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