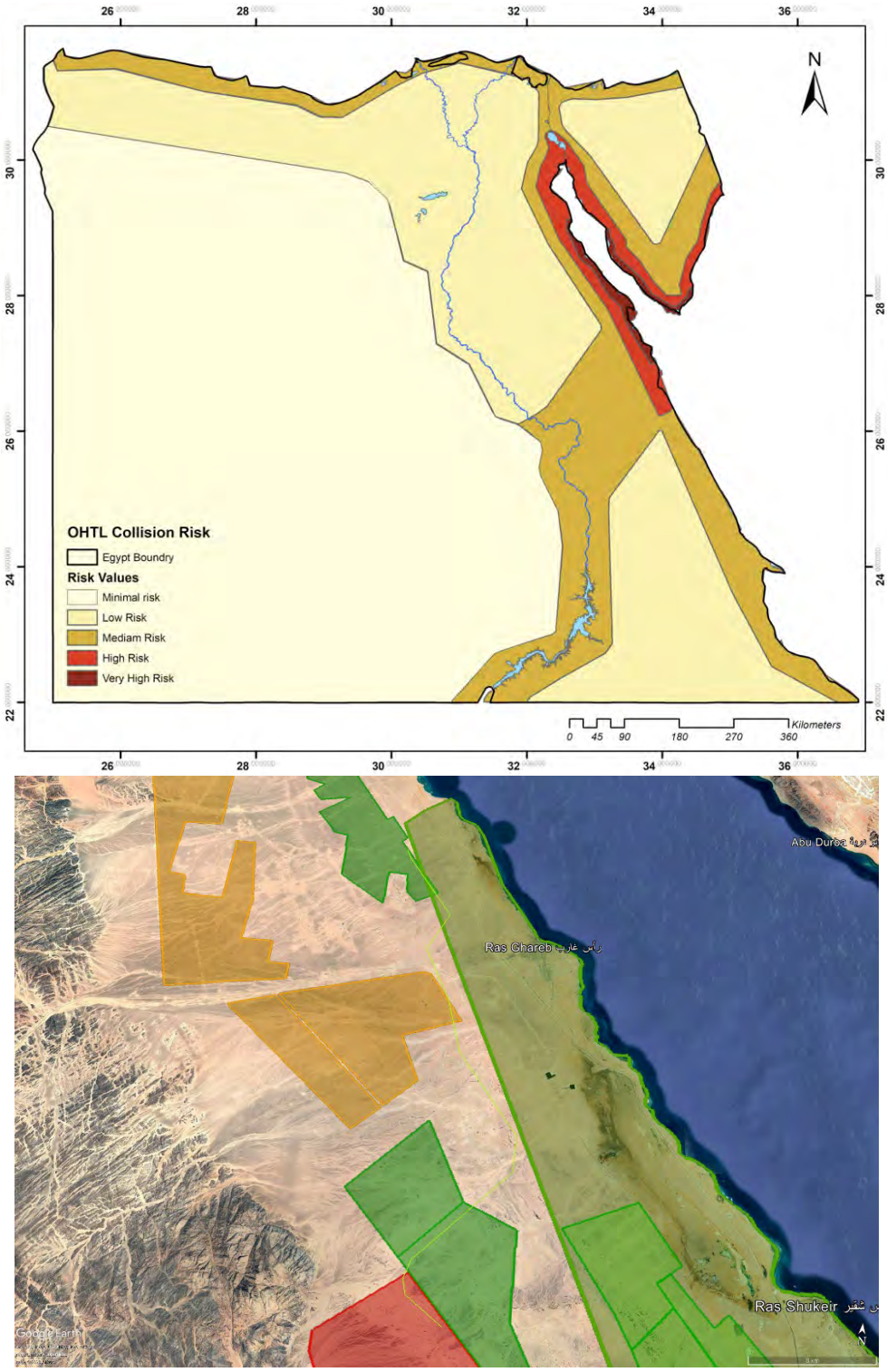


Figure 42: Preliminary OHTL Collision Risk Map for Egypt (Up) – Proposed OHTLs and Gebel El Zeit IBA (Down)

Assessing risks of avian mortality from power line collisions is dependent on identifying the factors and circumstances under which birds fly at collision risk altitudes. These conditions could be the basis for the identification and development of appropriate risk management strategies to reduce the potential of collision risk. Flight altitudes and consequently bird collision risk are influenced by both extrinsic (site-

specific and OHTL-specific) and intrinsic (species-specific) factors[10]. Topographic variations, habitat features, weather and light conditions, as well as anthropogenic disturbance levels are considered site-specific factors; while line configuration, wire diameter and height are OHTL-specific factors of collision risk.

Geography, topography and the distribution of water bodies define migratory flyways and thermal uplift zones, with mountains and depressions providing different flyways for soaring birds and consequently, different flight altitudes. In the current study area, the Gulf of Suez provides a "thermal barrier" for certain passive species, which strongly prefer to fly over landmasses, while some active fliers brave the crossing (at a cost). Understanding the soaring bird migration phenology in the region is critical for the assessment of risks from various infrastructure in this region.

While Intrinsic (species-specific) factors play a critical role in determining collision risk, including flight behavior, body size, maneuverability, and visual perception. Soaring species such as White Stork and European Honey Buzzard, which dominate movements along the RSRV Flyway, are generally considered susceptible due to their reliance on thermals, variability in flight altitude, and tendency to pass through the OHTL height range. However, recorded field data indicate that this susceptibility varies significantly depending on behavior and spatial context.

The Post-Construction Fatality Monitoring (PCFM) dataset referenced in this assessment comprises surveys undertaken along existing overhead transmission lines associated with the RGWE, RSWE, WBWF, AMUNET, Zaafarana and NREA developments. The combined monitored network exceeds several hundred kilometres of OHTLs and provides the largest available evidence base for evaluating collision mortality associated with transmission infrastructure in the Gulf of Suez region. The PCFM results demonstrate clear seasonal and spatial differences in collision patterns along the OHTLs. During the spring seasons (2021 – 2025), collisions were recorded mainly for 8 European Honey Buzzard, 2 Steppe Buzzard, and 1 Sparrowhawk, while no collisions of White Stork were observed, likely due to its strong coastal tracking behavior, which reduces interaction with inland infrastructure. In contrast, the PCFM in autumn seasons (2023–2025) within the coastal area recorded collisions involving multiple species, including 16 White Storks, 3 White Pelicans, 5 European Honey Buzzards, 1 Steppe Buzzard, 1 Sparrowhawk, 1 Marsh Harrier, and 1 Short-toed Eagle, while no carcasses were recorded during spring in the same coastal zone. So, the fatalities recorded in the central inland (between the mountains and the coastal plain) during the past five years (2021 – 2025) reflecting a different collision risk profile with OHTLs compared to the coastal corridor.

Overall, the available monitoring data indicate that collision risk varies among species and between seasons, and may also be influenced by local landscape characteristics and migration patterns. These factors have therefore been considered in the collision-risk assessment of the proposed Shadwan OHTL. White Storks experienced relatively low levels of recorded collision mortality within inland portions of the monitored OHTL network. This finding appears to reflect lower exposure within those specific alignments rather than active avoidance behaviour. Conversely, mortality records from coastal OHTLs demonstrate that White Storks remain susceptible to collisions where migration routes overlap with transmission

[10] Intrinsic risk depends on: flight behaviour, body size, altitude variability, visual limitation, experience, age, migration ecology and strategy.

infrastructure

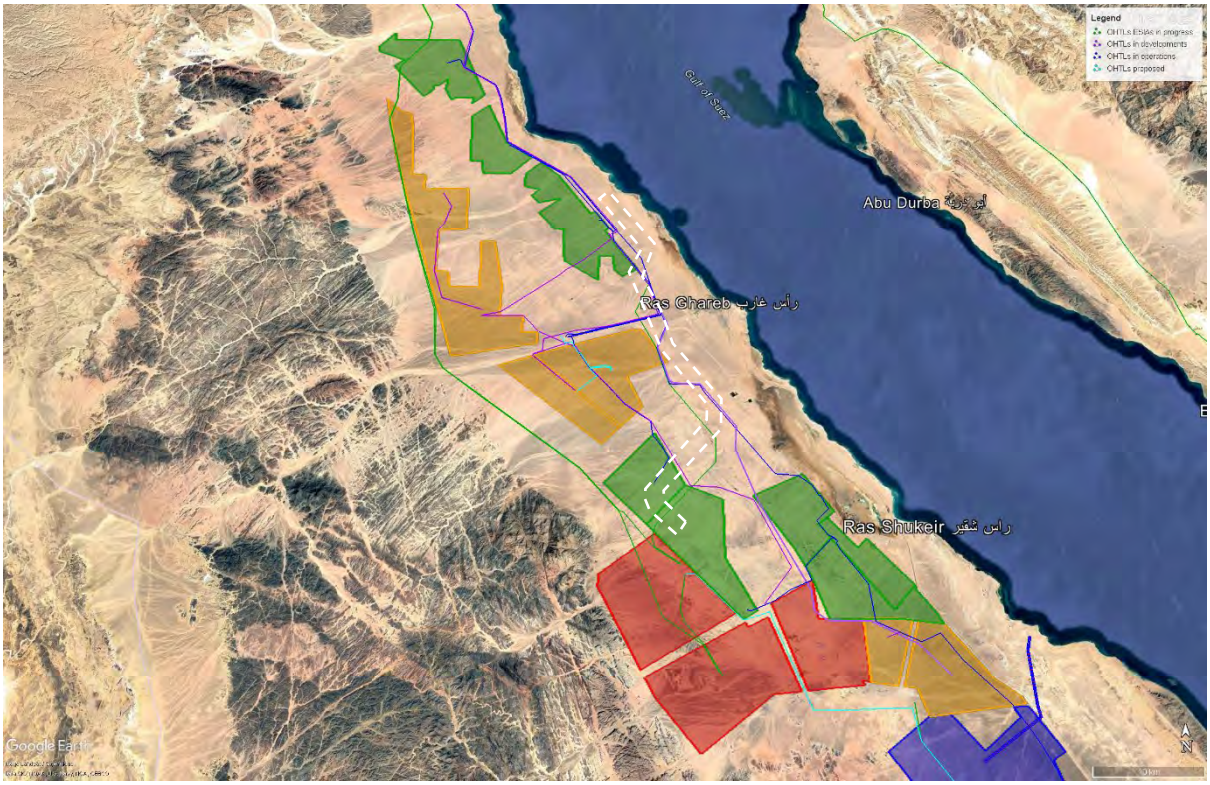


Figure 43: General location of the project region and the distribution of windfarms, operational OHTLs (blue), in development OHTLs (purple), OHTLs ESIAs in progress (green), proposed OHTLs (turquoise), and study area (dashed white).

7.6.1 *Avifaunal Assessment Approach and Methodology*

The avifauna assessment initiation (bird migration and fatalities) used a pragmatic approach taking into consideration the limited time that was available for its preparation and capitalizing on available data from the wind energy developments in the region during the previous years to optimize the outcome of the study. This was formulated by combining all available information from large parts of the study area. In this respect, the study depended on two basic data sources:

- Bird monitoring data

Bird monitoring data from 17 locations for renewable energy projects (wind farms and solar photovoltaic plants PV) located within the Gulf of Suez. The bird data was collected from 176 observation points (vantage points) scattered through the 17 RE projects along the study area through the last year (2025) from both the spring and autumn seasons. The Figure 6 shows the location of the VPs during spring and autumn 2025, while the Figures 9 and 10 below identifies the MSB sensitivity (bird/hour) that flew in 120m. The data collection included the date, location, number, species, direction and altitude data for each observation, amongst other parameters. Most relevant to this assessment were data on the number of birds and flight altitude, location and seasonality.

Figure 44 VPs locations in the west side of GoS during spring and autumn 2025

- Overhead Powerlines fatality surveys

There is now a common protocol for fatality monitoring at wind farms of the region. While project-specific carcass searches are localized and only cover relatively short lengths of overhead powerlines directly associated with individual wind farms, data was also gathered from other lengths of the overhead powerlines for the purposes of the SESA CIA in 2024-25 in the western side of GoS, see Figure 7 below. This data provides important evidence of the existence of high levels of mortality in some aforementioned localities along the existing overhead powerlines.

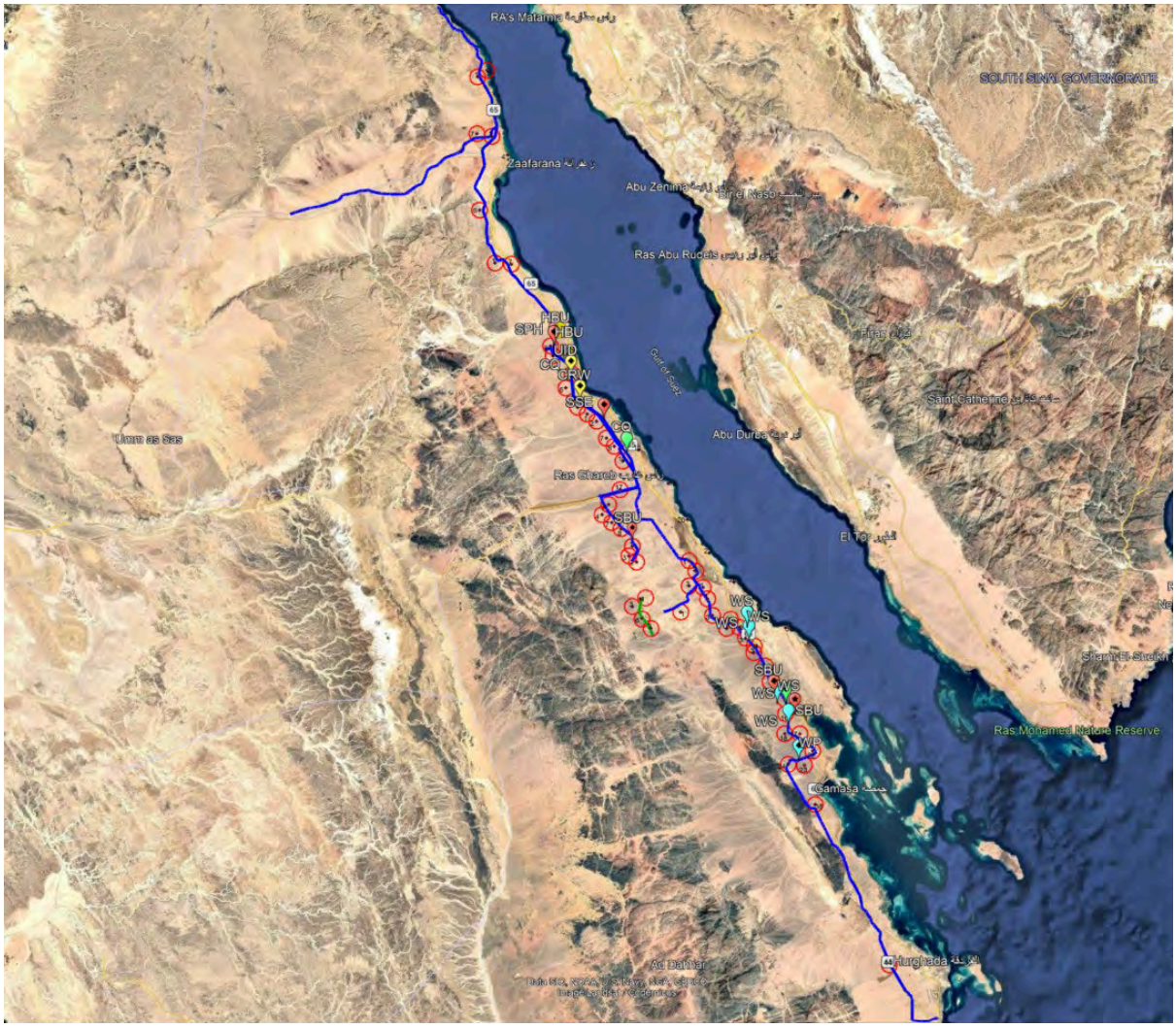


Figure 45 Fatalities recorded on overhead power transmission lines and the observation points intersecting with them during 2025

Systematic fatality surveys of sample lengths of existing overhead powerlines in the vicinity of wind farms and other power stations in the study region near the proposed OHTL route provided some empirical data on the potential mortality from power transmission infrastructure in the region, which could be applied to the proposed Shadwan OHTL. However, the data collected is not equally distributed along existing overhead powerlines during 2021-22-23-24-25 and thus can only serve to indicate potential relative mortality from powerlines in general rather than provide spatially differentiated mortality levels along different lengths of the powerline.

This available data on actual bird deaths along existing OHTLs is more valuable than surveys within the area that MSBs pass through as it provides real data from similar and close by projects and will provide a more accurate result to determine predicted numbers of MSB collisions per year / over the lifetime of the Project. Three assessments have been undertaken:

- Number of fatalities per year: Two collision-risk scenarios were developed for the assessment. The Realistic Case Scenario is based primarily on inland OHTLs that exhibit similar topographic setting,

route orientation, migration characteristics and infrastructure design to the proposed Shadwan OHTL. The Worst-Case Scenario is based on coastal OHTLs where bird densities, migration concentrations and observed collision rates are demonstrably higher. Together these scenarios provide a reasonable range within which actual Project mortality is expected to occur. So, bird collision data from OHTLs monitoring fatalities in the immediate vicinity of the proposed project (such as RGWE and VESTAS OHTLs that considered as a Realistic Case Scenario "High Risk Zone") and the coastal existing OHTLs (Such as RSWE, WBWF, AMUNET, Zaafarana, NREA (KFW, FIEM, JICA), and Gabel Elzeit Hurghada OHTLs that considered as Worst Case Scenario "Very High Risk Zone") was used to extrapolate how many individual birds are predicted to collide with the Shadwan OHTL each year. This was done by taking the average number of fatalities for each species per km over several seasons (with data surveyed a length of 30km from 2021-2025 for the Realistic Case Scenario, while other data surveys lengths of 38km, 61.4km, and 198.3km during 2023, 2024, and 2025 respectively for the Worst Case Scenario). Data from these projects has been extrapolated to predict how many birds may potentially collide with the proposed Shadwan OHTL per km of overhead powerlines, per year. The prediction of annual collision mortality for the proposed Shadwan OHTL was based on empirically derived fatality rates from existing OHTLs within the Gulf of Suez region. Four independent datasets were used:

- Realistic Case Scenario (Observed Fatalities): based on the actual number of bird fatalities recorded during PCFM surveys along representative inland OHTLs. Annual species-specific fatality rates were calculated by dividing the observed number of fatalities by the monitored OHTL length (21 km).

Year	Covered OHTL length in Km	No of Fatality	Species	Species Fatality/Km
2021	21	2	HBU	0.10
		1	SBU	0.05
		1	SPH	0.05
2022	21	3	SBU	0.14
		2	HBU	0.10
2023	21	2	LBU	0.10
		2	SBU	0.10
		1	SPH	0.05
2024	21	4	HBU	0.19
2025	21	1	SBU	0.05

- Realistic Case Scenario (GenEst-Corrected Fatalities): based on estimated mortality derived using GenEst correction factors for carcass persistence, searcher efficiency and survey coverage. Species-specific fatality rates were calculated by dividing the estimated annual fatalities by the monitored OHTL length (21 km).

Year	Covered OHTL length in Km	No of Estimated Fatality	Species	Species Fatality/Km
2021	21	2.86	HBU	0.14
		1.43	SBU	0.07
		1.43	SPH	0.07
2022	21	4.29	SBU	0.20
		2.86	HBU	0.14
2023	21	2.468	LBU	0.12
		2.468	SBU	0.12
		1.234	SPH	0.06
2024	21	5.78	HBU	0.28
2025	21	1.6	SBU	0.08

- Worst Case Scenario (Observed Fatalities): based on actual mortality recorded along coastal OHTLs located within higher bird-density migration corridors. Species-specific

fatalities were divided by the monitored OHTL length in each year (62.6 km in 2021–2023, 199.73 km in 2024 and 372.7 km in 2025) to derive annual fatalities per kilometre.

Year	Covered OHTL length in Km	No of Fatality	Species	Species Fatality/Km
2021	62.6	31	WS	0.50
		6	HBU	0.10
		1	MAHA	0.02
2022	62.6	4	SBU	0.06
		2	BK	0.03
		2	HBU	0.03
		10	WS	0.16
2023	62.6	25	WS	0.40
		2	LBU	0.03
		2	SBU	0.03
		2	HBU	0.03
2024	199.73	9	HBU	0.05
		5	WS	0.03
		2	WP	0.01
		1	MAHA	0.01
2025	372.7	3	SBU	0.01
		6	WS	0.02
		3	WP	0.01
		7	HBU	0.02
		2	SHE	0.01
		1	MAHA	0.003
		1	SPH	0.003

- Worst Case Scenario (GenEst-Corrected Fatalities): based on corrected mortality estimates from coastal OHTLs. Mean annual fatality rates were calculated for RSWE, AMUNET, WBWF and NREA OHTLs using GenEst-adjusted mortality estimates. Average mortality rates ranged from 0.206 fatalities/km/year at WBWF to 0.325 fatalities/km/year at NREA, producing an overall mean fatality rate of approximately 0.24 fatalities/km/year, which was adopted as the representative coastal worst-case mortality rate.

Year	Spring	Autumn	Avg
2025	71	71	km
RSWE	0.243	0.176	0.210
AMUNET	0.243	0.200	0.222
WBWF	0.211	0.200	0.206
NREA	0.350	0.300	0.325

The Realistic Case Scenario produced an average GenEst-corrected collision rate of approximately 0.14 fatalities/km/year (range 0.08–0.28 fatalities/km/year). The Worst Case Scenario produced an average GenEst-corrected collision rate of approximately 0.24 fatalities/km/year based on coastal OHTLs (RSWE, AMUNET, WBWF and NREA). These rates were adopted as the primary mortality coefficients used to estimate annual collision mortality for the 45 km proposed Shadwan OHTL.

The selected reference OHTLs were chosen because they share key characteristics with the proposed Shadwan OHTL, including tower design, route orientation, topographic setting, proximity to migratory bird movement corridors and location within the Gulf of Suez migration system. Accordingly, they provide representative analogue datasets for estimating potential collision risk associated with the proposed Project. As part of the extrapolation, it has been assumed that no bird diverters are currently in place (it is known to be the case that at least 5 of the powerlines have no diverters and the exact use of diverters along the full length of the other lines is unknown). s. . Based on the RGWE PCFM monitoring reports (2021–2025), the estimated average collision fatality rate in the inland section of the OHTL, where bird flight diverters (BFDs) are installed (assumed 50% efficiency), is estimated at approximately 0.14 fatalities

per km per year. In comparison, data from RSWE, AMUNET, WBWF[11], and NREA (2025) indicate a higher estimated fatality rate of approximately 0.24 fatalities per km per year in the coastal area, reflecting increased collision risk associated with higher bird densities and more concentrated migration pathways along the coast.

- Number of fatalities with and without diverters: data has been used from background data studies is based on findings reported by Bernardino et al. (2019), Barrientos et al. (2011), and regional monitoring programmes undertaken within the Gulf of Suez, which collectively indicate that appropriately selected wire-marking devices can reduce collisions by approximately 50% or more.

- Compounded and cumulative risk assessment: using bird collision data from local wind farms with OHTLs associated with OHTLs exhibiting comparable route orientation, topographic setting, migration intensity, habitat characteristics and engineering specifications to assess which areas of the OHTL are at the highest risk of MSB collisions, a cumulative risk assessment was undertaken by RCREEE and Safe Soar.

- To distinguish project-specific risks from cumulative risks, the assessment was undertaken in two stages. Firstly, the proposed Shadwan OHTL was assessed using site-specific bird monitoring data collected along the proposed alignment during the Spring and Autumn 2025 migration seasons. These data were used to evaluate bird migration intensity, flight altitude distributions, species composition and route-specific collision exposure within the proposed OHTL corridor. Secondly, a compounded and cumulative risk assessment was undertaken using additional regional datasets from existing and planned OHTLs and renewable energy developments within the Gulf of Suez. This supplementary assessment was undertaken to identify whether external landscape factors and the presence of other infrastructure could increase or decrease collision risk along different sections of the proposed Shadwan OHTL. Accordingly, the five indicators presented below should be considered cumulative risk modifiers applied to the site-specific assessment rather than primary indicators of collision risk. The resulting assessment therefore identifies those sections of the proposed Shadwan OHTL where cumulative conditions may elevate collision risk above that indicated by site-specific bird observations alone.

- The compounded and cumulative assessment of the proposed Shadwan OHTL takes into account five indicators (parameters) that may influence collision risk at a landscape scale:

Topography (route-specific input)

Points	Criteria
1	Flat surface
2	Area with small elevations
3	Area with higher elevations and hills
4	Area with hills and different successive elevations

[11] BFDs are installed (assumed 50% efficiency) at associated WBWF OHTL.

The cumulative effect resulting from the convergence of other OHTLs (cumulative input)

Points	Criteria
1	Distance between different OHTLs > 1000 m
2	Distance between different OHTLs 500-1000 m
3	Distance between different OHTLs 250-500 m
4	Distance between different OHTLs 50-250 m

When calculating the risk level for the cumulative effect of converging OHTLs, the differences in the pylon elevations are taken into account. If two converging lines have different elevations, this increases the risk level by one point.

The cumulative effect resulting from the convergence of OHTLs with Wind Turbines (cumulative input)

Points	Criteria
1	Distance between OHTL and Wind Turbines > 2000 m
2	Distance between OHTL and Wind Turbines 1000-2000 m
3	Distance between OHTL and Wind Turbines 500-1000 m
4	Distance between OHTL and Wind Turbines 100-500 m

Distance from any attraction (Sea –Sabkha - Hills or Mountainous areas) (route-specific input)

Points	Criteria
1	Distance from attraction site >10 km
2	Distance from attraction site 6-10 km
3	Distance from attraction site 3-6 km
4	Distance from attraction site 0-3 km

Bird Density at risky height (<120m) (This indicator is assessed in segments of 2.5 km) (project-specific input)

Points	Criteria
1	0-1000 Bird / 2.5 km
2	1001-5000 Bird / 2.5 km
3	5001-10000 Bird / 2.5 km
4	≥10000 Bird / 2.5 km

Each indicator was assessed in segments of around 2.5 km

7.6.2 Results

Avifauna

The abundant available data from wind energy developments throughout the region provided by RCREEE was composed of bird records of pre and post construction monitoring at active, under construction and planned wind farms in the Gulf of Suez region, coinciding with the proposed lengths of powerlines.

This data was collected in roughly the same manner and provides similar information on bird movements through the target region. Some modest treatment of the data was required to align all data sets to provide a common plateau for analysis, most importantly unifying altitudinal bands used amongst various wind farm monitoring teams and to categorize these data into two altitudinal bands below 50 m above ground and below 120 m above ground. These height bands were selected in order to provide the best evaluation of risk from OHTLs in the region, without the loss of too many observations that would not conform with these bands otherwise.

Because bird monitoring data was not equally distributed across the study area spatial interpolation techniques were used for predicting the values of bird migration intensity at unsampled sites in order to generate spatially continuous data (Li and Heap, 2011). Among the interpolation methods, the most commonly used are Interpolates an Inverse Distance Weighted (IDW) technique (Mirzaei and Sakizadeh, 2016).

The output value for a cell using inverse distance weighting (IDW) is limited to the range of the values used to interpolate. Because IDW is a weighted distance average, the average cannot be greater than the highest or less than the lowest input. The best results from IDW are obtained when sampling is sufficiently dense regarding the local variation to be simulated. If the sampling of input points is sparse or uneven, the results may not sufficiently represent the desired surface (Watson and Philip 1985).

This technique was used to generate the bird migration intensity maps and identify potential risk hotspots along the proposed powerlines.

Bird monitoring data used in this assessment were collected from fourteen VPs located along the proposed OHTL route during the spring and autumn seasons of 2025. The dataset includes key observation parameters such as date, location, species, number of individuals, flight direction, and flight altitude.

In addition, carcass data from existing OHTLs along the western coast of the Gulf of Suez were incorporated to provide context on historical bird mortality and potential collision risk associated with transmission infrastructure in the region.

To support a broader spatial understanding of bird movement and sensitivity, seasonal sensitivity maps (spring and autumn) were developed using data from all wind energy projects within the GoS. These maps provide a regional perspective on migration patterns and high-use areas, complementing the site-specific observations collected along the proposed OHTL route.

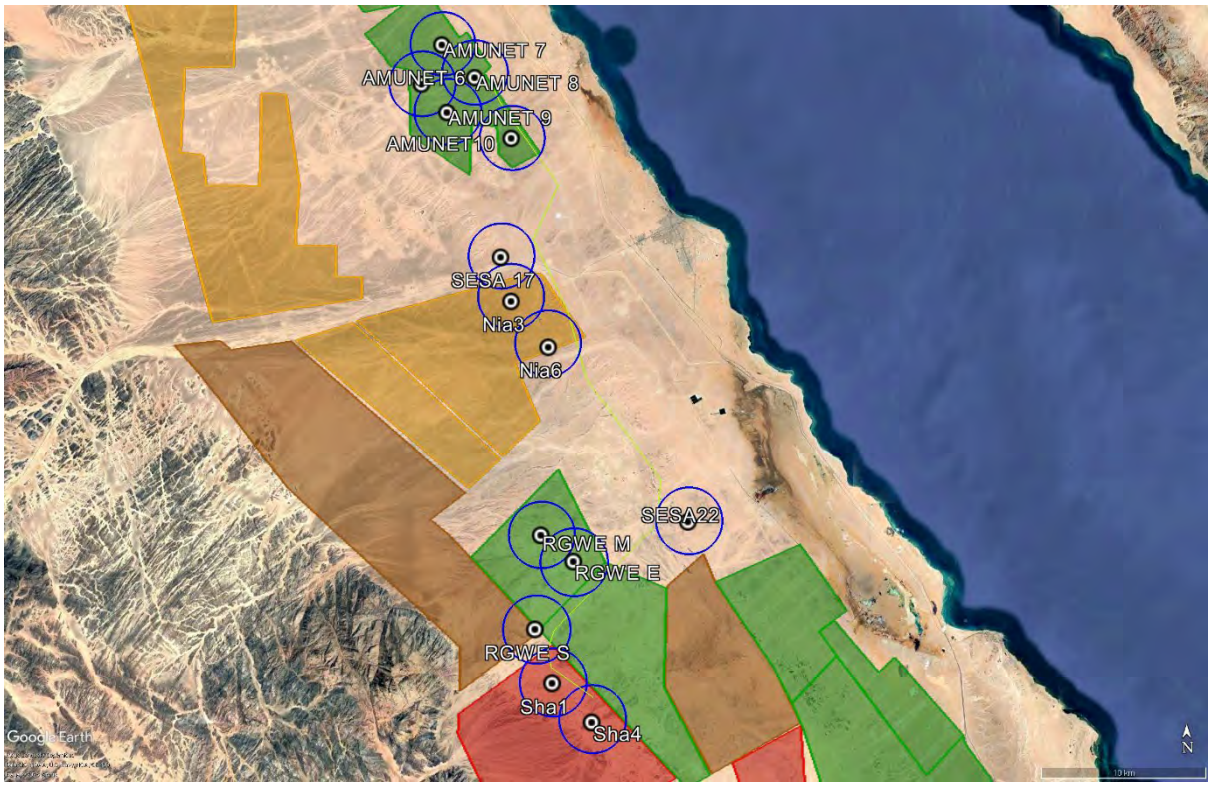


Figure 46 Fatalities recorded on overhead power transmission lines and the observation points intersecting with them during 2025

Spatial Distribution of Migration Intensity Along the Western Coast of the GoS Spring and Autumn 2025

The first map presents a sensitivity assessment of wind farm areas in the Gulf of Suez (GoS) based on soaring bird migration activity during spring and autumn 2025. It highlights how bird passage rates vary spatially along the coastal corridor, which is a well-known migration route. The color-coded zones represent bird activity intensity, ranging from very low (0-29 birds/hour) (light yellow) to very high (360-730 birds/hour) (dark red) in spring, while very low levels (0–17 birds/hour in light yellow) to very high levels (192–319 birds/hour in dark red) in autumn 2025, indicating areas of increasing ecological sensitivity and potential collision risk.

The central part of the study area shows the highest bird passage rates, particularly in locations where darker orange and red colors appear. These zones represent migration hotspots where large numbers of birds concentrate, increasing the likelihood of interaction with man-made structures. In contrast, the

northern and southern sections generally show lower to moderate activity levels. The map emphasizes that bird migration is not uniform but rather concentrated in specific segments along the coast.

In addition to bird sensitivity, the map overlays existing and planned wind farms, as well as overhead transmission lines (OHTLs) and vantage points (VPs). This allows for identifying areas where infrastructure overlaps with high bird activity, highlighting potential collision risks. The map is therefore an important tool for environmental assessment and planning, supporting decisions on turbine placement, transmission routing, and the implementation of mitigation measures to reduce impacts on migratory birds.

The second map provides a detailed sensitivity assessment of soaring bird migration at low altitude (<120 m) within the wind farm area and its associated 500 kV overhead transmission line in the Gulf of Suez during spring and autumn 2025. It shows that most of the project footprint lies within low to moderate bird passage zones (approximately 0.1–200 birds/hour in spring, while 0.01-20 bird/hour in autumn), while higher activity areas (up to 500–800 birds/hour in spring) are mainly located toward the southeast of the OHTL route. The map also overlays key infrastructure, including nearby wind farms, transmission lines, and observation points used to derive the data. Overall, it indicates that although some moderate-risk zones exist—particularly along certain transmission line segments — the project area is relatively well positioned outside the highest bird migration hotspots, suggesting manageable collision risks with appropriate mitigation measures.

The southwestern section of the Shadwan OHTL predominantly traverses areas classified as low to moderate migration sensitivity. Sensitivity increases progressively towards the northeastern section where bird passage rates are higher and where the alignment approaches areas identified as migration concentration zones. Consequently, the northeastern segments contribute disproportionately to the overall collision risk associated with the OHTL.

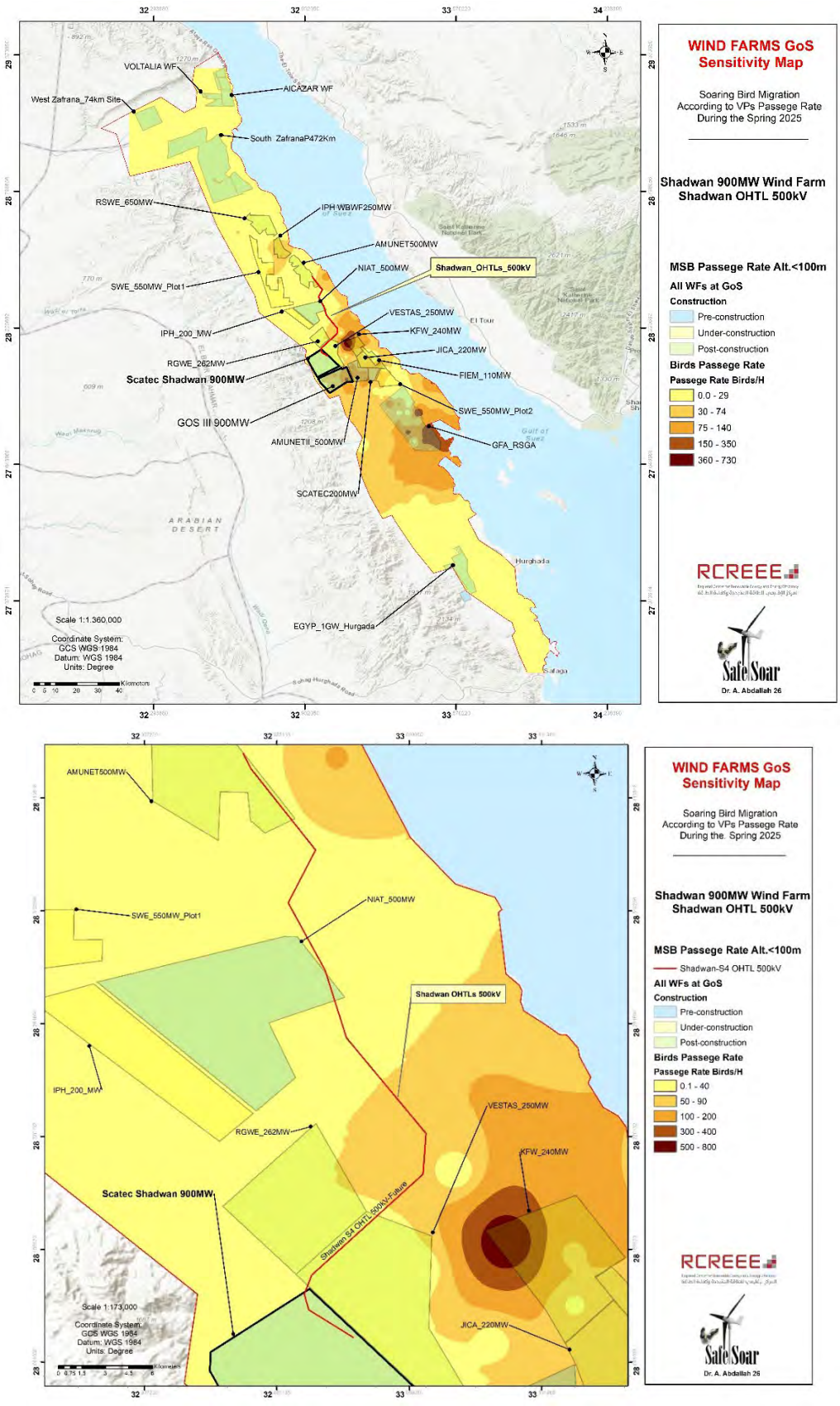
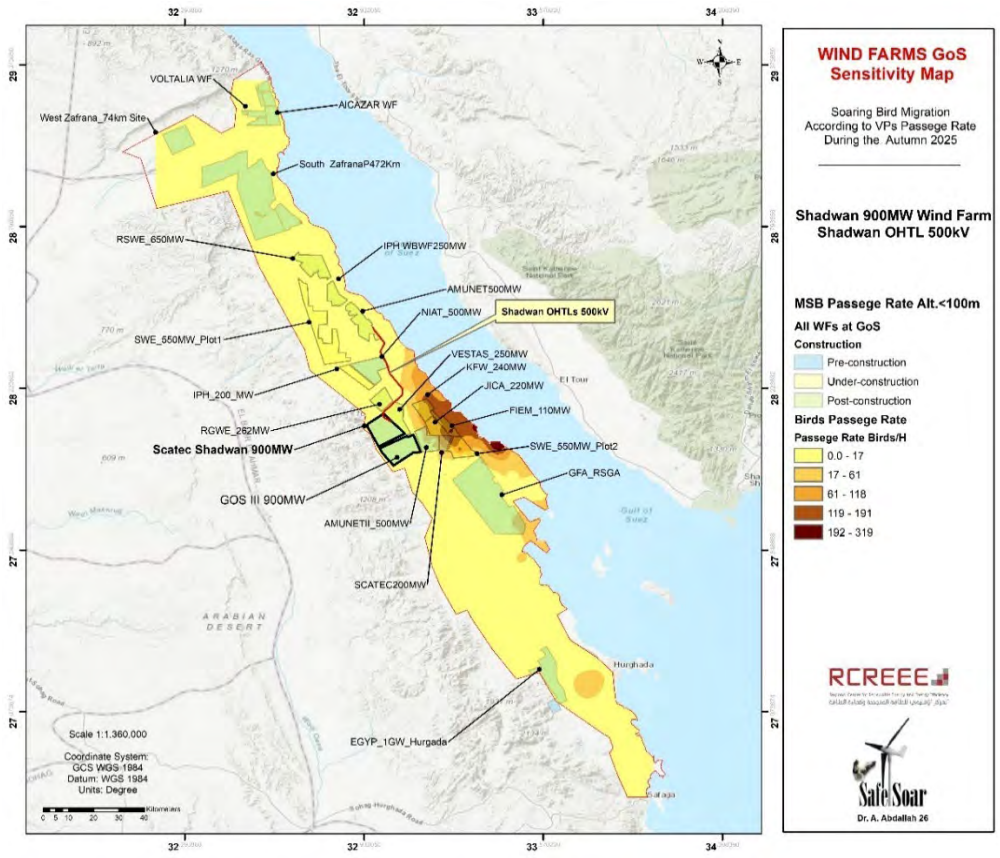


Figure 47 Intensity of MSB migration in spring 2025 season below 120 m.


WIND FARMS GoS
Sensitivity Map
Soaring Bird Migration
According to VPs Passege Rate
During the Autumn 2025
Shadwan 900MW Wind Farm
Shadwan OHTL 500kV
MSB Passege Rate Alt.<100m
All WFs at GoS
Construction
Pre-construction
Under-construction
Post-construction
Birds Passege Rate
Passege Rate Birds/H
0.0 - 17
17 - 61
61 - 118
119 - 191
192 - 319
VOLTALIA WF
AICAZAR WF
West Zafrana_74km Site
South ZafranaP472Km
RSWE_650MW
IPH WBWF250MW
AMUNET500MW
NIAT_500MW
Shadwan OHTLs 500kV
SWE_550MW_Plot1
VESTAS_250MW
KFW_240MW
JICA_220MW
IPH_200_MW
FIEM_110MW
RGWE_262MW
Scatec Shadwan 900MW
SWE_550MW_Plot2
GFA_RSGA
GOS III 900MW
AMUNETII_500MW
SCATEC200MW
EGYP_1GW_Hurgada
Hurghada
ARABIAN DESERT
Gulf of Suez
Scale 1:1.360.000
Coordinate System:
GCS WGS 1984
Datum: WGS 1984
Units: Degree
Kilometers
0 5 10 20 30 40
RCREEE
Safe Soar
Dr. A. Abdallah 26

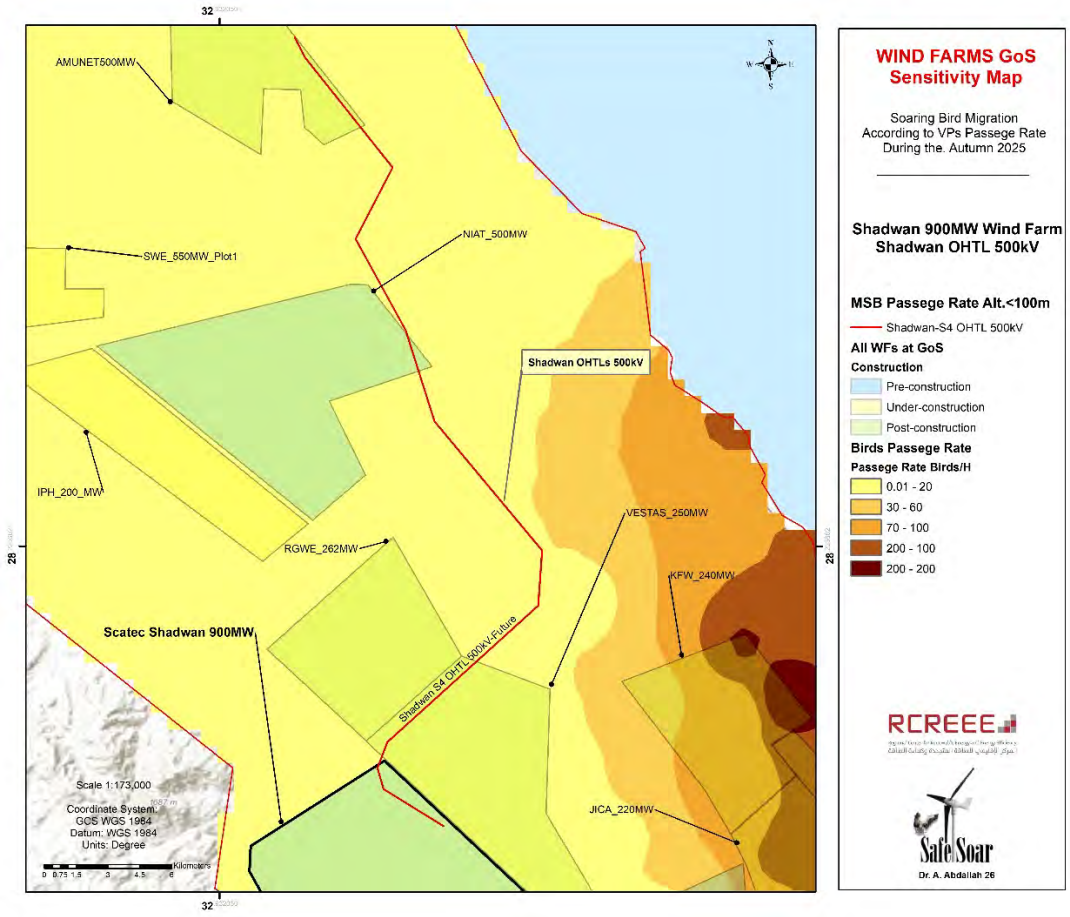


Figure 48 Intensity of MSB migration in autumn 2025 season below 120 m.

MSBs Species Sensitivity to Collision Risk in Spring 2025 , Autumn 2025, and Spring 2026.

The migration data presented below relates to observations collected from vantage points associated with the proposed Shadwan OHTL corridor shown in Figure 8 and are therefore considered representative of bird activity within the Project area. The spring migration monitoring period (20 February–20 May 2025) recorded 243,709 migratory soaring birds from a diverse assemblage of species. The migration was strongly dominated by White Stork (102,870 individuals), followed by Steppe Buzzard (49,400 individuals), Black Kite (25,427 individuals), and European Honey Buzzard (24,352 individuals), with Steppe Eagle (16,287 individuals) also representing a major component of the migration. These species collectively accounted for the vast majority of all recorded movements and are characteristic of the major migratory flyways crossing the region.

Flight activity analysis indicates that only about 16.1% of all recorded birds flew within the 0–120 m altitude band, which corresponds to the collision-risk zone for overhead transmission lines (OHTLs). Consequently, approximately 83.9% of all birds were recorded above the collision-risk height, reducing their potential exposure to OHTL-related collisions.

Collision risk was assessed based on bird abundance, frequency of occurrence within the Shadwan OHTL corridor, cumulative time spent within the risk zone, and the proportion of movements recorded between 0–120 m altitude. The analysis demonstrates that:

- White Stork exhibits the highest collision exposure, with 23,063 individuals recorded within the 0–120 m risk zone, representing approximately 22% of all White Storks observed. Owing to its exceptionally high abundance, the species contributes the largest number of potentially exposed birds.
- Black Kite shows substantial exposure, with 5,151 individuals (20%) recorded within the risk zone and the longest cumulative time spent at risky altitudes (1,126 minutes), indicating prolonged use of low-altitude flight paths.
- Steppe Buzzard, despite a relatively low proportional exposure (10%), contributes significantly to overall collision risk because of its very high abundance, resulting in 4,777 individuals recorded within the risk zone and 1,660 cumulative minutes spent at risky altitudes.
- European Honey Buzzard also exhibits notable exposure, with 3,848 individuals (16%) recorded within the risk zone and a cumulative risk time of 528 minutes.
- Steppe Eagle shows comparatively low proportional exposure (4%), with 662 individuals recorded within the risk zone. However, its conservation importance and large body size make it a species of concern despite the lower risk percentage.
- Lesser Spotted Eagle, Short-toed Eagle, and Black Stork exhibited moderate exposure levels, with 88, 75, and 179 individuals, respectively, recorded within the risk zone. These species remain important from a conservation perspective and therefore warrant consideration in impact assessments.
- Several species, including Common Kestrel (60%), Montagu's Harrier (56%), Marsh Harrier (39%), Pallid Harrier (70%), and Golden Eagle (40%), showed relatively high proportions of low-altitude flight. This indicates a behavioural susceptibility to collision risk; however, their overall contribution to cumulative impacts is limited due to their low abundance.
- Species such as Bonelli's Eagle, Crested Honey Buzzard, and Lesser Kestrel showed no recorded use of the 0–120 m risk band, indicating negligible collision exposure during the survey period.
- Although White Pelican was observed in relatively high numbers (8,392 individuals), only 13% of individuals were recorded within the risk zone, suggesting a generally lower collision exposure compared with the dominant soaring migrants.

Overall, the collision risk assessment indicates that White Stork, Steppe Buzzard, Black Kite, and European Honey Buzzard contribute most significantly to potential collision impacts due to their combination of high abundance and frequent use of the OHTL risk zone, while Steppe Eagle and other large raptors remain key species of concern because of their conservation significance despite lower exposure rates.

Table 16 Summary of Bird Migration Intensity and Collision Risk by Species – Spring 2025/26

Species/Spring 2025-26 (20 Feb – 20 May)	Accumulated Number of Birds	Accumulated Number of Records	Bird/h	Accumulated Time Spent (minutes)	Accumulated Number of Birds at Risky Altitudes (0-120 m)	Accumulated Number of Records at Risky Altitudes	Bird/h at Risky Altitudes (0-120 m)	Accumulated Time Spent at risky Altitudes (minutes)	Risk Bird Counts %	Risk Bird Time %
Black Kite	**25427**	1774	3.08	5559	5151	325	0.62	1126	20%	20%
Black Stork	1118	124	0.14	685	179	14	0.02	135	16%	20%
Booted Eagle	382	323	0.05	669	54	47	0.01	160	14%	24%
Common Kestrel	84	80	0.01	156	50	47	0.01	91	60%	58%
Egyptian Vulture	164	127	0.02	400	16	12	0.00	81	10%	20%
European Honey Buzzard	**24352**	686	2.95	2058	3848	179	0.47	528	16%	26%
Imperial Eagle	55	54	0.01	137	6	6	0.00	15	11%	11%
Lesser Spotted Eagle	1632	495	0.20	1341	88	48	0.01	132	5%	10%
Long-legged Buzzard	141	135	0.02	369	39	37	0.00	105	28%	28%
Marsh Harrier	138	110	0.02	248	54	48	0.01	101	39%	41%
Montagu's Harrier	9	9	0.00	18	5	5	0.00	10	56%	56%
Osprey	40	40	0.00	185	8	8	0.00	65	20%	35%
Pallid Harrier	10	9	0.00	24	7	6	0.00	16	70%	69%
Short-toed Eagle	778	537	0.09	1300	75	61	0.01	165	10%	13%
Sooty Falcon	1	1	0.00	1	1	1	0.00	1	100%	100%
Sparrowhawk	120	99	0.01	152	34	29	0.00	42	28%	28%
Greater Spotted Eagle	22	21	0.00	53	4	3	0.00	6	18%	11%
Steppe Buzzard	**49400**	2573	5.99	8511	4777	514	0.58	1660	10%	20%
Steppe Eagle	**16287**	2156	1.98	6687	662	242	0.08	745	4%	11%
White Pelican	8392	50	1.02	570	1102	14	0.13	197	13%	35%
White Stork	**102870**	282	12.47	3161	23063	39	2.80	488	22%	15%
Bonelli's Eagle	3	3	0.00	5	0	0	0.00	0	0%	0%
Crested Honey Buzzard	7	6	0.00	14	0	0	0.00	0	0%	0%
Eurasian Crane	71	4	0.01	12	3	1	0.00	2	4%	17%
Eleonora's Falcon	6	6	0.00	8	4	4	0.00	6	67%	75%
Golden Eagle	5	4	0.00	17	2	2	0.00	4	40%	24%
Eurasian Griffon	9	9	0.00	20	2	2	0.00	6	22%	30%
Peregrine Falcon	2	2	0.00	4	2	2	0.00	4	100%	100%
Eurasian Hobby	1	1	0.00	2	1	1	0.00	2	100%	100%
Lanner Falcon	1	1	0.00	2	1	1	0.00	2	100%	100%
Lesser Kestrel	1	1	0.00	2	0	0	0.00	0	0%	0%
Levant Sparrowhawk	12181	26	1.48	94	10	3	0.00	4	0.1%	4%

The autumn migration survey recorded 55,153 birds from the target soaring bird species, distributed across 1,530 observation records. Overall, the migration season was dominated by European Honey Buzzards, White Storks, and White Pelicans, which together accounted for more than 97% of all recorded individuals.

The European Honey Buzzard was by far the most abundant species, with 28,453 individuals (51.6% of all birds recorded). This was followed by the White Stork with 16,119 individuals (29.2%) and the White Pelican with 9,105 individuals (16.5%). All other species were recorded in substantially lower numbers, including Black Kite (790 individuals), Marsh Harrier (362 individuals), and Steppe Buzzard (157 individuals).

The high abundance of European Honey Buzzards is consistent with the importance of the Gulf of Suez region as a major autumn migration corridor for this species. White Storks and White Pelicans also showed strong migratory passages, typically occurring in large flocks during favorable weather conditions.

Collision risk was evaluated based on the proportion of birds recorded within the rotor-swept risk zone (0–120 m).

European Honey Buzzards: represented the greatest potential collision risk due to both its abundance and its flight altitude distribution:

- 21,800 birds (77%) were recorded within the risk altitude zone.
- 517 records occurred at risky altitudes.
- 1,431 minutes (60%) of the total observation time were spent within the risk zone.

This species therefore constitutes the principal contributor to seasonal collision risk and should be considered the key species of concern during autumn migration.

White Pelicans: were the second most important risk species in absolute terms:

- 2,755 birds (30%) flew within the risk zone.
- 42% of total flight time occurred at risky altitudes.

Although the percentage of birds within the risk zone was lower than for European Honey Buzzards, the large overall population size resulted in a substantial number of individuals potentially exposed to collision risk.

White Storks: were recorded in large numbers; however, their risk exposure was comparatively limited:

- Only 1,625 birds (10%) were recorded within the risk altitude band.
- 38% of flight time occurred in the risk zone.

The majority of migrating White Storks therefore flew at higher altitudes above the OHTLs area.

Raptors and Other Soaring Birds: Among raptors, several species showed relatively high proportions of flights within the risk zone despite their lower abundance:

MSB Species	Risk Bird Counts	Risk Bird Time
Sooty Falcon	86%	86%
Pallid Harrier	67%	61%
Marsh Harrier	60%	64%
Montagu's Harrier	57%	54%
Black Kite	49%	52%
Common Kestrel	45%	39%

The Marsh Harrier was particularly notable among raptors due to its relatively high abundance (362 individuals) and substantial proportion of flights within the risk zone (60% of birds and 64% of flight time). Consequently, Marsh Harriers may represent an important secondary risk species despite their much lower numbers compared with the dominant migratory species.

The Black Kite, although recorded in moderate numbers (790 individuals), also spent more than half of its flight time within the OHTL risk zone, indicating a moderate collision sensitivity during autumn migration.

Species with Negligible Risk: Several species were recorded in very low numbers and showed little or no exposure to collision risk such as Lesser Spotted Eagle, Steppe Eagle, Golden Eagle, and Lanner Falcon.

These species either flew entirely above the risk zone or were observed too infrequently to contribute meaningfully to overall collision risk.

So, the overall autumn season conclusion was characterized by:

1. Very high passage rates of European Honey Buzzards, White Storks and White Pelicans, which together dominated seasonal migration.
2. European Honey Buzzard being the primary species of concern, owing to both its exceptional abundance and high proportion of flights within the OHTL risk zone.
3. White Pelicans representing a secondary collision-risk species because of the large numbers migrating through the area.
4. Marsh Harriers and Black Kites constituting the most relevant raptor risk species, given their relatively frequent use of risky flight altitudes.
5. Most other recorded species occurring in low numbers and contributing only marginally to overall collision risk.

Table 17 Summary of Bird Migration Intensity and Collision Risk by Species – Autumn 2025

Species/Autumn 2025 (10 Aug – 10 Nov)	Accumulated Number of Birds	Accumulated Number of Records	Bird/h	Accumulated Time Spent (minutes)	Accumulated Number of Birds at Risky Altitudes (0-120 m)	Accumulated Number of Records at Risky Altitudes	Bird/h at Risky Altitudes (0-120 m)	Accumulated Time Spent at risky Altitudes (minutes)	Risk Bird Counts %	Risk Bird Time %
Black Kite	790	150	0.10	526	391	79	0.05	273	49%	52%
Black Stork	1	1	0.00	3	1	1	0.00	3	100%	100%
Booted Eagle	9	9	0.00	33	3	3	0.00	7	33%	21%
Common Kestrel	51	49	0.01	98	23	22	0.00	38	45%	39%
Egyptian Vulture	11	5	0.00	10	1	1	0.00	2	9%	20%
European Honey Buzzard	28453	854	3.49	2396	21800	517	2.68	1431	77%	60%
Lesser Spotted Eagle	2	2	0.00	4	0	0	0.00	0	0%	0%
Long-legged Buzzard	12	11	0.00	26	4	3	0.00	8	33%	30%
Marsh Harrier	362	249	0.04	548	219	161	0.03	352	60%	64%
Montagu's Harrier	23	23	0.00	46	13	13	0.00	25	57%	54%
Pallid Harrier	18	17	0.00	43	12	10	0.00	26	67%	61%
Sooty Falcon	7	6	0.00	16	6	5	0.00	13	86%	81%
Sparrowhawk	9	8	0.00	12	3	3	0.00	5	33%	38%
Steppe Buzzard	157	59	0.02	420	44	21	0.01	212	28%	50%
Steppe Eagle	9	9	0.00	19	0	0	0.00	0	0%	0%
White Pelican	9105	46	1.12	181	2755	17	0.34	76	30%	42%
White Stork	16119	20	1.98	42	1625	7	0.20	16	10%	38%
Crested Honey Buzzard	1	1	0.00	2	1	1	0.00	2	100%	100%
Eleonora's Falcon	4	4	0.00	6	2	2	0.00	2	50%	33%
Golden Eagle	4	2	0.00	6	0	0	0.00	0	0%	0%
Eurasian Hobby	2	2	0.00	3	1	1	0.00	1	50%	33%
Lanner Falcon	4	3	0.00	6	0	0	0.00	0	0%	0%

Resting and Roosting Birds in the Vicinity of the Proposed OHTL Route

During the spring season, a total of 10,800 birds belonging to 21 soaring bird species were recorded resting or roosting in the vicinity of the proposed OHTL route. White Stork was by far the most abundant species, with 9,530 individuals recorded in 13 resting/roosting events, followed by White Pelican (391 individuals), Steppe Buzzard (264 individuals), Black Kite (255 individuals), and European Honey Buzzard (231 individuals). Other species, including Steppe Eagle (49 individuals), Black Stork (46 individuals), and several eagle, falcon, harrier, and raptor species, were recorded in relatively low numbers. Resting and roosting

durations varied among species, with the longest cumulative times recorded for Black Stork (75 minutes), White Pelican (71 minutes), Steppe Buzzard (46 minutes), Egyptian Vulture (36 minutes), and Black Kite (34 minutes). Overall, the observations indicate that the vicinity of the proposed OHTL route was used as a temporary resting or roosting area by a diversity of migrating soaring birds, with White Stork being the dominant species.

The table below shows the resting and roosting birds in the vicinity of the proposed OHTL routes in spring 2026.

Table 18 Resting and Roosting (Re/Ro) bird activity recorded along the proposed OHTL Route in spring 2025

Species	Number of Birds	Number of Records	Total Time of Re/Ro in minutes
Unidentified Eagle	2	2	4
Black Kite	255	44	34
Booted Eagle	3	3	
Black Stork	46	3	75
Eleonora's Falcon	1	1	
Egyptian Vulture	2	1	36
European Honey Buzzard	231	14	1
Imperial Eagle	1	1	
Common Kestrel	2	2	
Long-legged Buzzard	6	4	5
Lesser Spotted Eagle	3	3	
Marsh Harrier	6	5	5
Osprey	1	1	35
Pallid harrier	1	1	2
Peregrine Falcon	1	1	

Species	Number of Birds	Number of Records	Total Time of Re/Ro in minutes
Steppe Buzzard	264	32	46
Short-toed Eagle	2	2	3
Sparrowhawk	3	3	3
Steppe Eagle	49	17	10
White Pelican	391	5	71
White Stork	9530	13	13

During the autumn season, a total of 656 soaring birds belonging to 11 species were recorded resting or roosting in the vicinity of the proposed OHTL route. White Pelican was the most abundant species, with 451 individuals recorded in three resting/roosting events, followed by European Honey Buzzard (182 individuals in 22 events). The remaining species were represented by relatively few individuals, including Marsh Harrier (10 individuals), Black Kite (6 individuals), Steppe Buzzard (2 individuals), and single individuals of Hobby, Montagu's Harrier, Unidentified Harrier, Osprey, Short-toed Eagle, and Sooty Falcon. Where recorded, the longest cumulative resting/roosting duration was for Steppe Buzzard (90 minutes), followed by Marsh Harrier (5 minutes) and Sooty Falcon (2 minutes). Overall, the vicinity of the proposed OHTL route was used as a temporary resting or roosting area by a limited number of soaring bird species during the autumn migration season, with White Pelican and European Honey Buzzard accounting for the majority of observations.

Species	Number of Birds	Number of Records	Total Time of Re/Ro in minutes
Black Kite	6	3	
European Honey Bizzard	182	22	
Hobby	1	1	
Marsh Harrier	10	5	5

Species	Number of Birds	Number of Records	Total Time of Re/Ro in minutes
Montagu's Harrier	1	1	
Unidentified Harrier	1	1	
Osprey	1	1	
Steppe Buzzard	2	2	90
Short-toed Eagle	1	1	
Sooty Falcon	1	1	2
White Pelican	451	3	

Non-soaring Birds

During the spring season, a total of 3,808 birds belonging to 32 non-soaring species were recorded flying in the vicinity of the proposed OHTL route. European Bee-eater was the most abundant species, with 1,983 individuals, followed by Barn Swallow (841 individuals), Great Cormorant (378 individuals), House Martin (126 individuals), Sandgrouse (118 individuals), Short-toed Lark (101 individuals), Red-rumped Swallow (96 individuals), and Swift (83 individuals). The remaining species were represented by fewer than 50 individuals each. Most non-soaring birds were observed flying at low altitudes, predominantly within the 1–50 m and 1–120 m flight height bands. Only a few species exhibited higher dominant flight heights, including Great Cormorant (>300 m), Cattle Egret (200–300 m), and unidentified waders (120–180 m).

Table 19 Non-Soaring bird species and their dominant flight height in spring 2025

Row Labels	Total Number of Birds Recorded on the Proposed OHTL Route	Dominant Flight Height
Alpine swift	2	1-50
Barn Swallow	841	1-50
Bar-tailed lark	2	1-50

Row Labels	Total Number of Birds Recorded on the Proposed OHTL Route	Dominant Flight Height
Blue-cheeked Bee-eater	32	1-50
Brown-necked Raven	26	1-50
Cattel Egret	3	200-300
Common Swift	2	1-50
Cream-colored Courser	9	1-50
Crowned Sandgrouse	24	1-120
Desert Lark	3	1-50
European Bee-eater	1983	1-120
Great Cormorant	378	>300
Hooded Crow	1	1-50
Hoopoe Lark	2	1-50
House Martin	126	1-50
Lark Species	1	1-50
Lesser whitethroat	2	1-50
Masked Shrike	1	1-50
Mourning Wheatear	1	1-50
Red-rumped Swallow	96	1-50
Rock Dove	6	1-50

Row Labels	Total Number of Birds Recorded on the Proposed OHTL Route	Dominant Flight Height
Rock Pigeon	13	1-50
Roller	1	1-50
Sand Martin	2	1-50
Sandgrouse	118	1-120
Short-toed Lark	101	1-50
Spotted Sandgrouse	15	1-50
Swift	83	1-50
Turtle Dove	1	1-50
Wader Sp	9	120-180
white Wagtail	3	1-50
Yellow Wagtail	1	1-50

During the autumn season, a total of 1,041 non-soaring birds belonging to 27 species were recorded flying in the vicinity of the proposed OHTL route. Great Cormorant was the most abundant species, with 494 individuals, followed by European Bee-eater (163 individuals), Sandgrouse (103 individuals), Purple Heron (96 individuals), Brown-necked Raven (29 individuals), Heron (28 individuals), and Short-toed Lark (26 individuals). The remaining species were represented by fewer than 25 individuals each. Most non-soaring birds were observed flying at low to moderate altitudes, predominantly within the 1–50 m, 50–120 m, and 120–180 m flight height bands. However, several species exhibited higher dominant flight heights, including Great Cormorant and Brown-necked Raven (180–300 m), European Bee-eater (240–300 m), and Purple Heron, which was predominantly recorded flying at altitudes exceeding 500 m.

Table 20 Non-Soaring bird species and their dominant flight height in autumn 2025

Row Labels	Total Number of Birds Recorded on the Proposed OHTL Route	Dominant Flight Height
Barn Swallow	24	50-120
Bar-tailed Lark	6	1-50
Brown-necked Raven	29	180-300
Cattle egret	2	180-300
Common Quail	1	1-50
Desert Lark	7	1-50
European Bee-eater	163	240-300
Great Cormorant	494	180-300
Grey Heron	1	9-180
Heron	28	1-50
Hoopoe lark	4	1-50
Isabelline wheatear	1	1-50
Namaqua Dove	1	1-50
Purple Heron	96	>500
Redstart	1	1-50
Reed Warbler	1	1-50
Rock Pigeon	6	1-50
Rüppell's Warbler	2	1-50

Row Labels	Total Number of Birds Recorded on the Proposed OHTL Route	Dominant Flight Height
Sand Martin	6	1-50
Sandgrouse	103	120-180
Short-toed Lark	26	1-50
Spanish sparrow	16	1-50
Spotted Flycatcher	1	1-50
Wheatear	1	1-50
White Wagtail	19	1-50
Willow Warbler	1	1-50
Yellow wagtail	1	1-50

7.7 Air Quality and Noise

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

7.7.1 Methodology for Assessment

A. Selection of Parameters

Monitoring was undertaken for the following parameters: (i) gases to include Carbon monoxide (CO), Sulphur Dioxide (SO_2) and Nitrogen Oxides (NO_x), (ii) Suspended Particulate Matter to include Particulate Matter smaller than 10.0 (PM_{10}) and 2.5 microns ($PM_{2.5}$) in diameter, TSP (total suspended particle) 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 characteristics and attributes. Suspended particulate matter is expected given the desert nature of the site. On the other hand, pollutants (such SO_2, NO_2,) are expected onsite but rather at minimal concentrations as the site is 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 the windy nature of the site and possibly casual vehicular movement.

- Such parameters are likely to be affected mainly during the Project's construction 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.

Based on a site visit undertaken by the 'E&S Team' and a review of satellite imagery, no significant point sources of anthropogenic air pollutant emissions were observed within the immediate vicinity of the Project site. Previous air quality and noise monitoring programs undertaken in the area[12] further confirms the above as they have indicated that outcomes of the monitoring results were all significantly less than the maximum permissible limits to include both Egyptian limits as well as international limits. The Project site is also expected to have similar air quality and noise characteristics.

B. Selection of Location

To assess the air quality baseline conditions within the Project area, three (3) monitoring points were selected as shown in the figure below. Monitoring was undertaken for 24 hours at each point respectively. The coordinates for the monitoring points and location are presented in the table and figure that follows.

Table 21: Location for Noise and Air Quality Monitoring Points

Station Name	Coordinates	
	Latitude	Longitude
Monitoring Point 1	28° 7' 18.10"N	32° 58' 45.40"E
Monitoring Point 2	28°3' 7.00"N	32° 59' 42.80"E
Monitoring Point 3	28°4' 32.10"N	33°2' 24.50"E

[12] SUEZ Wind Energy BOO Wind Power Plant 1.1. GW – SWE South (PLOT 2)

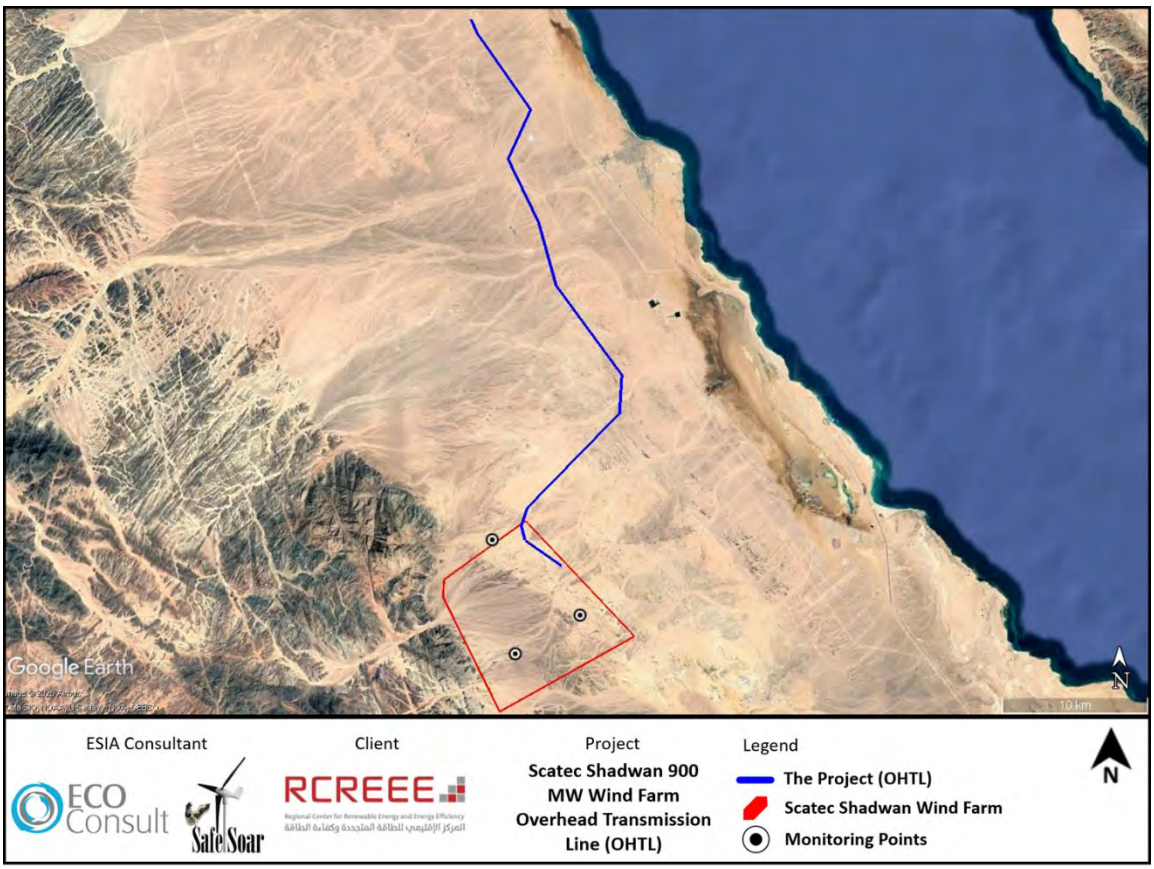


Figure 49: Satellite Map for Monitoring Point Location

C. *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 'urban' areas were used for comparison given the nature of the site that does not include any industrial activities and therefore cannot be classified as such.

Table 22:Applicable National Permissible Limits for Air Quality

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

Solid Particulates < 2.5 µm	Urban Industrial	--- ---	--- ---	80 80	50 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. Out of the areas below, it is believed that the following classification best describes the Project site "Residential suburb with low traffic activity and limited activities service". In such area limits are set at 55 dB(A) and 45 dB(A) for both day and night respectively.

Table 23: Applicable National Permissible Limits for Noise

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 suburbs 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

Results were also compared with the IFC General EHS Guidelines for air quality and noise as presented in the table below.

Table 24: IFC EHS General EHS Guideline Noise and Air Quality Limits

Parameter	**Limit**
Sulfur Dioxide (µg/m^3)	125 (Interim target-1) 24-hour
Nitrogen Dioxide (µg/m^3)	200 1-hour
Particulate Matter PM10 (µg/m^3)	150 (Interim target-1)24-hour
Noise one-hour LAeq (dB(A)	Daytime 07:00 - 22:00 = 55; Nighttime 22:00 – 07:00 = 45

7.7.2 Results

Air quality

The table below presents the analysis results of ambient (24-hour) air quality levels for this point, compared with the limits specified in national and international standards.

Table 25: Air Quality Analysis Result

Air Quality Monitoring Results							
Date	**Time**	**NO_2**	**SO_2**	**CO**	**PM2.5**	**PM-10**	**TSP**
2/7/2025	9:00AM	17.45	20.57	2.12	38.6	53.8	70.4
	10:00	13.76	13.14	1.875			
Monitoring	11:00	12.11	11.71	1.75			

Air Quality Monitoring Results							
Date	**Time**	**NO_2**	**SO_2**	**CO**	**PM2.5**	**PM-10**	**TSP**
Point 1	12:00PM	16.84	11.14	1.62			
	1:00	8.42	9.99	1.5			
	2:00	8.01	25.71	2.37			
	3:00	6.57	14.28	1.87			
	4:00	18.69	11.99	1.75			
	5:00	11.09	8.85	1.62			
	6:00	12.52	7.99	1.5			
	7:00	11.91	7.99	1.5			
	8:00	14.17	7.71	1.37			
	9:00	8.42	7.42	1.5			
	10:00	8.21	8.85	1.62			
	11:00	6.98	7.71	1.5			
	12:00AM	13.35	7.42	1.5			
	1:00	20.95	8.85	1.62			
	2:00	14.78	7.71	1.5			
	3:00	17.66	7.14	1.37			
	4:00	10.06	6.85	1.25			
	5:00	19.10	7.42	1.5			
	6:00	14.99	8.28	1.62			
	7:00	16.84	13.71	1.87			
	8:00	11.50	9.14	1.62			
	Average	**13.1**	**10.48**	**1.64**			
13/11/2025 **Monitoring Point 2**	9:00AM	10.88	11.14	1.62	37.3	52.6	73.1
	10:00	11.91	11.99	1.75			
	11:00	13.55	14.57	1.87			
	12:00PM	12.52	12.28	1.62			
	1:00	11.91	12.57	1.75			
	2:00	13.55	14.85	1.87			
	3:00	14.58	16.57	2			
	4:00	16.63	17.71	2.12			
	5:00	15.19	14.28	1.87			
	6:00	12.52	13.14	1.87			
	7:00	13.35	11.99	1.75			
	8:00	14.99	14.57	1.87			
	9:00	19.51	19.42	2.12			
	10:00	19.10	17.42	2			
	11:00	23.62	20.28	2.12			
	12:00AM	18.07	21.42	2.25			
	1:00	19.30	18.57	2			
	2:00	18.28	15.14	1.87			
	3:00	21.15	21.42	2.12			
	4:00	17.04	15.42	1.87			
	5:00	14.17	10.85	1.75			

Air Quality Monitoring Results							
Date	**Time**	**NO_2**	**SO_2**	**CO**	**PM2.5**	**PM-10**	**TSP**
	6:00	14.78	12.28	1.75			
	7:00	17.86	13.42	2			
	8:00	18.89	14.00	1.87			
	Average	**15.97**	**15.22**	**1.90**			
14/11/2025	9:00AM	20.74	18.00	2	47.8	57.6	78.3
	10:00	16.84	15.71	1.875			
Monitoring Point 3	11:00	14.78	11.71	1.75			
	12:00PM	13.14	9.71	1.62			
	1:00	20.33	13.14	1.75			
	2:00	11.29	11.14	1.62			
	3:00	15.61	15.42	2			
	4:00	15.00	14.57	1.87			
	5:00	13.35	13.71	1.75			
	6:00	14.37	14.00	1.87			
	7:00	18.28	17.42	2			
	8:00	16.22	13.71	1.87			
	9:00	13.14	11.14	1.75			
	10:00	14.78	9.42	1.62			
	11:00	15.81	10.85	1.75			
	12:00AM	13.76	13.99	1.87			
	1:00	13.55	10.28	1.62			
	2:00	12.73	11.71	1.75			
	3:00	16.63	14.57	1.87			
	4:00	11.09	8.85	1.62			
	5:00	12.11	13.71	1.87			
	6:00	11.70	12.57	1.75			
	7:00	15.00	16.85	2			
	8:00	13.14	10.57	1.75			
	Average	**14.72**	**13.03**	**1.80**			
IFC limits		125	125	-	-	150(24hr)	-
Egyptian limit		150	125	30	100	-	230

As noted in the table above, all measured parameters comply with both Egyptian legislative requirements as set within Annex 5 of the Executive Regulation (D1095/2011) for ambient air quality as well as IFC limits.

Noise

The table below presents the analysis results of ambient (24-hour) noise levels for the measurement point, compared with the maximum permissible limits specified in Egyptian law standards.

Table 26: 24-Hour Ambient Noise Level Measurements and Comparison with National Standards

Noise Monitoring (24-hours) Results			
Time	**Monitoring Points**		
	1	**2**	**3**
	2/7/2025	**13/11/2025**	**14/11/2025**
9:00AM	42.3	48.2	52.3

Noise Monitoring (24-hours) Results			
Time	Monitoring Points		
	1	2	3
	2/7/2025	13/11/2025	14/11/2025
10:00	35.6	50.3	54.6
11:00	33.6	48.9	53.4
12:00PM	41.8	51.3	55.2
1:00	39.5	53.2	56.4
2:00	37.8	47.9	55.6
3:00	35.9	53.5	49.7
4:00	40.8	52.4	48.9
5:00	38.7	51.8	52.3
6:00	36.5	56.3	54.3
7:00	34.9	53.4	47.9
8:00	40.9	55.4	49.8
9:00	36.2	54.6	58.6
10:00	33.9	56.2	54.2
11:00	37.5	55.1	57.3
12:00AM	38.1	48.7	51.1
1:00	39.7	45.1	48.6
2:00	32.6	49.6	44.8
3:00	31.7	47.3	46.5
4:00	37.5	46.3	50.1
5:00	33.2	42.2	52.6
6:00	35.4	49.2	56.4
7:00	40.1	47.8	51.5
8:00	38.5	44.5	48.6
Average	**37.19**	**50.38**	**52.11**
Daytime Average	**38.20**	**51.3**	**52.6**
Nighttime Average	**35.51**	**48.9**	**51.3**
National Standards	**Daytime Limit: 55dB, Nighttime Limit: 45dB**		
IFC Limits	**Daytime Limit: 55dB, Nighttime Limit: 45dB**		

The above indicates that the site maintains good air quality and generally low noise levels in line with both national standards and the IFC guidelines. All air quality parameters measured during both daytime and nighttime were within the permissible limits. Concentrations of key pollutants, including NO_2, SO_2, CO, $PM_2.5$, PM_{10}, and total suspended particulates, were significantly below their respective thresholds, demonstrating a low risk of air pollution related impacts.

Noise levels were within the allowable limits during the daytime. While the nighttime results exceeded allowable limits, this is attributed to natural reasons, mainly wind, since no anthropogenic noise sources were identified during the monitoring period.

7.8 Archaeology and Cultural Heritage

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

7.8.1 Methodology for Assessment

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

A. 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.

B. Stakeholder Consultation and Engagement

Stakeholder consultation and engagement activities were undertaken with the Ministry of Tourism and Antiquities which is the key entity involved in archaeology and cultural management. In addition, as part of the consultations and FGD undertaken with the local communities, and more specifically Bedouin tribes, specific discussions were undertaken in relation to cultural heritage sites within the Project area. Refer to Section 4.3.2 in the Shadwan Wind Power 900MW ESIA.

C. Site Survey

A field survey was undertaken by an archaeology and cultural heritage expert in June 2025 to verify the presence/absence of any surface archaeological or cultural heritage remains within the Project site. The survey covered the entire Project boundary. The monitoring equipment used were GPS devices, digital cameras and data loggers 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 discovered, the following actions are to 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.

7.8.2 Results and Outcomes

A. Literature Review

This section presents the results in accordance with the methodology discussed above. Based on the literature review, it is concluded that there are no registered archaeological sites within the Project area itself and the area adjacent to the Project area. The closest sites that are considered of great

archaeological, historical and cultural heritage value are described in the table below and presented in the figure that follows.

Table 27: Nearest Archaeological Sites

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 labor under the supervision of their leader Merer who recorded the diary of the mission on a long papyrus sheet.	91km to the north of the Wind Farm
Saint Anthony Monastery (Deir El Qidis Antun)	Saint Anthony's disciples founded the monastery between 361 and 36 (Starkey.2012:205)	109km to the north of the Wind Farm
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).	91km to the north of the Wind Farm

B. Stakeholder Consultation and Engagement

Additionally, the discussions with local communities indicated that there are no cultural, spiritual or historical sites of significance to Bedouin tradition such as graveyards or shrines located within or near the Project site.

C. Site Survey

Based on the site survey for the Project site footprint, it was confirmed the absence of any archaeological evidence, indicating that the Project site shows no signs of any historical/cultural significance. The following was concluded from the survey:

- No surface archaeological remains or indications of subsurface archaeological deposits were observed.
- Pottery shards were found onsite however they do not hold any archaeological or cultural significance and are therefore not considered relevant artifacts.
- The natural surface consists of gravelly/sandy/rocky soil (as appropriate), with no clear evidence of ancient human activity.
- The area is not listed as an official archaeological site according to the records of the Ministry of Tourism and Antiquities.

7.9 Infrastructure And Utilities

This section first provides an assessment of baseline conditions within the Project site and its surroundings in relation to infrastructure and utilities.

7.9.1 Assessment of Baseline Conditions

Assessment of baseline conditions was based on a site visit by the 'E&S Team' to the Project site and surrounding area in March. The site visit aimed to identify any key visible infrastructure and utility elements within the Project site or surrounding areas (e.g., electricity infrastructure lines, water infrastructure lines, etc.).

Desktop review as well as consultations were undertaken for the 900MW Wind Farm project with key governmental entities to better understand and characterize infrastructure and utility element services required for the Project development as discussed further throughout this section. This includes water supply, waste management services, traffic and transport, etc.

Table 28: Infrastructure and Utilities Within the Project Site Greater Area

Item Type	GPS Coordinates (Decimal Degrees)	Area (m²)	Description
Dump site	28.310847°N 32.992391°E	150,000	Decommissioned dump site
Retention dam	28.298253°N 33.004481°E	180,000	Flood mitigation measures
Retention wall	28.335921°N 33.044270°E	-	
Asphalt mixer	28.334496°N 32.998366°E	110,000	Temporary asphalt mixing unit
Asphaltic Rd	28.333846°N 33.009980°E	-	Sheikh Fadl Rd
Concrete mixer	28.341553°N 32.998519°E	26,000	Temporary asphalt mixing unit
Unused levelled area	28.341612°N 32.999039°E	60,000	Former oil exploration camp
Sand stockpile area	28.366870°N 33.005514°E	60,000	Stockpiles of sand and soil
Asphaltic Rd	28.238336°N 33.055169°E	-	Access road for wind farms facilities
S4	28.444019°N 32.965733°E	80,000	S4 substation
Flood mitigation measures	28.411722°N 32.985860°E		Linning the base of the tower
	28.396430°N 32.997864°E		1.5m fence around the tower
	28.339129°N 33.022832°E		Retention wall around electric power facility
	28.275943°N 33.048429°E		1.5m fence around the tower
Oil facility	28.231262°N 33.041211°E	5000	Crude Oil collection tanks
M1	28.167645°N 33.034213°E		Wind towers
M2	28.334139°N 32.987636°E		
Dry oil wells	28.271542°N 33.026761°E		Sealed wells

Asphaltic Rd	28.191200° N 33.054370° E		Access road for wind farms facilities
Power facility	28.188520° N 33.056664° E		Power distribution line
Transportation infrastructure	28.189001°N 33.210691°E	≈450,000	Ras Shukeir airport
	28.362990°N 33.096554°	350,000	Ras Gharib sea port
Public utility facilities	28.135661°N, 33.247981°E	36,570	Wastewater treatment plant
Oil facility	28.131661°N, 33.245547°E	9,320	Gas compression station
	28.129333°N, 33.246517°E	12,575	GPC oil tanks
Communication facilities	28.121103°N 33.249242°E	10,400	Communication tower
Oil facility	28.125508°N, 33.272486°E	557,680	GUPCO oil tanks
Power plant	28.087489°N, 33.245672°E	150,950	G. Zeit wind farm (NREA)
Water infrastructures	28.080108° N 33.256719° E	23,500	Desalination plant
Power facility	28.053372°N 33.210750°E	-	Existing Power line
Power plant	28.063586°N 33.232950°	99,634,598	Wind farm (9)
Flood mitigation	28.054706°N, 33.241292°E	-	Culverts (10)
Settlements	27.993934° N 33.234090° E	-	Agricultural areas (Dara village)
Power facility	28.065528°N 33.089647°E	10,580	Substation
Power plant	28.146658°N, 33.045785°E	110,000	Wind farm
Power facility	28.101756°N 33.148586°E	-	Existing Power line
Power facility	28.178072°N 33.003859°E	36,000	Substation
Economic land use	27.986550°N 33.223511°E	-	Ranches
	27.974718°N 33.239645°E	-	Agricultural areas
	27.988714°N, 33.147483°E	-	Ranches
Transportation infrastructure	27.892778°N 33.404444°E	-	Hurghada Rd
Communication facilities	28.020574°N 33.306752°E	-	Communication tower
Power facility	28.251562°N 33.073478°E		Power line
Meteorological infrastructure	28.227379°N 33.004036°N		Met Mast

Public utility facilities	28.266852°N 33.089550°E		Oxidation pond
Meteorological infrastructure	27.987486°N 33.341973°E		Met Mast
Communication facilities	27.987531°N 33.344470°E		Communication tower
	27.986467°N 33.343410°E		Communication tower
	27.982234°N 33.338635°E		Communication tower
storage facility	28.461096°N 32.951691°E		EMEA Cable storage area
Site administration	28.467549°N 32.945341°E		EMEA Utility infrastructure support area
Oil filled facilities	28.463556°N 33.006442°E		General Petroleum Company site
	28.395274°N 33.048169°E		
Service area	28.392492°N 33.029601°E		Roadside service facility
Power facility	28.339050°N 32.969028°E		OHTLs with flood mitigated towers
Flood mitigation facility	28.335563°N 32.967320°E		Retention dam along W. Abu Had
	28.335860°N 32.965800°E		Culverts underneath Sheikh Fadl – Ras Gharib Rd
	28.322187°N 32.912321°E		Culverts underneath Sheikh Fadl – Ras Gharib Rd
Communication facilities	28.311221°N 32.880500°E		Communication towers
	28.436594°N 33.003656°E		Communication towers
workshop facility	28.397909°N 32.962977°E		Evanika Projects Workshop
Oil facility	28.345007°N 33.095297°E		Oil tanks
Meteorological infrastructure	28.291169°N 32.881856°E		Met Mast
Power facility	28.552493°N 32.846695°E		Substation

7.9.2 Existing Roads and Networks

The Cairo-Hurghada (Highway 65) runs through and to the east of the Project site, as shown in the figure below. There is also a road network for the adjacent wind farms.

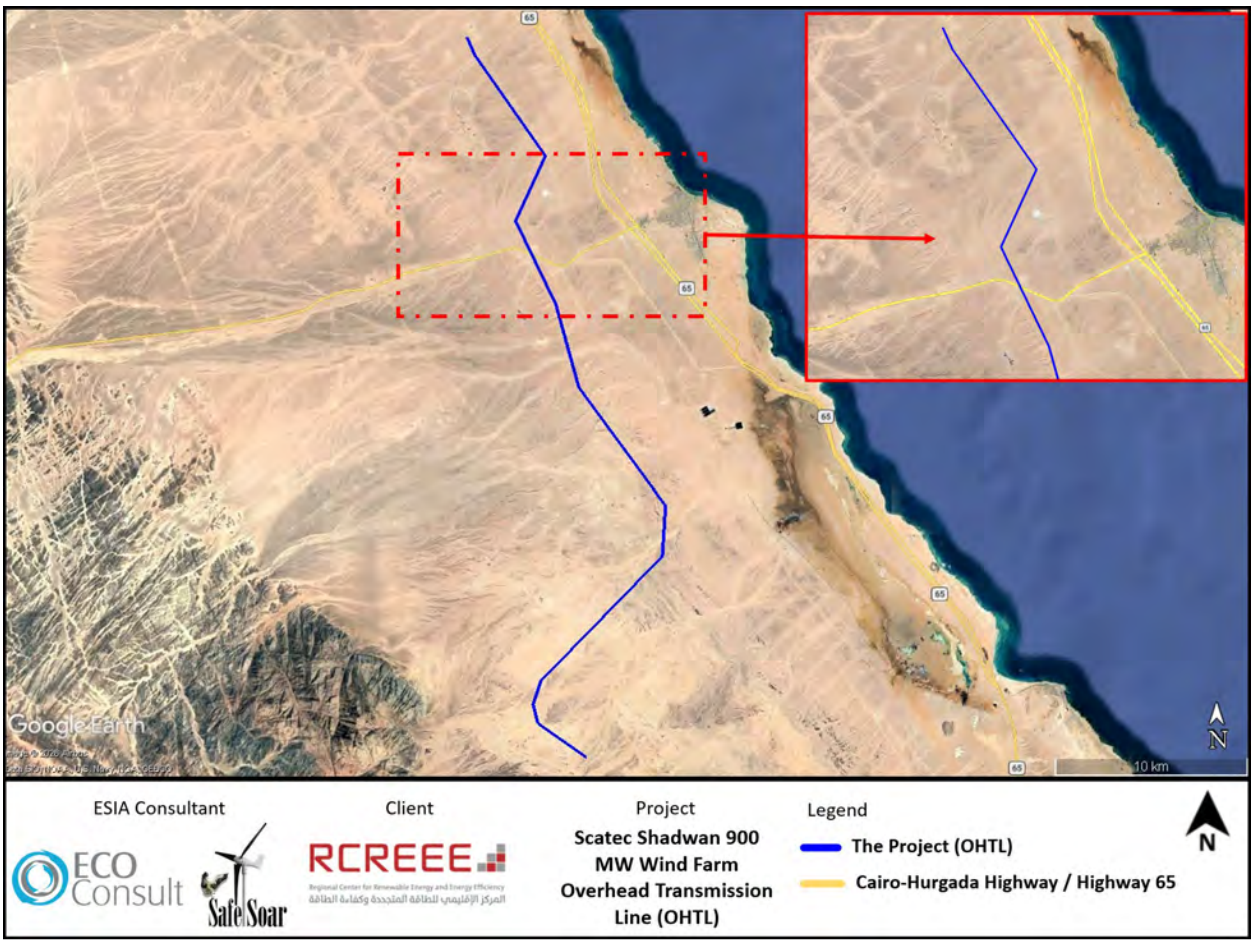


Figure 50: Highway 65 in Relation to the Project Site

7.9.3 Telecommunication, Radio and Television

As part of the site survey undertaken, no infrastructure elements in relation to telecommunications, radio or TV were noted within the Project site (e.g. broadcasting towers). A total of three (3) communication towers were noted within the surrounding area of the Project, as shown in the figure below.

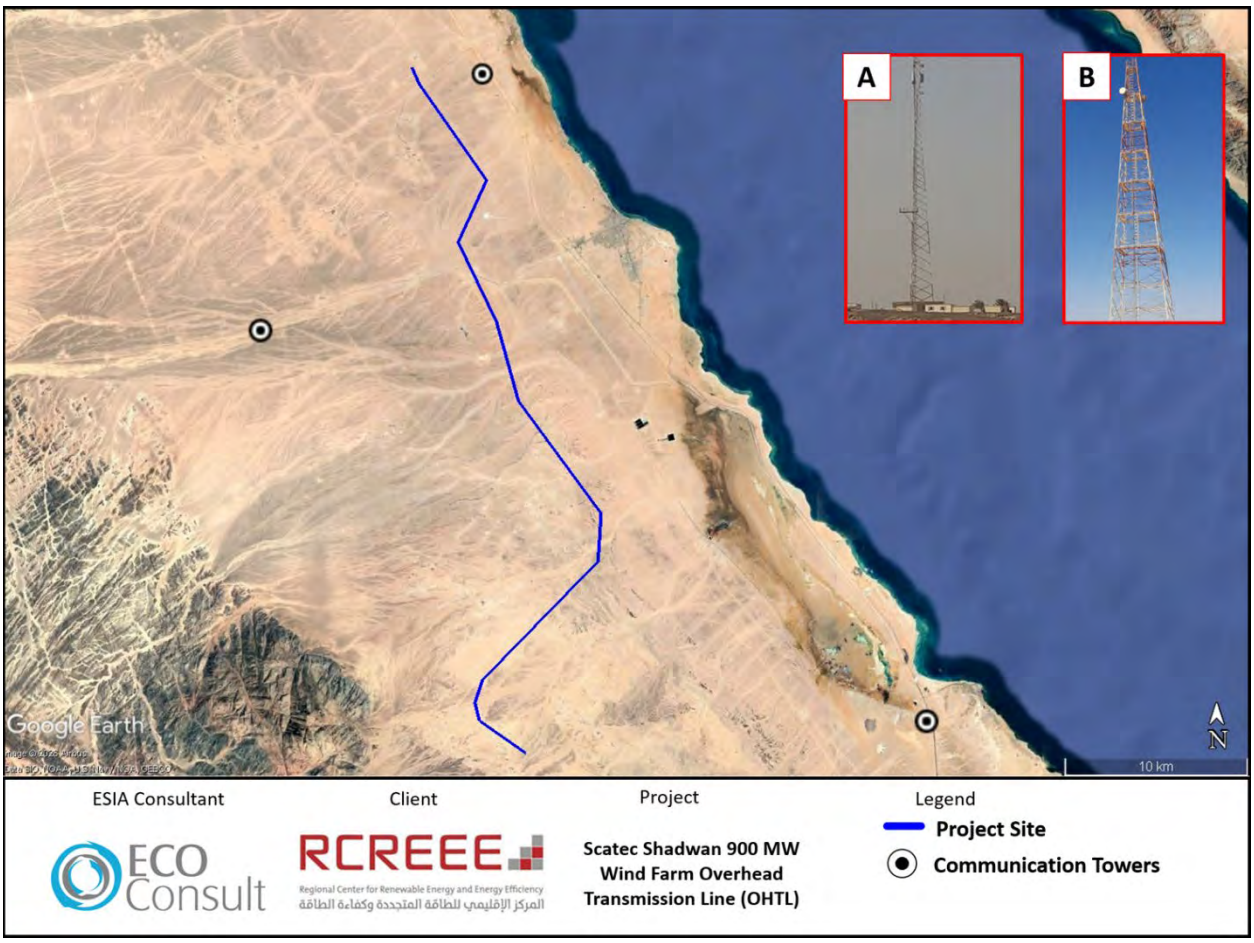


Figure 51: Nearest Communication Towers to the Project Site

7.9.4 *Waste Management (Solid Waste, Wastewater and Hazardous Waste)*

As discussed in the Shadwan 900MW Wind Farm ESIA, consultations were undertaken to obtain information on municipal and construction waste disposal facilities, Wastewater Treatment Plants (WWTPs), and hazardous waste landfills with the following entities:

- Solid Waste Management Branch of Red Sea Governorate which is the relevant entity that is responsible for handling solid waste in Red Sea Governorate;
- Hazardous Waste Management Unit in Red Sea Governorate, which is the relevant entity that is responsible for handling hazardous waste in Red Sea Governorate; and
- Red Sea Water and Wastewater Company (RSWWC) and the Sanitation Authority in Ras Gharib which are the relevant entities responsible for handling wastewater in Ras Gharib District.

According to consultations undertaken with the Solid Waste Management Branch, the nearest landfill in Ras Gharib is located next to Um-Al-Yeser with a current capacity of 200,000m^3, and the entity confirmed that it can handle waste expected from the 900MW Wind Farm project.

Wastewater Treatment Plants

According to consultations with RSWWC and the Sanitation Authority in Ras Gharib, the nearest wastewater treatment plant is the Ras Gharib Treatment Plant located near the Project site, as shown in the figure below. It was also indicated that wastewater generated by the Project should be managed using septic tanks and drained regularly via septic trucks.

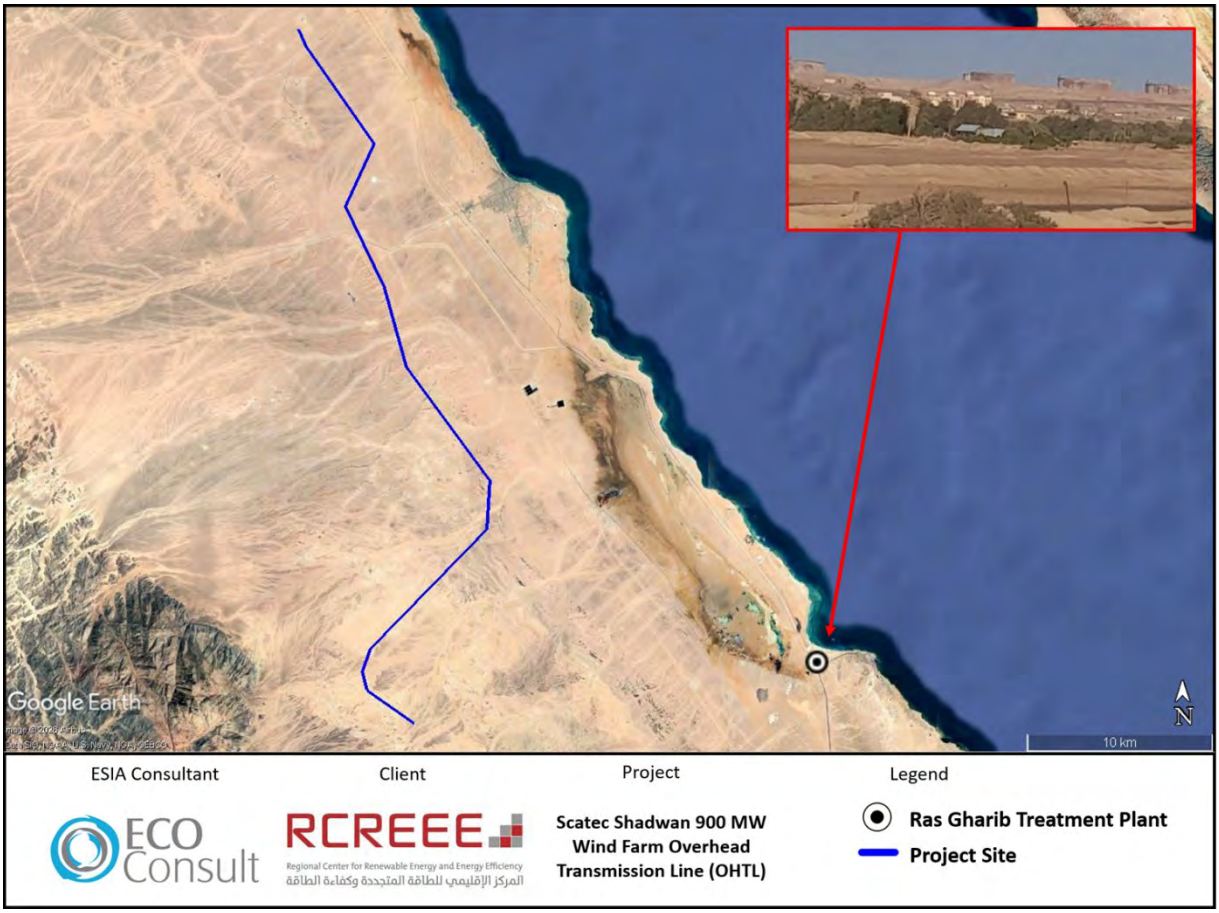


Figure 52: Project Site Relative to the Closest Wastewater Treatment Plant

Hazardous Waste Landfill

According to consultations with Hazardous Waste Management Unit in Red Sea Governorate, there are no hazardous waste treatment or disposal facilities within the Red Sea Governorate. Instead, the hazardous waste must be collected, transported and disposed of by a licensed company approved by the Waste Management Regulatory Authority (WMRA).

7.9.5 Water Resources

Consultations undertaken for the Shadwan 900MW Wind Farm project with RSWWC indicated that the main source of water supply in Ras Gharib is by the Kureimat pipeline along the highway, which experiences service disruptions affecting local demand. Due to this, direct connection to the main line is considered difficult and therefore it is recommended to use water tankers during the construction period.

7.9.6 Electricity Networks

Based on desktop review as well as a site visit, the Project area contains existing electrical infrastructure, including substations and several overhead transmission and distribution lines in the vicinity of the Project. As such, the area is already subject to routine electromagnetic field (EMF) exposure associated with standard power infrastructure.

Substations and Overhead Transmission Lines

The greater Project area also contains other Wind developments surrounding the Project site, and therefore within a 20km buffer around the wind farm there are three (3) existing substations, as shown in the figure below.

In addition, there are multiple 220kV OHTLs surrounding the Project site which are under the responsibility of the Egyptian Electricity Transmission Company (EETC). As such, the area is already subject to routine electromagnetic field (EMF) exposure associated with standard power infrastructure.

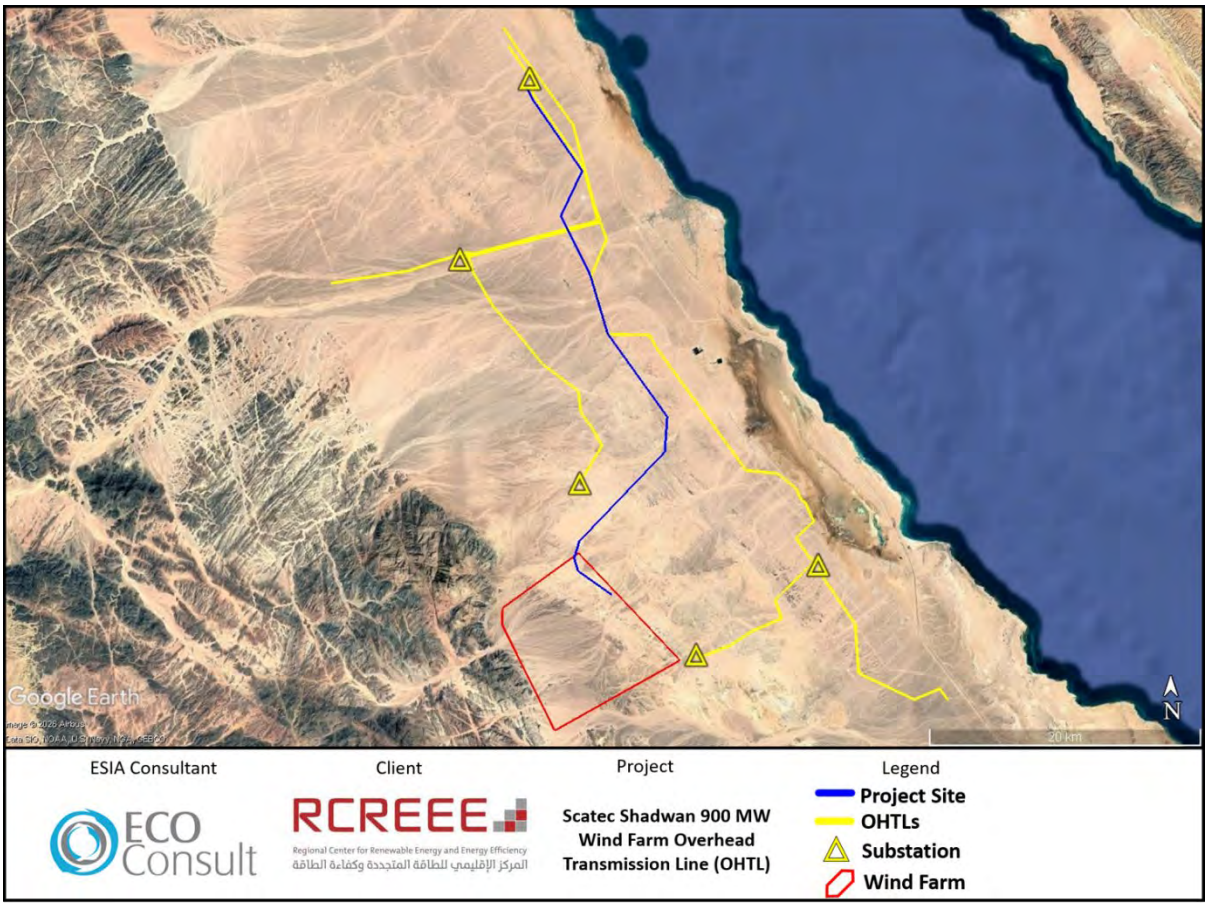


Figure 53: Existing Transmission Lines and Substations in the Project Area

Figure 54: Existing OHTLs

8. ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

This section provides an overview of the strategic environmental and economic impacts related to the Project development followed by an assessment of anticipated impacts resulting and or influenced by the Project throughout its phases (construction, operation and decommission) on Environmental and Social receptors and attributes.

8.1 Overview of Strategic Environmental and Economic Impacts

8.1.1 Government Vision for the Energy Sector

The GoE has taken steps to adopt an energy diversification strategy underscored by increased development of renewable energy and the 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 Integrated Sustainable Energy Strategy (ISES) 2015 – 2035, which outlines the nation's roadmap to increase the contribution of renewable energy to 42% of the country's electricity mix by 2030.

To promote renewable energy sources and in order to open the way for the private sector to effectively participate in the implementation of renewable energy project, the Renewable Energy Law (Decree Law 203/2014) was issued. The law facilitates investors in developing renewable grid-connected electricity production through the BOO scheme as discussed earlier in "Section 1.1".

8.1.2 Energy Security

The topic of 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 emphasized 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 address 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 Shadwan 900MW Wind Farm project in specific will contribute to increasing energy security by way of increasing the availability of a national and mostly import-independent energy resource. The estimated electricity generation from the Project is estimated at around 2,450 Gigawatt hours (GWh) per year on average; which will serve the annual electricity needs of around 900,000 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).

8.1.3 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 (SO2), Nitrogen Dioxide (NO2), 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 is to aid in reducing GHG emissions, as well as air pollutant emissions. The Shadwan 900MW Wind Farm project is to displace around 1.2 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 are around 479g per kWh.

In addition, there is an important benefit in relation to wind farm developments related to water conservation because unlike certain power generation methods, wind projects do not require significant amounts of water for cooling or steam generation. Conservation of water is particularly important in arid regions like Egypt, where water scarcity is a significant challenge.

8.2 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.

8.2.1 Visual Impacts During the Construction Phase

Site preparation activities which are to take place onsite by EETC for installation of the transmission cables, storage buildings, etc. are expected to include land clearing activities, levelling, excavation, 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, there are no key sensitive visual receptors within the Project site and surrounding vicinity.

The table below provides an overall summary of the impact on landscape and visual during the construction phase. The overall impact is considered to be of minor significance.

Construction Phase		
Type	Negative	N/A
Duration	Short-term	Limited to construction phase which is XX months
Magnitude	Medium	Given that construction activities will be noticeable
Reversibility	Reversible	With completion of construction activities
Sensitivity	Low	Given that there are no sensitive receptors within the area
Likelihood	High	Given nature of activities expected
Extent	Low	Impacts will occur within the actual footprint of Project.
Significance	**Minor**	

Mitigation Measures

The following identifies the mitigation measures to be applied by EETC 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 workday.
  - 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.
- Implement restoration and rehabilitation measures to restore the site's visual quality through for example re-contouring the land and removing temporary structures (e.g. batching plant).

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 EETC during the construction phase:

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

8.3 Land Use

As discussed earlier, the Project is under governmental ownership. Therefore, there is no land expropriation or acquisition process to be undertaken for the Project. Therefore, there are no impacts

anticipated in terms of land ownership. In addition, there are no physical or economical activities undertaken at the Project site. Therefore, there are no anticipated impacts on land use in relation to physical and/or economical displacement from the Project footprint.

Based on the above, there are no anticipated impacts on land use and there are no further requirements to be considered for the ESIA study.

8.4 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.

8.4.1 Potential Impacts from Flood Risks on the Project Site

Potential flood risks associated with the proposed OHTL were assessed to determine the likelihood of flash flood events affecting the Project infrastructure during both the construction and operational phases. Although the Project area is located within a hyper-arid environment and does not contain permanent rivers, streams or surface water bodies, episodic high-intensity rainfall events can generate flash floods within the ephemeral wadi systems that drain eastwards from the Red Sea Mountains towards the Gulf of Suez.

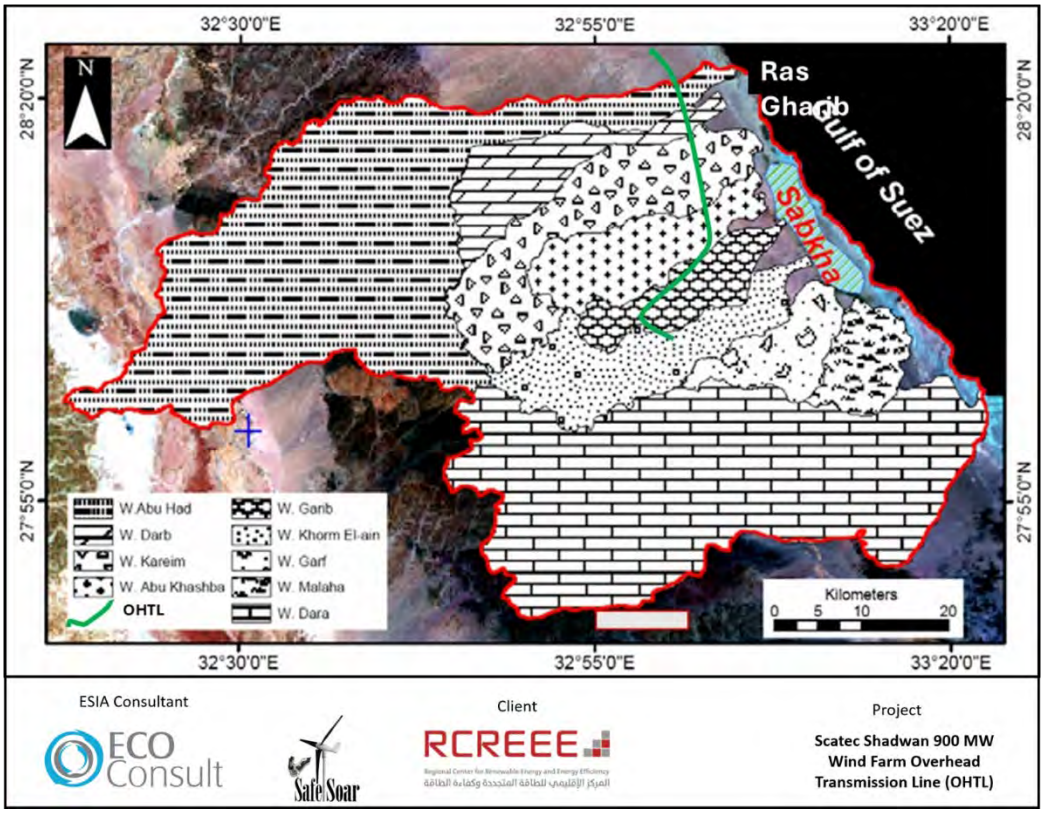


Figure 55: The Drainage Basins Delineated in the Area (Modified after Youssef and Hegab 2005).

Hydrological assessment undertaken for the Project, including desktop studies, Digital Elevation Model (DEM) analysis, drainage basin delineation and field investigations, confirmed that the proposed OHTL alignment intersects six principal drainage basins: Wadi Abu Had, Wadi Al Darb, Wadi Karim, Wadi Abu Khashaba, Wadi Gharib and Wadi Kharm El Ain. These wadis represent the primary pathways for surface runoff during extreme rainfall events and constitute the principal hydrological receptors relevant to the Project.

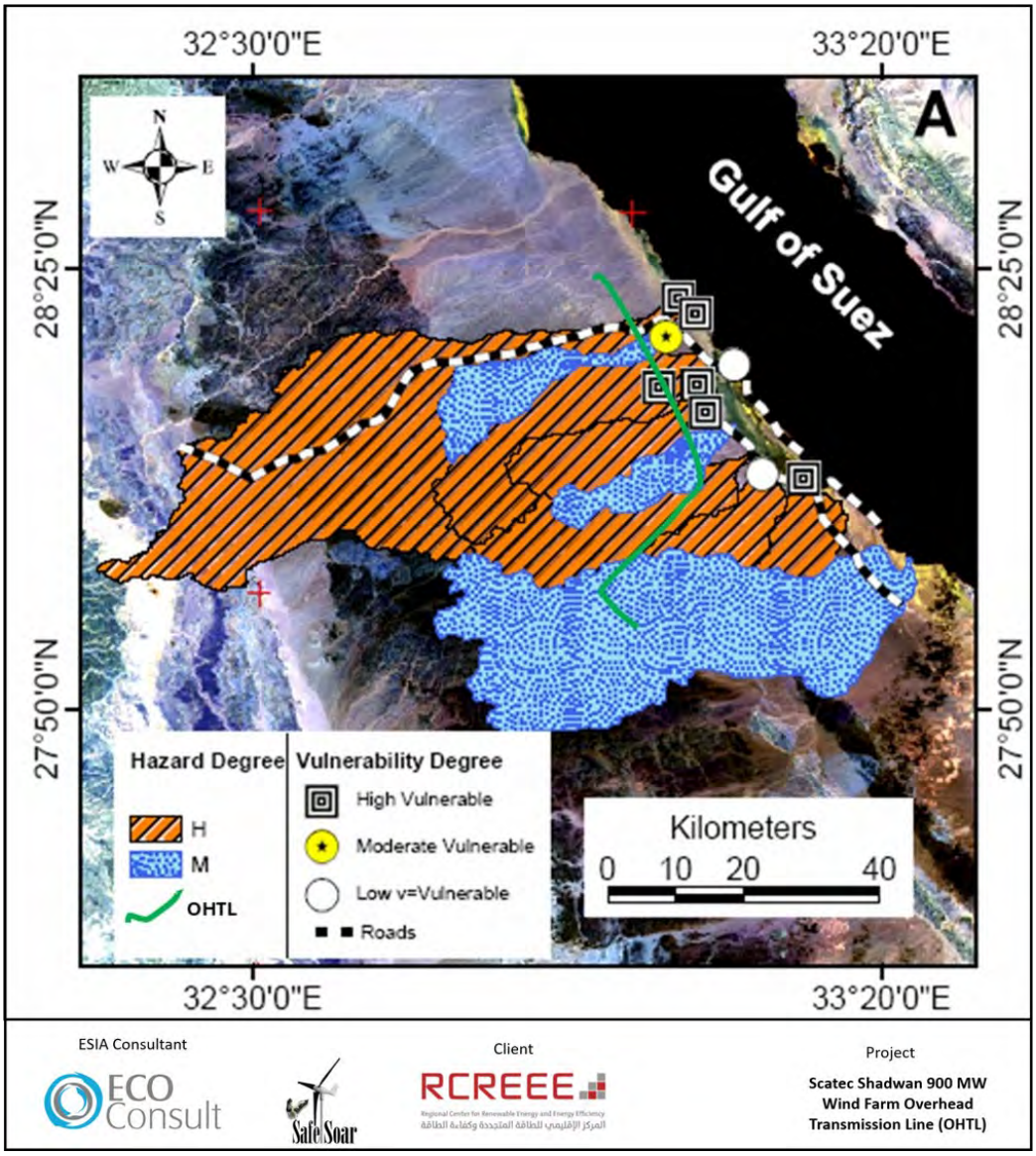


Figure 56: Drainage Basins Hazard and Vulnerability Map (Youssef and Hegab 2005).

A review of historical flood records within the Red Sea and Gulf of Suez region indicates that destructive flash flood events have occurred periodically between 1972 and 2016, affecting areas such as Ras Gharib, Safaga, Hurghada, El Quseir, and Marsa Alam. These events resulted in varying levels of damage to roads, infrastructure, utilities, and residential areas. However, during the major October 2016 storm event, Wadi Dara itself did not receive significant rainfall, whereas Ras Gharib City, located approximately 30 km north of the Project site, experienced severe flash flooding impacts.

Table 29: Historical Records of Hazardous Flash Floods in Egypt

Date	Area	Recorded damage & References
October 2019	Cairo, Alexandria, meet Ghamr and new Cairo	12 Deaths, road damages
April 2018	Al ain Alshokhna, Fifth settlement "New Cairo"	Road damage, damaged vehicles, 10 million EGP loss
October 2016	Ras sedr, Sharm Elshekh, Hurghada, and Qena	Road damage, water pipe damage

2015	Assuit, Sohag, Qena, Luxor, and Aswan	Destroyed houses
2015	Alexandria, Al-bhera, and Matrouh Governorates	35 Deaths, 180 destroyed houses, dozens injured thousands of acres drowned
February, October 2015	North and south of Sinai, Red Sea region	Road damages, loading and unloading area of Hurghada International Airport drowned
March, May 2014	Taba, Sohag, Aswan, Kom Ombo	Dam failure at Sohag, road damages
2013	South Sanai & Sohag, and Assuit	Deaths, road damage, 750 million EGP loss
2012	W. Dahab, Catherine area	Dam failure, destroyed houses
January 2010	Aswan, Sinai, and Al Arish	8 Deaths, 1381 damaged houses, roads and infrastructure
2009	Along the Red Sea coast, Aswan, Sinai	12 Deaths, damaged houses and roads and 37 injuries
October 2004	W. Watier, Safaga, El-Qusier	Road damage
May 1997	Hurghada, Marsa Alam	200 Deaths, destroy roads, demolished houses damaged vehicles
November 1996	Dhab, Sohage, Qena, Safaga, El-Qusier, Marsa Alam,W. Aawag	3200 Destroyed houses
September, November 1994	W. El-Gemal, Marsa Alam, W. Sudr	1 Death, roads damage, 27 injuries
March, August 1991	South Sanai	32 Deaths, dam failure
October 1990	Qena Governorate	Demolished 180 houses
January 1988	South Giza	Roads damage and demolished houses
October 1987	Aswan Governorate	Roads damage, demolished houses and farms
1985	Aswan Governorate, W. Elarish, Qena and Sohag	5619 Deaths, demolished houses
February 1982	Aswan, Kom Ombo, Idfu, Assiut, Marsa Alam, El-Qusier	Drowning of 10 villages, 180 houses destroyed, and 1500 citizens displaced.
April 1981	Minia, Assuit, and Sohag	17 Deaths, road problems, and 200 houses destroyed
February, November, and December 1980	W. El-Arish	Destroyed houses, roads, and farms
May, October 1979	Giza	500 Houses destroyed
1975	Qena Governorate	Demolished houses, destroyed roods, and dam failure
February 1975	W. Al Arish	Demolished houses, destroyed roods, and dam failure

Regional records demonstrate that flash flood events have periodically affected the Gulf of Suez region, including the wider Ras Gharib area, resulting in damage to roads, utilities and other infrastructure. Although such events occur infrequently, they are typically characterized by short-duration, high-intensity runoff capable of transporting significant sediment loads and generating localized erosion within active drainage channels.

Figure 57: Observed Flood Damage in Ras Gharib During the October 2016 Storm Event

At the Project scale, the hydrological assessment confirmed that the majority of the OHTL alignment is located on gently sloping alluvial plains where runoff is generally dispersed and infiltration is enhanced by the predominance of coarse-grained alluvial deposits. Consequently, most sections of the alignment are considered to have a relatively low susceptibility to prolonged inundation. However, localized flood hazards remain where the proposed alignment crosses active wadi channels and their associated floodplains. During extreme storm events, these drainage pathways may convey high-velocity runoff capable of causing localized scour, erosion and sediment deposition.

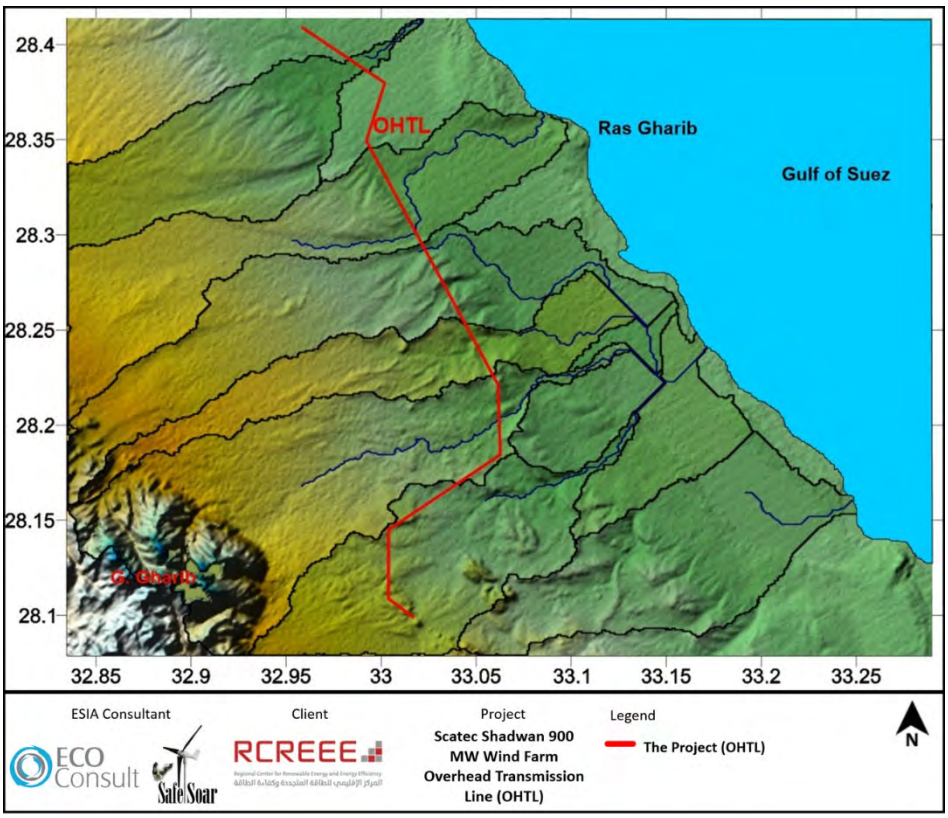


Figure 58: DEM Map of the Project Site

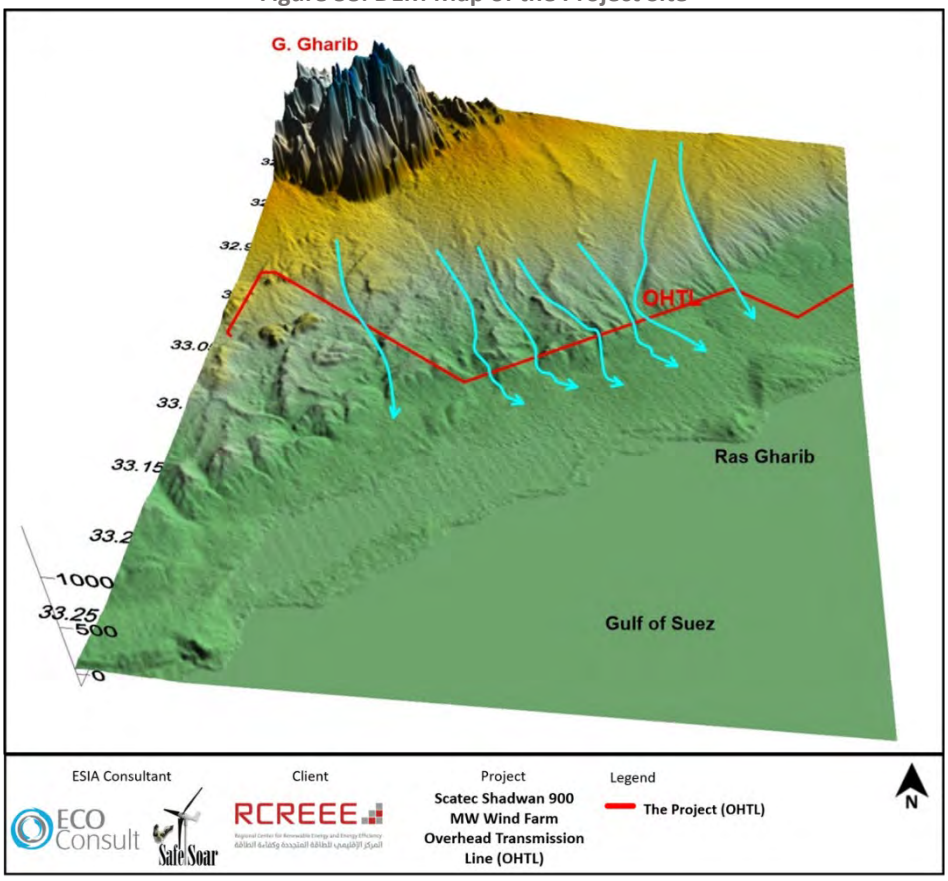


Figure 59: 3D Model

Potential flood-related impacts on the Project may include:

- Localized erosion and scouring around tower foundations located within or adjacent to active drainage channels;
- Undermining or exposure of tower foundations resulting from sediment erosion during high-flow events;
- Temporary inundation of construction areas and access roads, potentially delaying construction or maintenance activities;
- Sediment deposition around tower locations and temporary construction facilities; and
- Localized damage to temporary works, construction materials or site access infrastructure during extreme rainfall events.

Field observations confirmed that existing infrastructure within the wider Project area, including transmission lines, access roads and petroleum facilities, incorporates flood protection measures such as culverts, engineered drainage crossings and foundation protection systems. These existing measures demonstrate that flood-related risks within the Project area can be effectively managed through appropriate engineering design.

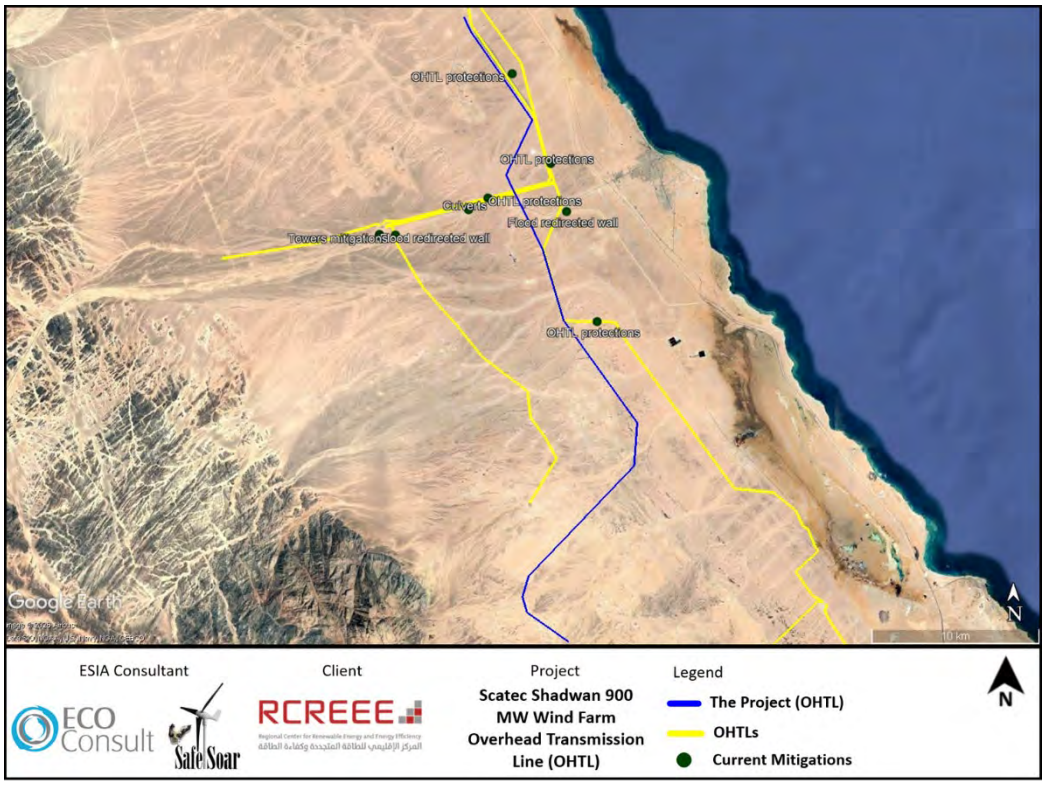


Figure 60: Existing Mitigations around the Project

Figure 61: Fences for Protection

Accordingly, flood-related impacts are anticipated to be localized and of limited spatial extent, provided that appropriate design measures are incorporated during the detailed engineering phase. Such measures should include avoidance of tower placement within active wadi channels wherever practicable, confirmation of design flood levels at major drainage crossings, implementation of scour and erosion protection around vulnerable tower foundations, provision of adequate drainage crossings for access roads where required, and site-specific hydrological assessment for infrastructure located adjacent to major wadis.

Accordingly, flood-related impacts on the Project are anticipated to be localized and manageable through the implementation of appropriate engineering design and mitigation measures during the detailed design phase. Such measures may include:

- Avoiding tower placement within active drainage channels wherever practicable;
- Positioning tower foundations above predicted flood levels;
- Implementing scour protection and erosion control measures around tower foundations;
- Incorporating suitable drainage crossings and culvert systems where required; and
- Undertaking site-specific hydrological assessment for infrastructure located near major wadi crossings.

Existing mitigation measures observed within the surrounding area displayed in figures above, including culverts beneath roads and protective concrete structures surrounding existing transmission tower

foundations, demonstrate the technical feasibility of mitigating localized runoff and erosion risks associated with infrastructure development within the Project area.

8.4.2 Potential Impacts from Improper Management of Waste Streams

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 EETC throughout construction phase.

Construction Phase			**Operation Phase**		
Type	Negative	Such impacts are controlled through implementation of general best practice.	Type	Negative	Such impacts are controlled through implementation of general best practice.
Duration	Short-term		Duration	Long - term	
Magnitude	Medium		Magnitude	Medium	
Reversibility	Reversible		Reversibility	Reversible	
Sensitivity	Low		Sensitivity	Low	
Likelihood	Medium		Likelihood	Medium	
Frequency	Frequent		Frequency	Frequent	
Timing	Not relevant		Timing	Not relevant	
Extent	Medium		Extent	Medium	
Significance	Minor		Significance	Minor	

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.).

Mitigation Measures

The following identifies the mitigation measures to be applied by all involved entities to include EETC 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";
- Adhere to waste hierarchy principles with associated mitigation measures to include prevent, minimize, reuse, recycle, recover and dispose.
- 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 EETC during the construction 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 Gharib WWTP). However, if inadequate disposal of wastewater occurs and is allowed to drain on land, this might contaminate the soil and possibly infiltrate to groundwater.

Mitigation Measures

The following identifies the mitigation measures to be applied by all involved entities to include EETC 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;
- 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 EETC 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 EETC 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 EETC 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 EETC 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 refueling) 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 EETC 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.

8.4.3 Potential Impacts from Erosion and Runoff during the Construction Phase

Site preparation activities which are to take place onsite by the EETC for installation of the various Project components to include towers, 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.

Construction Phase		
Nature	Negative	Such impacts are controlled through implementation of general best practice.
Duration	Short-term	
Magnitude	Medium	
Reversibility	Irreversible	
Sensitivity	Low	
Likelihood	Medium	
Frequency	Periodic	
Timing	During rain events	
Extent	Low	
Significance	Minor	

Mitigation Measures

The following identifies the mitigation measures to be applied by all involved entities to include the EETC during the construction phase:

- Existing natural flows will be maintained where possible as part of the drainage system design and any change to the natural/pre-development surface water conditions within the site to be minimized to the extent possible.
- Scheduling to avoid construction activities during heavy rainfall periods (i.e., during the wet season) to the extent practical. In addition, this will include modifying or suspending activities during extreme rainfall and high winds to the extent practical.
- Salvage and store topsoil and subsoil before areas are excavated, with topsoil stripped and stockpiled separately.
- 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 sites during site preparation and construction to prevent silt runoff where applicable. This could include but not limited to silt fences, gravel bag berms, fiber rolls, or other similar applications.
- Return surfaces disturbed during construction to their original (or better) condition to the greatest extent possible.
- Specifically in terms of road design the following shall be considered:
    - All roads shall be graded and shaped appropriately;

- Provision of limiting access road gradients to reduce runoff-induced erosion;
- Provision of effective short-term measures for slope stabilization, sediment control and subsidence control;
- On steep sections of access road, transverse drains ('grips') will be constructed where appropriate in the surface layer of the road to divert any runoff off the road into swales/roadside drains; and
- To reduce damage to soil and risks of soil erosion, the length and width of the on-site and off-site roads should be with the route optimized to reduce the need for cut-and-fill material. Run-off and erosion control features should be included in designs.

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

Monitoring and Reporting Requirements

The following identifies the monitoring and reporting requirements that must be adhered to by all involved entities to include EETC during the construction phase:

- Inspection for erosion and runoff control to include inspections for implementation of mitigation measures.

8.5 Climate and Meteorology

This section discusses the potential impacts anticipated from the various Project phases to include the planning, construction and operation phases. For each identified impact, a set of mitigation measures and monitoring requirements have been identified to eliminate the impact or reduce it to acceptable levels.

The key risks on climate and meteorology are related to the following:

- Impacts on occupational health and safety from onsite construction and operational works related to extreme climate conditions such as sandstorms, extreme heat, etc. Such risks have been assessed under "Section 8.12" and applicable mitigation and monitoring measures have been identified.
- Impacts on ensuring appropriate worker accommodation considering climatic conditions such as extreme heat, extreme cold, etc. Such risks have been assessed under "Section 8.13" and applicable mitigation and monitoring measures have been identified.
- Impacts on worker health and safety from transportation activities during construction and operation (e.g. worker transportation to/from local community areas, component transportation, etc.) related to extreme climate conditions such as sandstorms, etc. Such risks have been assessed and applicable mitigation and monitoring measures have been identified.

Taking the above into account, there are no further requirements to be considered.

8.6 Biodiversity

This section identifies and assesses the anticipated impacts from the Project activities on identified ecological receptors during the construction 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.

8.6.1 Potential Impacts during Construction

Habitat Loss, Fragmentation and Degradation

Site clearance and subsequent construction activities associated with the proposed OHTLs will result in the direct loss of areas of natural habitats. The final design of the OHTL will be completed by the OHTL Contractor and therefore the full details of required habitat loss is not currently known.

The EPC contractor will ensure that detailed consideration has been given to locating temporary works areas (laydown areas, workers camps, batching plants, access roads, etc.) are sited within areas that are already modified habitat or degraded, poor condition, natural habitat. The actual loss of natural habitat will therefore be very minor.

The routes of the OHTL show a typical Red Sea coast Biodiversity with all but one species recorded being of IUCN Least Concern and no endemic species noted. Egyptian Spiny-Tailed Lizard is IUCN Vulnerable and was found to have populations in a number of locations along the proposed OHTL, Specific mitigation measures are therefore required to ensure no harm comes to the species during works.

Habitat loss of terrestrial species can lead to a negative impact on overall population viability. In the situation here the impact is reduced due to the nature of the development meaning that habitat loss is spread in small areas over a wider project site. This means that connectivity is maintained through the area and no barriers to movement put in place or wide areas of specific interest will be lost. Given habitats are found through the area the small loss of habitat, it is considered that there will be no impact on conservation status of these species.

The potential impacts on habitat loss, fragmentation and degradation would be negative in nature yet short-term in duration. Impacts at pylons would be medium in magnitude yet deemed irreversible and along the working route medium to high in magnitude however short term and reversible. Considering the ecology of the site, the receiving environment is determined to be of medium sensitivity. Given the above, the impact is considered overall of minor significance.

Direct Impacts on Sensitive Receptors (Habitats and Flora) – Non-native Species and Introduced Flora

It is possible that non-native or introduced flora could be imported into the area on vehicles or within any imported soil material. The impacts of non-native and introduced flora could have a moderate significant impact in absence of any mitigation as these species could become established and out-compete native flora. Construction works could improve conditions for these species and it is possible earth moving could increase the distribution and spread them along the route of the OHTL.

Impacts associated with non-native, invasive or introduced flora could result in long-term negative impacts, irreversible (if allowed to become established) and moderately significant.

Direct Impacts on Sensitive Receptors (Vertebrates) - Site Clearance and Earthworks

As well as impacts to habitats it is near-certain that site preparation works and construction activities will negative impact sensitive ecological receptors (e.g. reptiles, mammals, breeding birds) as a result of direct mortality.

Egyptian Spiny Tailed Lizard (IUCN VU) are likely to be particularly exposed to impacts during construction works for the Project and OHTL as they are a diurnal species meaning they will be mobile while site works are active. Unmitigated impacts on Egyptian Spiny Tailed Lizard could potentially be medium-term and irreversible (e.g. loss of breeding habitat and mortality).

Direct Impacts on Sensitive Receptors (Vertebrates) – Vehicle Collisions

Vehicle related collision is possible for all vertebrate species present within the Project's AoI and this will result in direct mortality on receptors of low to high sensitivity. Any such impact would be negative, long-term and irreversible and would be of medium to high magnitude and therefore of minor to major significance (depending on the receptor killed).

Both small and large vertebrate species are at risk of vehicle collisions throughout construction. Species such as Egyptian Spiny Tailed Lizard are at higher risk of collision with vehicles and machinery as they are active in the day.

It is possible that carcasses on the road could attract scavenging animals, including birds of prey which in turn would increase their risk of collision with vehicles and machinery.

Direct Impacts on Sensitive Receptors (Habitats, Vertebrates) – Poaching, Collection etc.

It is possible that site worker may poach or take plants and animals from the site, either for firewood or in the case of the Spiny-Tailed Lizard for food, trophy or to be sold. Species such as Red Fox could also face persecution.

Any of the identified receptors are potentially at risk from this long-term, irreversible negative impact. The likelihood of this occurring is possible and the magnitude of this impact ranges from Low to High magnitude depending on the receptor affected.

Direct and Indirect Impacts on Sensitive Receptors (Vertebrates) – Disturbance

The presence of site workers and machinery can result in disturbance related impacts to all terrestrial ecological receptors present within the area. These impacts are not certain, and the magnitude of such impacts will vary depending on the sensitivity of each receptor to disturbance. The significance of any such disturbance impacts is likely to range from Minor to Moderate / Major, depending on the sensitivity of the affected receptor. The duration of impact will also likely vary from very short-term (e.g. running away from a vehicle using the access road) to short to medium term in areas adjacent to construction areas or worker accommodation. It is likely that any disturbance impacts, irrespective of duration will be reversible once the disturbance event has passed.

Direct and Indirect Impacts on Sensitive Receptors (Vertebrates) – Reduced Air Quality / Dust

The habitat across the area is very sandy. It is likely that constructed related ground disturbance will likely increase the amount of dust in the air which in turn could result in negative impacts on plants and vertebrate receptors. In addition, air pollution from site vehicles from the concreate batching plant could also result in negative impacts on valued receptors. These impacts are possible, short-term and reversible and are considered to be of minor to moderate significance.

Direct Impacts on Sensitive Receptors (Vertebrates) – Noise

Noise as a result of construction can result in direct impacts on valued ecological receptors (vertebrates) due to acoustic masking, disturbance and displacement thereby reducing survivorship and reproductive success.

Any impacts are likely to be short- to medium term (for the duration of construction) and reversible. The magnitude of impact ranges from low to medium and is likely to be of low not significant to moderate significance.

Direct and Indirect Impacts on Sensitive Receptors (Vertebrates) – Littering, Waste Management

Unmitigated it is possible that poor waste management could result in the proliferation of litter across the Project area including plastic containers, plastic bags and glass. This waste could result is negative impacts to sensitive receptors through ingestion or entanglement. Any such impact could be long-term and irreversible, and the significance of this impact would be not significant to major depending on the receptor effected.

In addition, poor management of other solid wastes, including food waste could result in the presence of pest species such as rats and mice, which could outcompete wild rodents and feral cats and dogs which could increase the risk of predation of wild rodents and other prey species.

Direct and Indirect Impacts on Sensitive Receptors (Vertebrates) – Pest Species

As discussed above it is possible that pest species become established within the Project as a result of increased littering or poor waste management as well as the propensity of certain species (e.g. rats, cats and dogs) to associate with human habitation.

An increase in pest species could result in long-term negative impacts on wild animals through direct and indirect competition for food resources, direct mortality through predation, and direct impacts as result of disturbance impacts. Such impacts could be reversible or irreversible, will be between low to high magnitude and as such significance will vary from minor to major depending on the receptor being affected.

8.6.2 Potential Impacts during the Operation Phase

Direct Impacts on Sensitive Receptors (Vertebrates) – Vehicle Collisions

Vehicle related collisions are possible for all vertebrate species present within the Project's area and this will result in direct mortality on receptors of low to moderate sensitivity. Any such impact would be negative, long-term and irreversible and would be of low to moderate magnitude and therefore of minor to moderate significance (depending on the receptor killed).

It is possible that any carcasses on the road could attract scavenging animals, including birds of prey which in turn would increase their risk of collision with vehicles and machinery.

Direct Impacts on Sensitive Receptors (Habitats and Flora) – Non-native Species and Introduced Flora

It is possible that non-native or introduced flora could be imported into the area on vehicles or within any imported material. The impacts of non-native and introduced flora could potentially be significant in absence of any mitigation as these species could become established and out-compete native flora.

Impacts associated with non-native, invasive or introduced flora could result in long-term negative impacts, irreversible (if allowed to become established) and potentially significant.

Direct and Indirect Impacts on Sensitive Receptors (Vertebrates) – Pest Species

It is possible that pest species become established within the Project as a result of increased littering or poor waste management as well as the propensity of certain species (e.g. rats, cats and dogs) to associate with human habitation.

An increase in pest species could result in long-term negative impacts on wild animals through direct and indirect competition for food resources, direct mortality through predation, and direct impacts as result of disturbance impacts. Such impacts could be reversible or irreversible, will be between low to high magnitude and as such significance will vary from minor to moderate depending on the receptor being affected.

8.6.3 Mitigation Measures

Construction Phase

Habitat Loss, Fragmentation and Degradation

The following mitigation measures will be employed to reduce the significance of habitat loss, fragmentation, and degradation during the construction period. Mitigation measures are largely based on avoidance of impact through selection of the working areas to favor areas of degraded natural habitat or those areas where habitats have been modified. Where impacts cannot be avoided the following will be completed

- All site workers will undertake a Project induction before working on site. The induction will include a comprehensive biodiversity element where the baseline ecological value and sensitivity of the site will be discussed.

- Prior to construction works, working areas will be clearly demarked (using temporary fencing (e.g. orange netting attached to wooden posts)) so that site workers fully understand the working area. Encroachment into areas outside of agreed working areas will be prohibited and working areas will be subject to regular check by the EPC Project Ecologist to check enforcement of working areas.
- On completion of phased construction works the EPC Contractor will be responsible for habitat rehabilitation works in all areas that have been subject to temporary disturbance.

Direct Impacts on Sensitive Receptors (Habitats and Flora) – Non-native Species and Introduced Flora

- Prior to construction works, working areas will be subject to a botanical walkover survey to identify areas of non-native or invasive species. Any specimens will be clearly marked, and the area avoided and if this is not possible the specimen will be removed and disposed of.
- Areas of soil in proximity to these species will be stored separately and not used further on the site. It will be collected from the site and disposed of or used as deep sub-soil fill (to reduce the chance of seed germinating.
- Areas of non-native or invasive species will be mapped and a program of mechanical control will be completed over the construction period in order to remove these species from the area. Chemical control will be avoided however if necessary, will be used but in accordance with national and international guidelines as well as those applied by the Lenders (e.g. specific risk assessment and Lender agreement prior to use).
- Soil imports to be taken from local quarries or borrow pits to avoid importing non-native and invasive species.
- Adequate wheel-washing facilities to be constructed at the entrance to the site and any wastewater will be disposed of correctly to prevent spread of undesirable species.
- Regular site walkover surveys throughout the construction period by a suitably qualified botanist to check to the presence and abundance of non-native or invasive species.

Direct Impacts on Sensitive Receptors (Vertebrates) - Site Clearance and Earthworks

A summary of mitigation measure to avoid and mitigate for direct impacts on sensitive vertebrate receptors is included below. These measures will be included (and expanded upon) in a Construction Biodiversity Management Plan/Biodiversity Action Plan.

- All site workers will undertake a Project induction before working on site. The induction will include a comprehensive biodiversity element where the baseline ecological value and sensitivity of the receptors within the area will be discussed.
- Prior to construction works, working areas will be clearly demarked (using temporary fencing (e.g. orange netting attached to wooden posts)) so that site workers fully understand the working area. Encroachment into areas outside of agreed working areas will be prohibited and working areas will be subject to regular check by the EPC Project Ecologist to check enforcement of working areas.
- Working areas should avoid trees / shrubs as these are likely, due to their sporadic distribution across the area to be of importance to breeding birds (e.g. passerines, raptors).

- A pre-construction walk-over survey will be undertaken of all working areas to check for the presence of ground nesting birds. Surveys will be completed by an appropriately qualified ecologist and surveys will be undertaken in the hours after sunrise (up to 10:00). The surveyors will aim to identify behavior indicative of breeding activity (e.g. carrying food / nesting material / fecal sacs, presence of nests, eggs or chicks (both nidifugous and nidicolous).
- Where nests are found they will be recorded in full and their locations mapped, with the data transferred to Excel master sheets and Google Earth. Mapping will then be circulated to the project team along with details of a works exclusion zone. Exclusion zones will be dependent on the species of bird nesting along with its conservation status and be agreed with the qualified Project Ecologist.
- Mitigation during construction will include timing work to remove suitable nesting habitat outside of the most sensitive times of year for ground nesting species, and for all clearance work within this time period to be done under the supervision of an on-site ecologist.

Pre-construction surveys for sensitive species (i.e. those qualifying Priority Biodiversity Features) of herpetofauna have taken place within the Project site and the locations of known/active burrows used by Egyptian Spiny-tailed Lizard have been marked. This survey effort and marking will be repeated for the OHTLs.

Prior to the start of construction suitable sites for the release of relocated Egyptian Spiny-tailed Lizards will be identified and mapped. A suitable translocation receptor site must;

- Be within 10 km of the Project site.
- Contain appropriate vegetation (both for food and cover).
- Have suitable soil types to allow animals to dig and create new burrows.
- Not already be close to carrying capacity for this species.

Capture and movement of Spiny-tailed Lizards will only be completed as a last resort. All works will aim to be completed at least 50m from active burrows. Locations where burrows are present between 50 and 100m of construction will be monitored throughout the construction period and if significant negative impacts (i.e., abandonment of burrows or increased mortality) are observed the remaining burrows in closest proximity will be excavated and the animals translocated to holding areas in accordance with the below protocols for the duration of the construction window in that location.

- Detailed design for the final infrastructure layout will take into account the results of the preconstruction surveys and Project infrastructure will be sited to avoid the identified burrows. Where this is not possible, or where fresh burrows are identified at the commencement of clearance works, these burrows will be excavated by hand and the animals captured and translocated, details of this are provided below.
- Prior to work in an area containing Spiny-tailed Lizard burrows any remaining burrows within 50m of proposed works will be re-checked by the Ecologist using an endoscope and if empty dug out and destroyed. If any animal is found back in the working areas the burrow will be dug out carefully by hand and the animal captured and placed in a secure box before taking to a cool location ready for translocation to the receptor site. Once the lizard is removed from the burrow the hole will be collapsed and made unsuitable for future use.

- If areas suitable for translocation exist within the Project Area these will be prioritized as this minimizes the impacts of transporting animals away from the Project site.
- Studies have shown that soft releasing Spiny-tailed Lizards leads to a better survival rate than simply releasing the animals into a new site so any animal which is translocated will be soft-released into an individual mesh enclosure within an area of suitable habitat. The pen will measure at least 2m x 2m and be covered to provide shade and prevent attack from above. A "starter hole" will be dug using a 20cm auger to a depth of approximately 30cm to provide some initial shelter. Supplementary feeding will also be undertaken and after a period of seven days the enclosure will be removed to allow the lizards to move and forage naturally.
- After the relocation period, a report will be prepared which will include the following information:
    - Survey dates and timing of capture and release
    - Weather conditions during survey and relocation effort
    - Location of captured individuals
    - Number of captured individuals during each relocation effort
    - Number of juveniles, mature males and mature females
    - Release sites used for relocation of each effort
    - Number of males and females released at each site
    - Number of mortalities during relocation effort

Direct Impacts on Sensitive Receptors (Vertebrates) – Vehicle Collisions

- Speed limits of 20 kph are to be enforced by the EPC Contractor on the OHTL Contractor
- Regular signage will be installed along the site access roads and internal roads informing all drivers of the speed limit
- A gated entrance will be staffed and any visitors or locals using the site roads will be informed of the speed limits and that there are regular checks of vehicle speeds
- A ban of driving at night will be enforced and if absolutely necessary the speed limit will be reduced to 15kph
- Ban against off-road driving at all times of the day
- Regular checks of the road for carcasses and if found these will be moved to at last 10m from the road to reduce the likelihood of hitting scavengers, including birds of prey.
- A incidental / chance find procedure will be included in the BMP so that all workers report any road collisions so that any such incident can be investigated in full.

Direct Impacts on Sensitive Receptors (Habitats, Vertebrates) – Poaching, Collection, etc.

- The Project will enforce strict controls on hunting, gathering, poaching and otherwise disturbing flora and fauna within the Project area. Any breaches of this ban will be strictly enforced, and any workers found in breach of this control measure will be subject to disciplinary procedures.
- The ban on hunting etc. will be included in the site induction along with discussions about the sanctions for breaches of this control measure.
- A chance find procedure will be implemented should any site worker find a wild animal, especially one that has become a nuisance (e.g. scavenger in the works camp, presence of small mammals in worker accommodation, presence of snake or scorpion on the works site) and the EPC Ecologist will arrange for an appropriately qualified person to capture and relocate. Where scavengers have been identified within the works site additional housekeeping measures may be required.

Following mitigation a low magnitude and not-significance would be expected.

Direct Impacts on Sensitive Receptors (Vertebrates) – Disturbance

- Site wide induction to include information regarding disturbance of ecological receptors.
- Chance find procedure to report sightings of potentially sensitive receptor and investigation of any such sightings by the EPC Contractor in order that additional buffer areas can be agreed, where necessary.
- Continued monitoring of the dam to understand use of the area by staging and roosting birds.

Following mitigation an impact low magnitude and not-significant would be expected.

Direct and Indirect Impacts on Sensitive Receptors (Vertebrates) – Reduced Air Quality / Dust

- Where necessary tracks will be damped down to reduce the risk of dust. Damping down will also include areas adjacent to roads. These measures will be implemented where necessary.
- Vehicles will be properly maintained to reduce emissions.

Direct Impacts on Sensitive Receptors (Vertebrates) – Noise

- Vehicles will be properly maintained to noise emissions.
- Use of available technology and management practices with construction methodologies to reduce noise.
- Regular monitoring of noise levels within works compounds and works areas as far as possible and apply corrective measures as necessary.

Direct Impacts on Sensitive Receptors (Vertebrates) – Lighting

- Limit the amount of lighting, especially within the wider area (e.g. at transmission tower construction sites). This will be achieved by ensuring that night-time working is limited.
- Where lighting is required within worker compounds, site offices etc. ensure that any lighting is shielded and protected to reduce light-spill and glare. Low intensity lighting should also be used, where possible, to further reduce light spill.
- For external security lights PIR trigger units should be used and these should be timed to automatically switch off after five minutes.
- No lighting will be installed along the access roads.

Direct and Indirect Impacts on Sensitive Receptors (Vertebrates) – Littering, Waste Management

- Waste Management will be included in the Site Induction so that all site workers understand their responsibilities to maintaining a clean and tidy site. Where possible all materials than can be recycled will be.
- Zero tolerance to littering on the works site and within the worker compound. This zero-tolerance approach should also be applied to smoking and workers must use appropriate smoking areas (supplied with 'butt bins') at all times, even when on construction sites. Litter must not be thrown out of vehicle windows when driving to and from or around the site.
- Daily inspections of working areas and worker compound should be completed, and corrective actions applied, where necessary.
- Additional mitigation measures for pest species, including feral cats and dogs are included below.

Direct and Indirect Impacts on Sensitive Receptors (Vertebrates) – Pest Species

Where pest species are identified the EPC Contractor / Ecologist will be notified and an appropriate course of action taken. For small mammal pest's live traps will be used, in order to reduce the risk of bycatch. Poison baits should be avoided, unless it can be certain that non-target species will be affected, and any such use should be in accordance with national and international best practice. If poison baits are to be used it must be certain that any poisoned animal cannot move out on to the wider area to reduce the risk of natural predators eating poisoned animals. Any chemical control of pest must only be undertaken in accordance with national and international guidelines as well as following Lender guidelines including risk assessment and prior agreement with the Lender.

Operational Phase

Indirect Impacts on Sensitive Receptors

- Ban on off-road driving, especially during sensitive periods of the year (e.g. breeding bird season) and if off-road driving is required a check of the working area should be completed by the Project's Ecologist.
- Speed limits to be enforced.

- Sensitive species are to be included in the site induction for all operational staff where additional control measures will be discussed including allowing animals to move around the site, not chasing after them in vehicles or approaching them on foot and what to do if they observe breeding birds within their works areas.

In addition, if any significant maintenance work is required (e.g. replacement of any transmission towers or wires etc.) all impacts related to construction will be relevant and all mitigation outlined in previous sections will be followed.

Monitoring

Long-term monitoring of the Project AoI will be completed as set out above and will include:

- Habitat and Flora monitoring within the AoI to measure the success of habitat rehabilitation work to reasonably demonstrate a net gain in Natural Habitat as well as to record the presence of invasive / non-native flora.
- The above monitoring requirements will be included within the Construction and Operational Biodiversity Action Plans which will include KPIs and a BEMP against which the results of the monitoring will be assessed.

8.7 Avifauna

General

This assessment looks at the shadwan OHTL, as there will be cumulative impacts across the Project area.

8.7.1 Impacts During Operational Phase

Direct and Indirect Impacts on Sensitive Receptors (Birds) – Collision with OHTL

The proposed OHTL route crosses part of the Rift Valley/Red Sea Flyway and extends for approximately 45 km through an area known to support substantial movements of migratory soaring birds. Site-specific monitoring undertaken during the Spring and Autumn 2025 migration seasons recorded bird movements across the full length of the route; however, the monitoring data did not identify a discrete or geographically confined migration bottleneck within the proposed OHTL corridor. Instead, bird movements were observed across a relatively broad front, with migration intensity varying between different sections of the route. Consequently, migratory birds may approach, follow, or cross the proposed OHTL at multiple locations along the alignment.

The route partially traverses approximately 4 km of the Gebel El-Zeit Important Bird Area (IBA) and lies within the wider Rift Valley/Red Sea Flyway, which represents one of the principal migration routes used by soaring birds moving between Eurasia and Africa. This means that the proposed OHTL is located within a landscape that is regularly used by migratory birds during both spring and autumn migration periods, increasing the potential for interactions between birds and transmission infrastructure. Site-specific monitoring results and regional ornithological studies indicate that bird migration activity is generally higher within the northeastern sections of the route and in areas associated with important landscape features and existing migration pathways. As a result, these sections of the OHTL are considered to have a comparatively higher potential collision risk than other parts of the alignment.

In addition, the proposed OHTL will operate within a landscape that already contains existing and planned wind farms and transmission lines. Consequently, cumulative impacts have been considered to account for the potential interaction of multiple infrastructure developments with the same migratory bird populations.

The operation of OHTLs is likely to have an impact on birds as they are proven to have a mortality factor for migratory and soaring birds. In most cases, impacts from overhead powerlines lead to severe injuries or immediate death. In case of collision accidents, birds crash at high flight speed into cables or wires. The resulting injuries vary widely and are comparable to trauma caused by collisions with cars. Electrocution harms mostly birds sitting on the live components or having ground contact, but this is less of an issue with high power OHTL such as the one proposed here, that should be addressed and mitigated.

Table 30: MSBs likely to utilize OHTL area, their conservation status and notes on likelihood of site utilization

Common Name	Conservation Status	Notes
	IUCN	
Egyptian Vulture	EN	Recorded across the existing OHTLs corridor (occurred in spring and autumn seasons)
Steppe Eagle	EN	High numbers of birds recorded migrating across the proposed OHTL corridor (Mostly occurred in spring seasons). Migration through the AoI is likely
Sooty Falcon	VU	A minor bird registered on survey per season. Migration through AoI possible.
Pallid Harrier	NT	Recorded in low numbers during surveys. Migration through the AoI is likely.
Imperial Eagle	VU	Recorded in low numbers during surveys. Migration through the AoI is likely.
Greater Spotted Eagle	VU	Recorded in low numbers during surveys. Migration through the AoI is likely.
White Stork	LC	Very high numbers of birds recorded migrating across the proposed OHTLs corridor (mostly recorded in spring season) Migration through the AoI is likely.
Black Kite	LC	Very high numbers of birds recorded migrating across the proposed OHTLs corridor (mostly recorded in spring

		season). Migratory species through the flyway. Migration through the AoI is likely.
Steppe Buzzard	LC	Very high numbers of birds recorded across the proposed OHTLs corridor (mostly occurred in spring season). Migratory species through the flyway. Migration through the AoI is likely.
European Honey Buzzard	LC	Recorded across the proposed OHTLs corridor (mostly occurred in spring and autumn seasons). Migration through the AoI is likely.
White Pelican	LC	Recorded across the proposed OHTLs corridor (mostly occurred in spring and autumn seasons). Migratory species through the flyway. Migration through the AoI is likely.

Generally, any large soaring or fast flying species is at risk of collision with OHTLs. The size and flight behavior (and sometimes other biological characteristics) of these species results in a low level of detection and being able to avoid collision with such structures.

Available evidence from both the Gulf of Suez OHTL post-construction fatality monitoring (PCFM) datasets (2021-2025) and the Spring and Autumn 2025 vantage point (VP) surveys indicate that collision exposure varies considerably among migratory soaring bird species. The VP surveys showed that several large soaring species, including Steppe Eagle, Egyptian Vulture and other eagle species, were predominantly recorded above the OHTL collision-risk height band (<120 m), resulting in relatively low exposure to transmission lines. Similarly, smaller and more maneuverable species such as falcons and harriers were generally recorded in lower numbers and are considered to have a greater ability to avoid transmission infrastructure during flight. Consistent with these observations, the PCFM datasets from existing regional OHTLs recorded relatively few collision fatalities for these species. In contrast, Black Kite, Steppe Buzzard, European Honey Buzzard, White Stork and White Pelican demonstrated either higher levels of activity within the collision-risk height band or higher recorded collision rates on existing OHTLs and are therefore considered more susceptible to collision impacts. These findings are supported by both the site-specific VP monitoring undertaken for the proposed Shadwan OHTL and the regional OHTL fatality monitoring datasets used in this assessment. However, factors such as adverse weather conditions, reduced visibility, and resting or roosting behavior may increase collision exposure for all migratory species during certain periods.

As noted within “Assessment of Baseline Conditions” a compounded and cumulative risk assessment was undertaken by RCREEE and Safe Soar, which is presented in the Figure below. The results of this assessment show a range of high and very high collision risk areas within the proposed OHTL line. The expected risk of MSB collision is higher in the Northeastern OHTL segments compared with the Southwestern OHTL segments. However there are areas of medium risk throughout the powerlines, and although the risk maybe be moderate in sections, collisions are still possible.

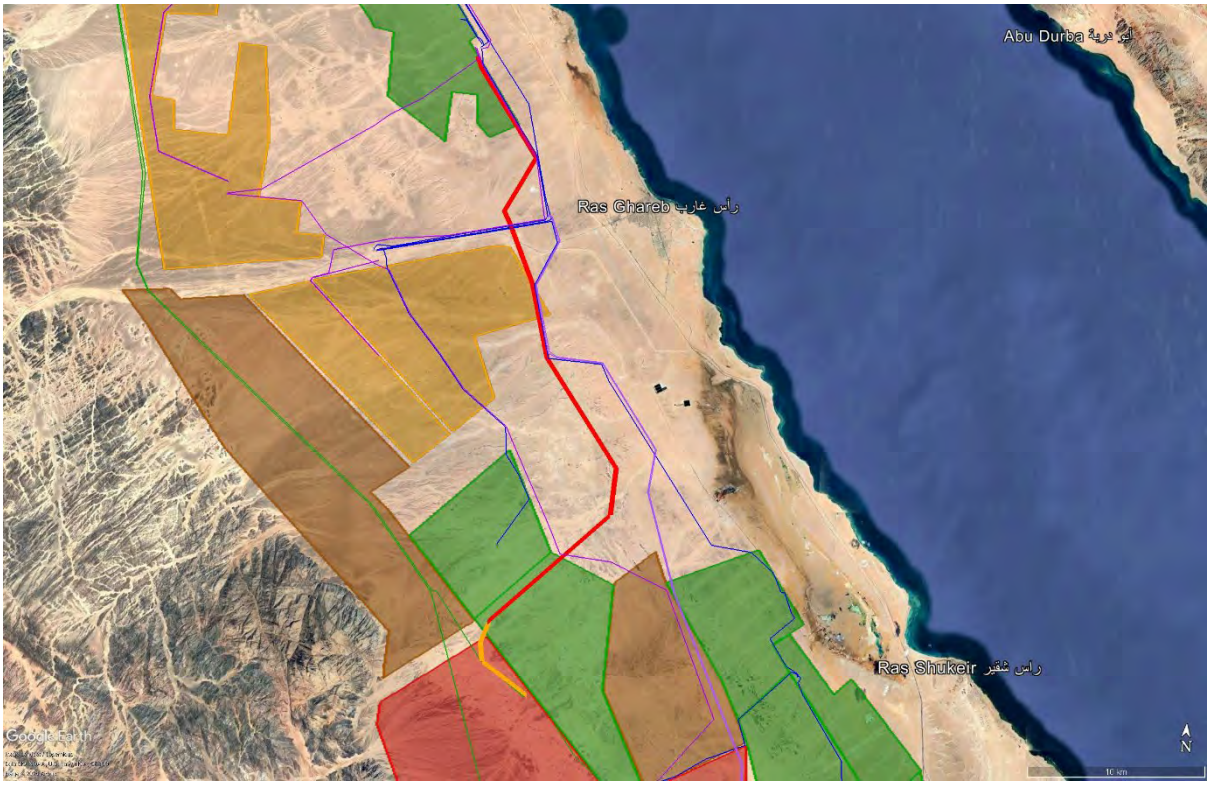


Figure 62: Compounded and cumulative risk assessment for predicted bird collisions along the proposed Shadwan OHTL for spring and autumn seasons (orange color for High Risk, red color for Very High Risk).

Using available data from the monitoring of confirmed bird casualties along existing OHTLs (RGWE, RSWE, WBWF, AMUNET, Zaafarana, NREA (KFW, FIEM, JICA) in the vicinity of the wind farm and proposed routes of the OHTL, an assessment has been undertaken to show predicted collision of MSBs for NIAT & RASGHA OHTLS for both worst case scenario and realistic case scenario as presented in the table below.

Following fatality monitoring at other wind farms locally, it has been predicted that, without the use of diverters, some MSBs will have a high number of collisions per year across the proposed OHTL lines as presented in the table below. White Storks are predicted to have over 27 collisions per year for Shadwan OHTL (45km) without mitigation. Without mitigation this will have a significant impact, however mitigation is discussed in further details below.

Collision Exposure and Fatality Estimation Methodology

Annual collision mortality estimates were derived using a two-step approach. First, a Collision Exposure Index (CEI) was calculated for each species using site-specific monitoring data collected along the proposed Shadwan OHTL corridor during the Spring and Autumn 2025 migration seasons. Secondly, the CEI was converted into annual fatality estimates using species-specific collision probabilities derived from observed mortality records on existing OHTLs in the Gulf of Suez and expert judgement regarding relative species vulnerability.

The Collision Exposure Index was calculated as follows: CEI = Total Number of Birds Recorded × (% of Individuals Flying within the OHTL Risk Height Band) × (% of Total Flight Time Spent within the OHTL Risk Height Band), where:

- Total Number of Birds Recorded = total number of individuals observed during migration surveys;
- % within Risk Height Band = proportion of birds flying within the collision-risk height (<120 m above ground level);
- % Flight Time within Risk Height Band = proportion of total observed flight time recorded within the collision-risk height.

The resulting CEI represents the relative exposure of each species to potential collision with the proposed Shadwan OHTL.

We assume species vulnerability classification and collision probabilities for worst/realistic case scenarios based on our expertise and judgment based on known species susceptibility as follows:

Species	**Vulnerability Class**	**Assumed Collision Probabilities for Worst Case Scenario**	**Assumed Collision Probabilities for Realistic Case Scenario**
Large soaring birds (White Pelican, White Stork)	Very High	0.010	0.0065
Large eagles (Steppe Eagle, Imperial Eagle, Egyptian Vulture)	High	0.006	0.004
Large non-raptors (Eurasian Crane)		0.005	0.0035
Medium raptors (Black Kite, Steppe Buzzard, Honey Buzzard)	Moderate	0.003	0.002
Harriers (Montagu's, Marsh, Pallid Harrier) (low flight but agile)	Low to Moderate	0.002	0.00125
Falcons, Kestrels (fast, maneuverable)	Low	0.001	0.00065

The CEI values were converted into annual fatality estimates using species-specific collision probability factors. These factors were derived from observed collision patterns on existing OHTLs within the Gulf of Suez region and account for differences in body size, maneuverability, flocking behavior and known collision susceptibility.

The calculation applied was: Predicted Annual Fatalities = Collision Exposure Index × Collision Probability. Two sets of collision probabilities were applied:

- Worst-Case Scenario: based on collision rates observed on coastal OHTLs with higher bird densities and mortality rates.
- Realistic Case Scenario: based on collision rates observed on inland OHTLs considered most representative of the proposed Shadwan OHTL alignment.

The annual species-specific fatalities presented in Table 8 therefore represent the application of these probability coefficients to the CEI values calculated from site-specific monitoring data.

Table 31: Predicted Fatalities per Year for Proposed Shadwan OHTL

MSB Species	Collision Exposure Index Spring	Collision Exposure Index Autumn	Collision Exposure Index per year	Worst Case Scenario based on Site-Specific Prediction	Realistic Case Scenario
Black Kite	1043.4	202.8	1246.1	3.7	2.5
Black Stork	35.3	1.0	36.3	0.4	0.2
Booted Eagle	12.9	0.6	13.6	0.1	0.1
Common Kestrel	29.2	8.9	38.1	0.04	0.0
Egyptian Vulture	3.2	0.2	3.4	0.0	0.0
European Honey Buzzard	987.2	13020.7	14007.9	28.0	21.0
Imperial Eagle	0.7	0.0	0.7	0.0	0.0
Lesser Spotted Eagle	8.6	0.0	8.6	0.1	0.0
Long-legged Buzzard	11.1	1.2	12.3	0.0	0.0
Marsh Harrier	22.1	140.7	162.8	0.3	0.2
Montagu's Harrier	2.8	7.1	9.8	0.0	0.0
Osprey	2.8	0.0	2.8	0.0	0.0

MSB Species	Collision Exposure Index Spring	Collision Exposure Index Autumn	Collision Exposure Index per year	Worst Case Scenario based on Site-Specific Prediction	Realistic Case Scenario
Pallid Harrier	4.9	7.3	12.2	0.0	0.0
Short-toed Eagle	9.5	0.0	9.5	0.1	0.0
Sooty Falcon	1.0	4.9	5.9	0.0	0.0
Sparrowhawk	9.4	1.1	10.6	0.0	0.0
Greater Spotted Eagle	0.5	0.0	0.5	0.0	0.0
Steppe Buzzard	931.7	22.2	953.9	2.9	1.9
Steppe Eagle	73.7	0.0	73.7	0.4	0.3
White Pelican	381.5	1156.8	1538.3	15.4	10.0
White Stork	3561.7	619.0	4180.8	41.8	27.2
Bonelli's Eagle	0.0	0.0	0.0	0.0	0.0
Crested Honey Buzzard	0.0	1.0	1.0	0.0	0.0
Eurasian Crane	0.5	0.0	0.5	0.0	0.0
Eleonora's Falcon	3.0	0.7	3.7	0.0	0.0
Golden Eagle	0.5	0.0	0.5	0.0	0.0
Eurasian Griffon	0.6	0.0	0.6	0.0	0.0
Peregrine Falcon	2.0	0.0	2.0	0.0	0.0
Eurasian Hobby	1.0	0.3	1.3	0.0	0.0

MSB Species	Collision Exposure Index Spring	Collision Exposure Index Autumn	Collision Exposure Index per year	Worst Case Scenario based on Site-Specific Prediction	Realistic Case Scenario
Lanner Falcon	**1.0**	**0.0**	**1.0**	**0.0**	**0.0**
Lesser Kestrel	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Levant Sparrowhawk	**0.4**	**0.0**	**0.4**	**0.0**	**0.0**

[1] Collision Exposure Index (CEI) = Total Birds × (% at risky altitude) × (% of time at risky altitude) mentioned in Table 1. CEI for White Stork in Spring 2025 is 102870*22.42%*15.44% =3561.7

[1] Assumed collision probability for large soaring birds under the Realistic Case Scenario: 0.0065. So, Predicted Annual Fatalities in Spring 2025: 3,561.7 × 0.0065 = 23.15. Considering Autumn 2025, the final annual fatality estimate presented in Table 8 is 27.2 White Storks per year under the Realistic Case Scenario.

It should be noted that the species-specific annual fatality estimates presented in Table 8 are derived from the Collision Exposure Index methodology and therefore do not represent a direct extrapolation of the average fatalities-per-kilometre values recorded on reference OHTLs. The reference OHTL datasets were used to calibrate species-specific collision probabilities, while the final mortality predictions are driven primarily by site-specific exposure data collected along the proposed Shadwan OHTL corridor.

It should be noted that the species-specific annual fatality estimates presented in Table 8 are derived from the Collision Exposure Index methodology and therefore do not represent a direct extrapolation of the average fatalities-per-kilometre values recorded on reference OHTLs. The reference OHTL datasets were used to calibrate species-specific collision probabilities, while the final mortality predictions are driven primarily by site-specific exposure data collected along the proposed Shadwan OHTL corridor.

C

Impact Evaluation

The significance of bird collision impacts associated with operation of the proposed Shadwan OHTL has been assessed in accordance with the methodology presented in Section 3.4 of the Main ESIA.

Migratory soaring birds (MSBs) are considered receptors of High Sensitivity due to the international importance of the Gulf of Suez migration corridor, the presence of the Gebel El-Zeit Important Bird Area (IBA), and the occurrence of species of conservation concern including Egyptian Vulture (Endangered), Steppe Eagle (Endangered), Eastern Imperial Eagle (Vulnerable), Greater Spotted Eagle (Vulnerable) and Sooty Falcon (Vulnerable).

Without mitigation, collision impacts would occur throughout the operational life of the Shadwan OHTL and would represent direct mortality of individual birds. The impact would be long-term in duration and irreversible at the individual level. Based on the realistic-case fatality predictions presented in Table 8, collision mortality is expected to occur annually, particularly for White Stork, European Honey Buzzard,

White Pelican, Black Kite and Steppe Buzzard. However, predicted mortality levels are low relative to the regional populations migrating through the Gulf of Suez flyway each year.

The impact extent is considered regional because the affected bird populations migrate through a wider flyway extending beyond the Project area. The likelihood of occurrence is considered likely because bird collisions with OHTLs are a well-documented phenomenon and have been recorded on existing overhead transmission lines within the Gulf of Suez.

Considering the predicted mortality rates, affected population size, conservation status of the species concerned, duration, reversibility and extent of the impact, the pre-mitigation magnitude is assessed as Medium. Applying the ESIA significance matrix and considering the High Sensitivity of the receptor, the pre-mitigation impact significance is assessed as Moderate to Major.

Mandatory mitigation measures have been incorporated into the Project design, including installation of Bird Flight Diverters (BFDs) along the entire OHTL shield wire. Based on published literature and regional monitoring data from comparable OHTLs, BFDs are expected to reduce collision mortality by approximately 50%. In addition, the Project will implement long-term post-construction fatality monitoring and an adaptive management program to identify collision hotspots and implement additional mitigation measures if required.

Following implementation of these mitigation and monitoring measures, the residual collision mortality is expected to reduce substantially. Consequently, the residual impact magnitude is assessed as Low to Medium. Applying the significance matrix, the residual impact significance is assessed as Moderate and acceptable with mitigation, monitoring and adaptive management measures in place.

Table 32: Impact Significance Assessment for Bird Collisions with the Proposed Shadwan OHTL

Assessment Criterion	**Evaluation**
Impact Type	Direct mortality due to collision with OHTL
Receptor	Migratory Soaring Birds (MSBs)
Receptor Sensitivity	High
Extent	Regional
Duration	Long-term (Operation Phase)
Reversibility	Irreversible at individual level
Likelihood	Likely
Magnitude (Without Mitigation)	Medium
Significance (Without Mitigation)	Moderate to Major

Key Mitigation Measures	BFD installation along entire shield wire, PCFM, Adaptive Management
Magnitude (Residual)	Low to Medium
Residual Significance	Moderate

The collision mortality estimates presented in Table 8 are based on species-specific Collision Exposure Indices (CEIs) derived from site-specific bird migration monitoring undertaken along the proposed Shadwan OHTL corridor during the Spring and Autumn 2025 migration seasons. Under the Realistic Case Scenario, the highest predicted annual collision mortality is associated with White Stork (27.2 birds/year), European Honey Buzzard (21.0 birds/year) and White Pelican (10.0 birds/year), reflecting their relatively high exposure within the OHTL collision-risk zone and their known susceptibility to collisions with overhead transmission lines. The high predicted collision mortality for White Stork is primarily driven by the exceptionally high number of individuals recorded during site-specific monitoring along the proposed Shadwan OHTL corridor and the resulting high Collision Exposure Index. This prediction is based on project-specific exposure data and therefore differs from the lower mortality levels recorded on some inland reference OHTLs, which reflect local conditions within those monitored alignments rather than overall exposure within the wider migration corridor.

Bird Flight Diverters (BFDs) will be installed along the entire shield wire of the proposed OHTL as a mandatory mitigation measure. Based on published literature and regional monitoring data from comparable OHTLs within the Gulf of Suez, BFD installation is expected to reduce collision mortality by approximately 50%. Following implementation of BFDs, annual collision mortality is predicted to decrease to approximately 13.6 White Storks/year, 10.5 European Honey Buzzards/year and 5.0 White Pelicans/year, with corresponding reductions expected for other species.

These residual mortality estimates form the basis of the impact significance assessment and will be verified through the Post-Construction Fatality Monitoring (PCFM) program implemented throughout the operational life of the Project. Monitoring results will be reviewed through the adaptive management framework, and additional mitigation measures will be implemented by EETC where monitoring indicates mortality levels higher than those predicted by this assessment.

A. Mitigation

Operational Phase

Direct and Indirect Impacts on Sensitive Receptors (Birds) – Collision with OHTL

Due to the requirements and length of the OHTL, routing options will never be able to completely avoid the risk to migratory birds or the risk of collision impacts. However, as discussed earlier within “Section 2” one factor considered with siting by EETC was to align the route with existing OHTL route. Studies by Pallet et al. (2022) have shown that aligning and staggering the towers could reduce collisions of collision prone MSBs by 67%.

The proposed design of the towers and lines are possibly the least impactful possible as the towers are free standing with no support wires.

An extensive literature review and meta-analysis was performed (Bernardion et al. 2019) to evaluate the overall effectiveness of wire-marking in reducing bird collisions with powerlines, including the possible influencing factors of powerline voltage, habitat and type of device. Data was gathered from 35 field studies across the world (which included 66 trials) assessing the effectiveness of wire-marking based on regular carcass searches beneath power lines. Overall, wire-marking reduced bird collisions with power lines by 50.4%.

Mitigation is being installed to reduce the operational impact of the OHTL on migrating birds including birds of prey, waterbirds and other large soaring birds. The below table shows the difference in collision predictions with and without diverter mitigation. The results, based on local OHTL data, show that there is a reduction in collisions through the use of diverters and therefore this has been recommended for this project.

While high-voltage OHTLs present relatively low electrocution risk, this risk is not negligible, particularly at jumper connections and substation interfaces where conductor spacing is reduced. Appropriate mitigation measures, such as insulation of critical components and bird-safe substation design, will be implemented to minimize any residual risk.

Table 33 Comparison of Annual Bird Collisions per Species Before and After Diverter Installation

MSB Species	Collisions per year without diverters	Collisions per year with diverters
Black Kite	**2.5**	**1.2**
Black Stork	**0.2**	**0.1**
Booted Eagle	**0.1**	**0.0**
Common Kestrel	**0.0**	**0.0**
Egyptian Vulture	**0.0**	**0.0**
European Honey Buzzard	**21.0**	**10.5**
Imperial Eagle	**0.0**	**0.0**
Lesser Spotted Eagle	**0.0**	**0.0**
Long-legged Buzzard	**0.0**	**0.0**
Marsh Harrier	**0.2**	**0.1**
Montagu's Harrier	**0.0**	**0.0**

MSB Species	Collisions per year without diverters	Collisions per year with diverters
Osprey	0.0	0.0
Pallid Harrier	0.0	0.0
Short-toed Eagle	0.0	0.0
Sooty Falcon	0.0	0.0
Sparrowhawk	0.0	0.0
Greater Spotted Eagle	0.0	0.0
Steppe Buzzard	1.9	1.0
Steppe Eagle	0.3	0.1
White Pelican	10.0	5.0
White Stork	27.2	13.6
Bonelli's Eagle	0.0	0.0
Crested Honey Buzzard	0.0	0.0
Eurasian Crane	0.0	0.0
Eleonora's Falcon	0.0	0.0
Golden Eagle	0.0	0.0
Eurasian Griffon	0.0	0.0
Peregrine Falcon	0.0	0.0
Eurasian Hobby	0.0	0.0
Lanner Falcon	0.0	0.0

MSB Species	Collisions per year without diverters	Collisions per year with diverters
Lesser Kestrel	**0.0**	**0.0**
Levant Sparrowhawk	**0.0**	**0.0**

Based on the results of the PCFM Program conducted along the OHTLs crossing the GoS region, the estimated annual bird collision fatality rate is consistent with the findings of the present assessment. The values derived from the initial analysis fall within the same range as those reported by the PCFM Program, indicating that the predicted collision risk is comparable and aligns with regional benchmarks for overhead transmission lines within this high-use migratory corridor.

Bird Flight Diverters (BFDs) are to be installed every 10 m along the entire length of the OHTL on the shield wire. All BFDs installed will be dynamic (*e.g.* move in the wind) to increase visibility. However, A hybrid approach combining dynamic and static bird diverters will be adopted to ensure both high visibility and durability under desert conditions, supported by regular maintenance to ensure continued effectiveness. The BFDs installed within 4km of the dam will include models that glow or light up at night (e.g. FireFly diverters) to increase visibility for birds staging in the area and arriving late or leaving early.

The Project Developer is committed to procuring diverters that meet the required long-term guarantee and specifications and take part in their installation. Installation of shield/earthing wire and attached BFDs will be completed by EETC around the same time (as practicably possible). BFDs will be installed by EETC to the manufacturer's guidance and assessment of the OHTL, taking into consideration number and spacing, at a minimum of 1 every 10m. Although EETC will be responsible for the construction, operation and maintenance of the OHTL, implementation of the proposed bird collision mitigation measures will be secured through regulatory requirements and existing institutional arrangements applicable to the Project. Specifically, the environmental permit issued by the Egyptian Environmental Affairs Agency (EEAA) is expected to include a condition requiring the installation and maintenance of BFDs along the OHTL. Compliance with this requirement will therefore form part of EETC's environmental obligations during project implementation. In addition, in accordance with the cooperation protocol established between EEAA, EETC, NREA and RCREEE, post-construction fatality monitoring (PCFM) for the Shadwan OHTL will be implemented by RCREEE following the approved monitoring methodology and reporting requirements. The results of the PCFM program will be reviewed by the relevant authorities and stakeholders to assess the effectiveness of the mitigation measures and identify any emerging collision hotspots. Where the monitoring results indicate that additional mitigation measures are required, adaptive management actions will be implemented by EETC in accordance with the conditions of the EEAA permit and the recommendations arising from the PCFM program. Compliance with mitigation, monitoring and adaptive management commitments will be documented through periodic reporting and review by the competent authorities and relevant stakeholders.

The installation of BFDs will need to be recorded by the Project Ecologist and these checks need to be included in the annual reports. BFDs should be checked every 6 months before the spring and autumn migration seasons so that they are in place and operational for higher risk periods. Any damaged or defective BFDs will need to be replaced within 2 months of being reported as faulty.

However, the need for and extent of replacing damaged / defective BFDs will be undertaken following a review of the outcomes of the PCFM studies (discussed in further details below). This issue will be discussed in agreement with lenders and other relevant stakeholders.

Indirect Impacts on Sensitive Receptors

- Ban on off-road driving, especially during sensitive periods of the year (e.g. breeding bird season) and if off-road driving is required a check of the working area should be completed by the Project's Ecologist.
- Speed limits to be enforced.
- Sensitive species are to be included in the site induction for all operational staff where additional control measures will be discussed including allowing animals to move around the site, not chasing after them in vehicles or approaching them on foot and what to do if they observe breeding birds within their works areas.

In addition, if any significant maintenance work is required (e.g. replacement of any transmission towers or wires etc.) all impacts related to construction will be relevant and all mitigation outlined in previous sections will be followed.

Also, the EETC construction team of the OHTL will work in full harmonization and compliance with Health, Safety, and Environment (HSE) local standards and regulations and so related developer's regulations and procedures during both OHTL's construction and operation phases.

B. Monitoring

Long-term monitoring of the Project AoI will be completed as set out above and will include:

- Post-construction fatality monitoring to be completed in the first three years of operation to record the actual impact of collisions with the OHTL. Additional surveys and/or mitigation measures to be implemented as part of an Adaptive Management Strategy if no sufficient decrease in fatalities have been recorded.
- All of the above monitoring requirements will be included within Construction and Operational Biodiversity Management Plans which will include KPIs and a Biodiversity Monitoring and Evaluation Plan (BEMP) against which the results of the monitoring will be assessed.

Avifauna

- Operational monitoring will be completed in line with best international practice presented in Post-Construction Bird and Bat Fatality Monitoring for Onshore Wind Energy Facilities In Emerging Market Countries (EBRD, IFC, KfW 2023) to monitor actual levels of mortality. Post construction fatality monitoring will be completed along the whole OHTL and the program of post construction monitoring will include carcass searching, searcher efficiency trials and carcass persistence trials. The results of the post-construction fatality monitoring will be used to inform a GenEst Analysis. Post-construction monitoring will follow the latest international best practice including the recently published PCFM Handbook (EBRD, IFC, KFW 2023). Full details of the PCFM Protocol will be included in an Operational BMP/BAP documents.
- An adaptive management strategy will be developed (in line with the PCFM Handbook), and additional mitigation will be undertaken if the results of the post-construction fatality monitoring indicate higher than predicted mortality, especially in relation to species of elevated conservation concern. Adaptive

management could include retrofitting of BFDs (or different types of BFD) on unmarked lines where PCFM surveys indicate areas of elevated mortality or provision of additional BFDs on marked lines if the installed BFDs are not preventing (or reducing) mortality. This could include installation of additional BFDs or those that are shown to increase avoidance / reduce collision in species susceptible to OHTL impacts. Installation of BFDs can be undertaken using a drone and would not require powerlines to be disconnected. Installed mitigation (if deemed necessary and useful) could also be changed if additional research into the effectiveness of BFDs comes to light during the construction period which would be agreed with lenders.

- Post-construction fatality monitoring will be undertaken during the spring and autumn migration seasons throughout the operational life of the Project. The PCFM program will follow internationally recognized methodologies and will include carcass searches, carcass persistence trials, searcher-efficiency trials and statistical correction of observed mortality estimates. This will be undertaken with the Lenders
- A chance finds procedure will be implemented and any carcasses seen by site workers will be reported to the Project Ecologist so that they can investigate.

C. Cumulative Impacts

Avifauna

Cumulative Impacts with the other wind farms and other OHTLs schemes

The cumulative impacts between the turbines and the OHTL have been considered. Without mitigation it is likely there would be a significant impact on MSBs. .Shutdown-on-demand measures reduce collision mortality associated with wind turbines and therefore contribute to reducing overall cumulative impacts on migratory bird populations at the landscape scale. However, such measures do not directly reduce collision risk associated with overhead transmission lines. Accordingly, OHTL collision risk has been assessed independently and mitigated through installation of Bird Flight Diverters and implementation of long-term monitoring and adaptive management measures. An adaptive management scheme is proposed which will monitor higher than predicted mortality and further mitigation undertaken.

There are several wind farms in operation within the same area with associated OHTLs, and therefore the addition of new OHTL lines may have a cumulative impact on species within the area (see Figure below).

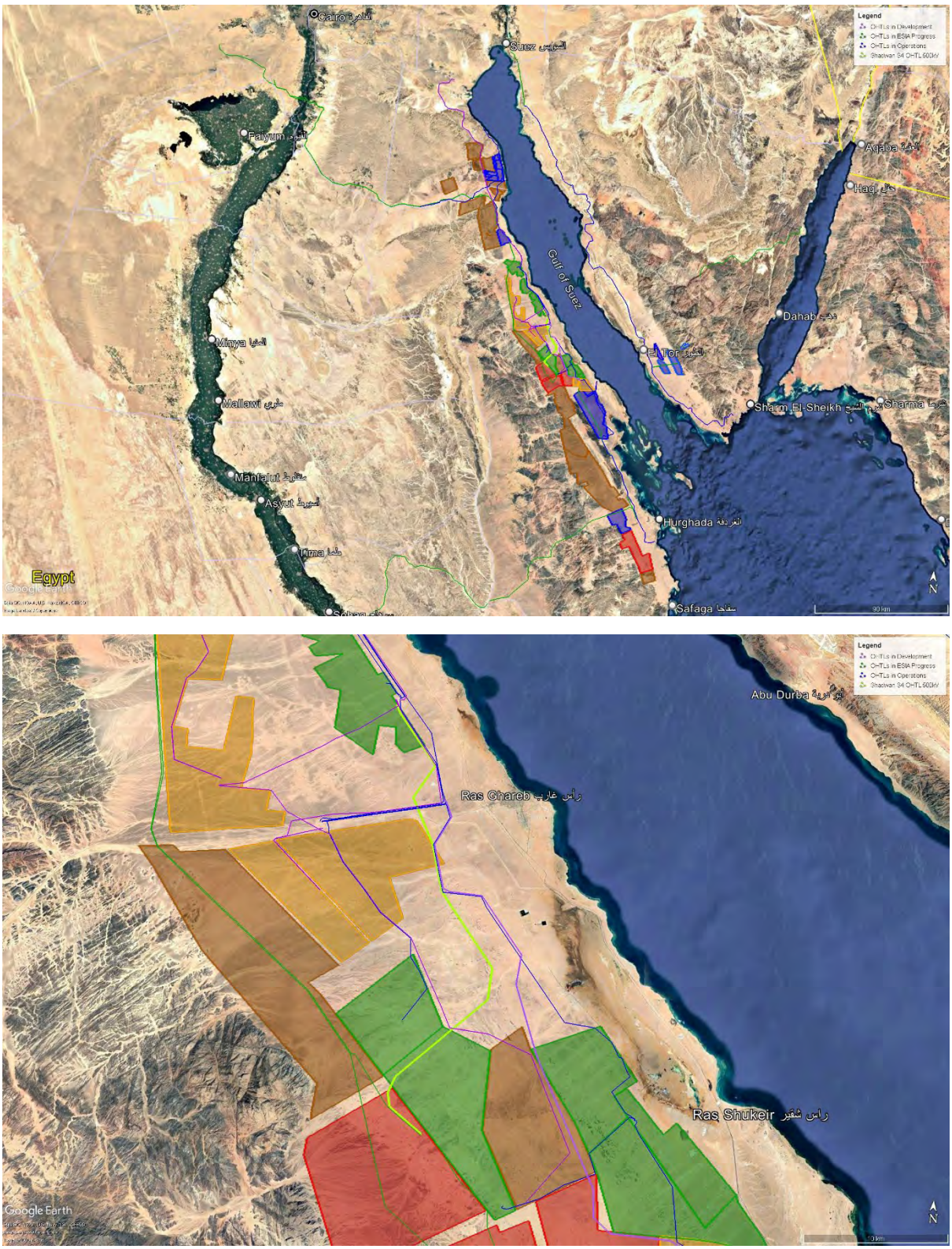


Figure 63: Wind and OHTL schemes within the Gulf of Suez (UP focus GOS region) (Down focus on Shadwan OHTL route)

Because of this the aforementioned projects have been considered within this assessment as each project could potentially affect the same populations of migratory birds. For example birds migrating through

Masdar IPH, RGWE, NREA Vesta, and AMUNET are likely to move across the NIAT & RASGHA wind farm and could also possibly migrate through its associated OHTLs.

For those projects already constructed or for those with impact assessments no significant residual impact are predicted after the application of impact avoidance through project design or additional mitigation has been applied such that residual impacts were considered to be minor / not significant.

Where residual negative impacts are possible and cannot be effectively mitigated, off-setting[13] will be applied to ensure no net loss to these VECs. Collision risk and electrocution residual impacts for other species (e.g. raptors) is not significant for any of these projects. The Shadwan OHTLs consists of one large 500KV transmission lines which will be constructed with BFDs. Collision risk of other species will therefore be minimal as BFDs are known to be effective at significantly reducing collision in other species and electrocution risk for raptors is minimal on HV lines due to their size (and visibility), insulation, distance between any live parts and size of pylons providing ample safe perching opportunities well away from any dangerous components.

Adaptive Management for Avifauna

Adaptive management is triggered when target thresholds are exceeded and when new evidence acquired over time shows an increased or decreased risk to a priority bird VEC or an increased risk to a non-priority population. Increased risk to priority birds requires that mitigation and management measures be revised to uphold thresholds and promote the long-term viability of the population. For priority bird VECs that exhibit a decreased risk over time, their primary threshold target may be reassessed, and revised or reassigned to reflect the reduced risk to their long-term population viability. Non-priority populations that exhibit evidence of increased risk may be assigned as priority bird VECs, may have an appropriate threshold determined and may be subject to associated adaptive management response strategies. Threshold s a key component of Adaptive management within the CEA as it provides a mechanism for dealing with the uncertainty associated with determining priority bird populations and with predicting thresholds for priority bird VECs.

8.8 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.

8.8.1 Potential Impacts During the Construction Phase on Air Quality and Noise

Site preparation activities associated with the Project, which will be undertaken by EETC, will include the preparation of tower locations and associated infrastructure components, including tower foundations, cables, access roads, and other ancillary facilities. These activities are expected to involve land clearing, land leveling and grading, earthworks and excavation activities, as well as final surface leveling and site preparation works.

[13] The need for biodiversity offsets will be determined through the residual impact assessment following mitigation and will be triggered where significant residual impacts remain on VECs. This process will be aligned with IFC PS6/EBRD PR6 and formalized within the Biodiversity Action Plan.

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 nearby petroleum activities). 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.

The table below provides an overall summary of the impact on air quality during the construction phase.

Construction Phase		
Type	Negative	Generation of dust
Duration	Short-term	Limited to construction period only and specifically activities such as the limited excavation which will be for a couple of weeks
Magnitude	Medium	Dust could be noticeable but dispersed
Reversibility	Reversible	Baseline restored after completion of construction works
Sensitivity	Low	Given that there are no key sensitive receptors within the area
Likelihood	Medium	Given that it is likely limited to activities such as the limited excavation which will be for a couple of weeks
Frequency	Periodic	Expected particularly during excavation and land clearing activities
Extent	Medium	Around 2km from active areas due to wind influence
Significance	**Minor**	

Mitigation Measures

The following identifies the mitigation measures to be applied by EETC during the construction phase:

- 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 EETC during the construction phase and which include:

- Periodic inspections should be conducted at nearby sites (e.g. such as nearby petroleum activities) 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.

8.9 Archeology and Cultural Heritage

The section below identifies and assesses the anticipated impacts from the Project activities on archaeology and cultural heritage during the construction 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.

8.9.1 Potential Impacts during the Construction Phase

Site preparation activities which are to take place onsite by EETC for installation of the OHTL and the various Project components 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. As noted earlier, there were several sites recorded within the Project area.

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.

The table below provides an overall summary of the impact on archaeology and cultural heritage during the construction phase. The overall impact assessment will be of minor significance.

Construction Phase		
Type	Negative	N/A
Duration	short-term	Limited to construction phase which is XX months
Magnitude	Medium	If a site of importance is unearthed and is improperly managed, it could be damaged or destroyed.
Reversibility	Irreversible	
Sensitivity	Low	
Likelihood	Low	Chance finds in general are of low probability
Extent	Low	Limited to actual footprint of Project activities
Significance	**Minor**	

Mitigation Measures

The following identifies the mitigation measures to be applied by EETC during the construction phase, and which include:

- Should the detailed design prepared by EETC include any additional areas outside of the current Project footprint that was surveyed in detail, follow inspections for these areas should take place by an archaeology and cultural heritage expert.
- Consult with the Ministry of Tourism and Antiquities to determine if an expert should be present during excavation activities.
- Develop and implement a chance find procedure. Throughout the construction phase, and as the case with any Project development that entails such construction activities, there is a chance that potential undiscovered archaeological remains may impacted. To mitigate such impacts, a chance find procedure must be develop and implemented in accordance with "Egyptian Archaeological Law 117/1983". The procedure should take into account the following requirements:
    - In case any remains are discovered construction activities must be halted and the area along with an appropriate buffer should be fenced along with proper signage installed in both Arabic and English language.
    - In this case, the Ministry of Tourism and Antiquities/ Antiquities Inspection Office should be immediately notified through formal communication.
    - Announce through appropriate channels to all construction staff that such a site has been discovered and no entry under any circumstance is allowed by any personnel. In addition, no collection of any remains or disturbance to the site is allowed.
    - No additional work will be allowed before the Ministry assesses the found potential archaeological site and grants clearance to resume the work.
    - Construction activities can continue at other parts of the site if no potential archaeological remains were found. If found, the same procedures above apply.
    - Ensure induction training that will be implemented for all employees includes a module on chance find procedure requirements.

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 EETC during the construction phase and which include:

- In the case that a suspected site is discovered, a report should be prepared that includes the following to be submitted to the Ministry of Tourism and Antiquities:
  - Photo documentation of the site including photos for delineation markers and signage.
  - Location (GPS coordinates)
  - Site estimate
  - Topographical description
  - Description of nature and conditions of the site
- After the Ministry of Tourism and Antiquities/ Inspection Office concludes their assessment of the discovered site, the above report should be updated with the findings of the Inspection Office with supporting formal letters to include: (i) formal letter with mitigation to be implemented as required by the Inspection Office (if required and applicable); (ii) formal letter from the Inspection Office granting permission to commence with construction work within the discovered site.

8.10 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.

8.10.1 Potential Impact on Electricity and Telecom Infrastructure during Construction

Inappropriate management of the various construction activities (to include but limited to transportation and traffic of vehicles in/out of the site, worker code of conduct, etc.) could damage or disturb the various nearby infrastructure and utility elements. This includes but is not limited to the electricity overhead transmission lines, gas pipeline and telecommunication tower.

The table below provides an overall summary of the impact on electricity, gas and telecom infrastructure during the construction phase. The overall impact is considered to be of minor significance.

Construction Phase		
Type	Negative	
Duration	Short-term	Limited to construction period only which is 4 months
Magnitude	Low	Given the nature of construction activities
Reversibility	Reversible	Baseline restored after completion of construction works
Sensitivity	Medium	Given the nature of construction activities
Likelihood	Low	Limited to construction period only
Extent	Medium	Impacts could have an effect up to 5 km radius
Significance	**Minor**	

Mitigation Measures

The following identifies the mitigation measures to be applied by EETC during the construction phase, and which include:

- Implement proper management measures to prevent damage or disturbance of nearby infrastructure and utility elements. This could include establishing a proper code of conduct and awareness raising / training of personnel to:
  - emphasize the presence of nearby infrastructure and utility elements.
  - restricting 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.

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 EETC during the construction phase and which include:

- Inspection of the works should be carried out at all times.

8.10.2 Potential Impacts on Water Resources during the Construction Phase

The following key risks and impacts are noted in relation to the construction phase of the in relation to water resources:

- Site preparation activities which are to take place onsite by EETC for installation of the OHTL are expected to include land clearing activities, levelling, excavation, grading, etc. Although such activities are limited to the relatively small individual footprints of the towers and the actual area of disturbance is relatively minimal, such activities could disturb soil, and result in erosion and runoff which could result in siltation of surface water and impacting its water quality.
- Improper management of construction activities (through for example improper waste management, hazardous material management) could reach and pollute such water bodies through impacts on water quality (e.g. dissolved oxygen) and/or impacts on water environment (as applicable – e.g. benthic communities).

Construction Phase		
Type	Negative	N/A
Duration	Short-term	Limited to construction period which is 4 months
Magnitude	Medium	Given the small project footprint of tower components, the overall impact is considered to be of minor significance during the construction phase.
Reversibility	Reversible	
Sensitivity	Low	
Likelihood	Medium	
Extent	Low	
Significance	**Minor**	

No key impacts are anticipated during the operation phase, given that activities will be minimal and target for specific tower areas that require either corrective or preventive maintenance.

Additional Requirements

- Coordinate with RSWWC to determine the most feasible and practical approach for securing the water requirements of the Project. In the case tankers will be used, a list of authorized tankers will have to be obtained from the Company.
- Document water consumption of the Project during construction (monthly).

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

Monitoring Requirements

- Submit report with proof of coordination with relevant authorities.
- Submit water consumption report.

8.10.3 Potential Impacts on Waste Utilities during the Construction Phase

The Project is expected to generate the following waste streams during the construction phase:

- Wastewater during construction includes black water (sewage water from toilets and sanitation facilities) and grey water (from sinks, showers, etc.). 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 of at the closest Wastewater Treatment Plant (WWTP). However, if inadequate disposal of wastewater occurs and is allowed to drain on land, this might contaminate the soil and possibly infiltrate to groundwater.
- Solid waste during construction and operation 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.). The approximate estimated municipal solid waste to be generated from the Project can be accounted as follows. Municipal solid waste and construction waste generated will likely be collected and stored onsite and then disposed to the closest approved dumpsite or, if possible, reused in the construction activities. Solid waste quantities generated are not expected to be significant and are likely to be easily handled by closest approved solid waste disposal facility.
- Hazardous waste during construction and operation 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.

The table below provides an overall summary of the impact on waste utilities during the construction phase. The overall impact is considered to be not significant.

Construction Phase		
Type	Negative	N/A
Duration	Short-term	Limited to construction phase which is 4 months
Magnitude	Low	Given limited waste quantities
Reversibility	Reversible	N/A
Sensitivity	Low	Given limited waste quantities
Likelihood	High	Given nature of activities expected

Extent	Medium	Could impact all resources / users relying on such waste utilities which could be more than 5 km away
Significance	**Not Significant**	

Additional Requirements

The following identifies the additional requirements to be applied by EETC during the construction phase and operation phase respectively and which include:

- Coordinate with the RSWWC and the Sanitation Authority in Ras Gharib and obtain list of authorized contractors for collection of wastewater.
- Coordinate with Hazardous Waste Management Unit in Red Sea Governorate to obtain list of authorized contractors for collection of hazardous waste from the site to the closest approved facility for final disposal.

8.11 Community Health, Safety and Security

This section discusses the potential impacts anticipated from the various Project phases to include the planning and construction phase and the operation phase. For each identified impact, a set of mitigation measures and monitoring requirements have been identified to eliminate the impact or reduce it to acceptable levels.

8.11.1 Potential Impacts from Electric and Magnetic Fields (EMF) during Operation

Electric and magnetic fields (EMF) are radiation associated with the use of electric power such as household wiring, electric appliances and also from OHTL. Electric fields are produced from the voltage in the transmission line 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.

Electric fields (ELF) are produced by voltage and increase strength as the voltage increases. Electric field strength is measured in volts per meter (V/m). Magnetic fields are produced by the current, which measures the flow of electricity, which increases in strength as the current increases. Electromagnetic fields are measured in units of tesla (T). Most electric power operates at 50 or 60 cycles per second or hertz (Hz), termed 'extremely low frequency (ELF).[14]

Extensive scientific research and studies have been undertaken to address potential human health impacts from long term exposure to EMF from transmission lines. The 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

[14] Radiation: Electromagnetic fields (who.int)

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.

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.

Table 34: ICNIRP Exposure Limits for General Public Exposure to Electric and Magnetic Fields

Frequency	Electric Field (V/m)	Magnetic Field (µT)
50 Hz	5000	100
60 Hz	4150	83

A study undertaken by Western Area Power Administration (responsible for electric power functions in Central and Western States of the USA), known as the "Electric and Magnetic Field Facts"[15] included measuring fields for 321 power lines for 1990 annual mean loads. The table below presents the outcomes of the study including typical values for electric and magnetic fields for a 500kV OHTL at various distances – with values of 1000 V/m and 1.26µT respectively.

Table 35: Typical 60 Hz Electric and Magnetic Field Levels from Overhead Power Lines

500 kV OHTL	Centreline	100 feet (30.5 m)	200 feet (60.96 m)	300 feet (91.44 m)
Electric field V/m	7000	1000	3000	1000
Magnetic field µT	8.67	1.26	0.32	0.14

In addition to the above, a study conducted by the National Institute of Environmental Health Sciences[16] further reinforces the findings mentioned above. The figure below presents the typical EMF levels for 500kV power transmission lines based on the study.

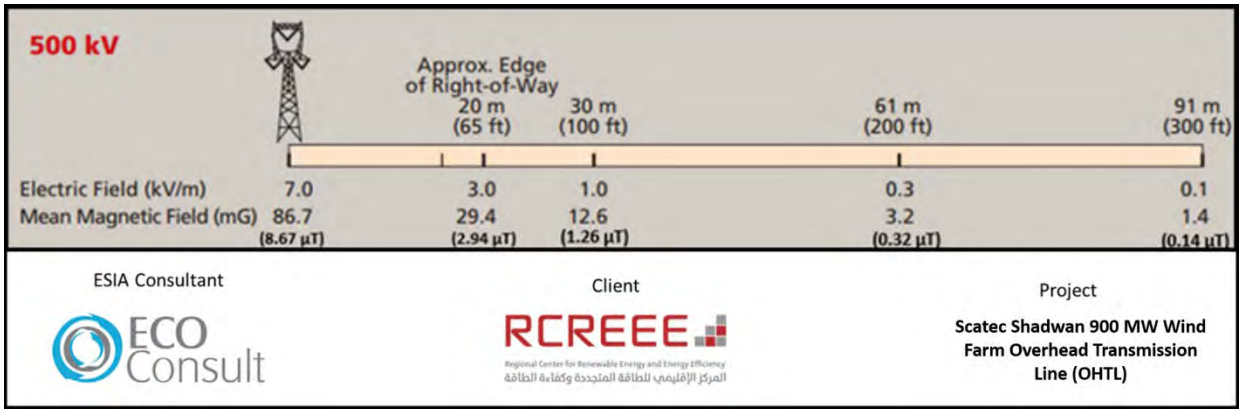


Figure 64: Typical EMF Levels for Power Transmission Lines

Finally, a study undertaken by ICNIRP[17] specifically for magnetic fields with one year's recorded load data with averages for a representative sample of 43 different lines further supports the findings earlier. This study enhances the credibility of the conclusion that the 30-meter buffer zone is adequate in ensuring public safety and well-being. It is important to note that the General Law Electricity Law No. 87 of 2015 requires a minimum of 25 m.

[15] EMF book for pdf.idd (wapa.gov)
[16] EMF Electric and Magnetic Fields Associated with the Use of Electric Power (nih.gov)
[17] EHC 238 Front pages final.fm (icnirp.org)

Table 36: Magnetic Field Values for different OHTLs

Typical Magnetic Field (µT) values for OHTL					
Type of line	Usage	Distance from line			
		15m	30m	61m	91m
115kV	Average	0.7	0.2	0.04	0.02
	Peak	1.4	0.4	0.09	0.04
230kV	Average	2.0	0.7	0.18	0.08
	Peak	4.0	1.5	0.36	0.16
500kV	Average	2.9	1.3	0.32	0.14
	Peak	6.2	2.7	0.67	0.30

8.11.2 Potential Impacts from Worker Influx during Construction

During the construction phase of the Project a maximum of XX workers (at peak) that will be involved for a duration of approximately XX months. As discussed earlier, at this point it is still unclear how many of these workers will be expatriates, and/or from local communities and it is still unclear where the accommodation of these works will take place. For the OHTL component, given its linear nature, influx poses an increased risk for communities.

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, including 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 hostility 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.

Increase in Competition for Public Services

The sudden increase in population due to the influx of workers and their families can put substantial pressure on existing local infrastructure, particularly water, electricity, and transportation systems. These services might not have been designed to handle such a rapid or substantial increase in use, leading to overloads and service disruptions.

Local Inflation of Prices

The arrival of a large labour force can drive up the demand for goods and services, potentially leading to higher local prices and displacing regular consumers in the local community.

Increased Risk of Crime

The influx of workers in communities could lead to a rise in criminal activities or create a feeling of insecurity among local residents. Potential issues may include theft, physical assaults, substance abuse, prostitution and human trafficking. The local police force might be unprepared to handle the surge in population and associated challenges.

Construction Phase		
Type	Negative	
Duration	Short-term	Limited to construction which is XX months
Magnitude	Low	Given number of workers and population
Reversibility	Reversible	Impact limited to construction phase only
Sensitivity	Medium	Worker influx could result in some sensitive impacts on local communities
Likelihood	Medium	Based on current information, worker influx into Ras Gharib is likely
Extent	Medium	Will be limited to Ras Gharib city mainly
Significance	**Minor**	

Mitigation Measures

EETC will be required to prepare and submit the below:

- Stakeholder grievance mechanism should be implemented in relation to any grievances related to worker influx. Any grievances submitted should be handled fully in accordance with the mechanism that is included within the SEP. Please refer to the SEP for additional details.
- Stakeholder engagement activities with local communities must provide information on worker influx expected and measures that will be undertaken to control such impacts. Stakeholder engagement activities are provided in further details in the SEP.

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 EETC:

- Reporting on the following: (i) worker influx incidents/accidents; (ii) health conditions to include epidemic outbreaks, diseases or infections; and (iii) submitted grievances related to visibility (if applicable) as part of the SEP and measures undertaken to resolve such grievances. This should be done on a monthly basis.
- Submission of stakeholder engagement log sheets that summarize local community engagement activities and their objectives for the reporting period along with evidence (e.g. photos of sessions or announcements). This should be done on a monthly basis.

8.12 Worker Welfare, Health and Safety

This section discusses the potential impacts anticipated from the various Project phases to include the planning and construction phase and the operation phase. For each identified impact, a set of mitigation measures and monitoring requirements have been identified to eliminate the impact or reduce it to acceptable levels.

8.12.1 Occupational Health and Safety Impacts during Construction

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 OHTL 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 and fire;
- Exposure to electric shocks and burns when touching live components;
- Heat Strokes/Heat Stress;
- Airborne diseases.

Construction Phase		
Type	Negative	In extreme cases could entail permanent impacts (e.g. permanent disability); however, such impacts are controlled through the implementation of general best practice.
Duration	Medium-term	
Magnitude	Medium	
Reversibility	Irreversible	
Sensitivity	Medium	
Likelihood	Medium	
Extent	Low	
Significance	**Moderate**	

Mitigation Measures

Occupational Health and Safety Plan (OHSP)

EETC for all their construction and operations activities in Egypt are likely to have an OHSP. The objective should be as follows:

The objective of the OHSP should be as follows:

- Prevent all occupational incidents to the greatest extent possible for all workers;
- Zero fatal accidents, injuries and lost time accidents;
- Zero occupational disease;
- Zero major incidents;
- Providing a place of work that is safe for workers and communities;
- Full compliance with legal and contractual requirements related to occupational health and safety;
- Maintain safe working areas and good housekeeping.
- The OHSP should be Project and site specific and must take into account the national OHS legislation which mainly includes Law 4/1994 and Law 12/2003 on Labor 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 international E&S standards and requirements to include in particular IFC PS2 (Labor and Working Conditions), EBRD PR 2 (Labor and Working Conditions) – all of 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 is likely to include the following components:

- Risk assessment and Job Safety Analysis (JSA) procedure;
- Permit to Work (PTW) system procedure;
- Lock Out/Tag Out (LOTO) Procedure;
- Site control occupational health and safety procedure to include requirements for: Personal Protective Equipment (PPE), requirements for site risks (fall protection, powered and hand tools, compressed air / gas cylinders, fire prevention, hot works, electrical works, material handling, machinery use and safety, excavation/concrete works/civil works, confined space activity, storage, medical requirements, and communicable disease management);
- Occupational health and safety signage requirements;
- Tower construction, erection and conductor / line connection OHS procedure;
- Identify OHS training requirements to include but not limited to induction training, specialized trainings, and other as appliable. Specialized trainings will be required for the following;

  - Safe rigging and lifting
  - Welding and Hot Works
  - Ladders and scaffolding
  - Electrical works
  - Fall protection
  - Heat Stress
  - Permit to work
  - Defensive driving
  - Lifting and rigging safety
  - Banksman

- Lock-out/tag-out
- Excavation
- Hot Works
- Power and Hand Tool Safety
- Extreme weather conditions (e.g. sand storms, windy conditions, hot and cold weather and conditions and low/high temperatures
- Firefighting
- Manual handling
- Confined Spaces
- Excavations
- Working at heights
- Personal Protective Equipment (PPE)
- First Aid

- Identify monitoring and reporting requirements;
- Identify roles and responsibilities of the personnel involved in implementation of the plan; and
- Exposure and risk of transmission of airborne diseases throughout the workforce and measures to reduce such risks (e.g., awareness session on symptoms, isolation measures for confirmed cases, utilizing masks and sanitizers, social distancing where applicable, etc.).
- A worker grievance mechanism should be implemented and that should handle any grievances related to OHSP.

EETC is expected to have a detailed OHSP for all operation and maintenance works undertaken for high voltage lines.

EETC is also expected to adopt and implement the provisions of the OHSP throughout the Project construction and operation phase.

Emergency Preparedness and Response Plan (EPRP)

EETC for all their construction and operations activities in Egypt are likely to have an EPRP. The objective should be as follows:

- Identify emergency response procedures to be implemented with the objective of establishing a series of organization, operational and preventive measures in, which in turn will ensure the safety of workers and property within the specific Project site; and
- Identify emergency control measures for key expected emergency incidents.

In general, the EPRP is likely to include the following components:

- Identify of a communication and management process with external authorities to include in particular firefighting services and health providers
- Identify an emergency procedure and onsite notification process
- Identify emergency control measures for key expected emergency incidents to include but not limited to fire, accidents, spillage, traffic accidents, natural disasters and other.

- Identify requirement for emergency kits
- Identification of onsite assembly points
- Identification of emergency signs
- Identify training requirements to include but not limited to induction training, emergency responders training, and emergency drills.
- Identify monitoring and reporting requirements;
- Identify an Emergency Response Team (ERT) that should include firefighters and first aiders;
- Identify roles and responsibilities of the personnel involved in implementation of the plan;
- A worker grievance mechanism should be implemented and that should handle any grievances related to emergency preparedness and response.

EETC is expected to have a detailed EPRP for all operation and maintenance works undertaken for high voltage lines.

EETC is also expected to adopt and implement the provisions of the EPRP throughout the Project construction and operation phase.

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 EETC during the construction phase:

- Inspection to ensure the implementation of the provisions of the OHSP and assess compliance with its requirements;
- Submission of training records.
- Submission of worker grievances related to OHSP and grievances close-out forms.
- Inspections and audits on OHSP requirements identified earlier; and
- Reporting on the following: (i) number of near misses per month; (ii) number of lost time injuries per month; (iii) number of medical evacuations per month; (iv) number of working condition complaints per month; (v) lost working hours per month; (vi) number of working days since the last accident; (vii) number of HS audit/inspections; (viii) number of HS training/toolbox talks; (ix) number of HS meetings per month; (x) number of unsafe acts/conditions per month.

Inspection to ensure the implementation of the provisions of the EPRP and assess compliance with its requirements;

- Inspections and audits on EPRP requirements identified earlier; and
- Submission of drill reports and TBT training records.
- Submission of worker grievances relate to EPR and grievances close-out forms.

- Reporting on the following: (i) number of emergency responders assigned with required certification; (ii) number of ambulances; (iii) number of clinics; (iv) number of fire extinguishers; (v) number of fire alarms; (vi) number of doctors / nurses; (vi) number of emergency drills conducted; (vii) number of emergency incidents triggered.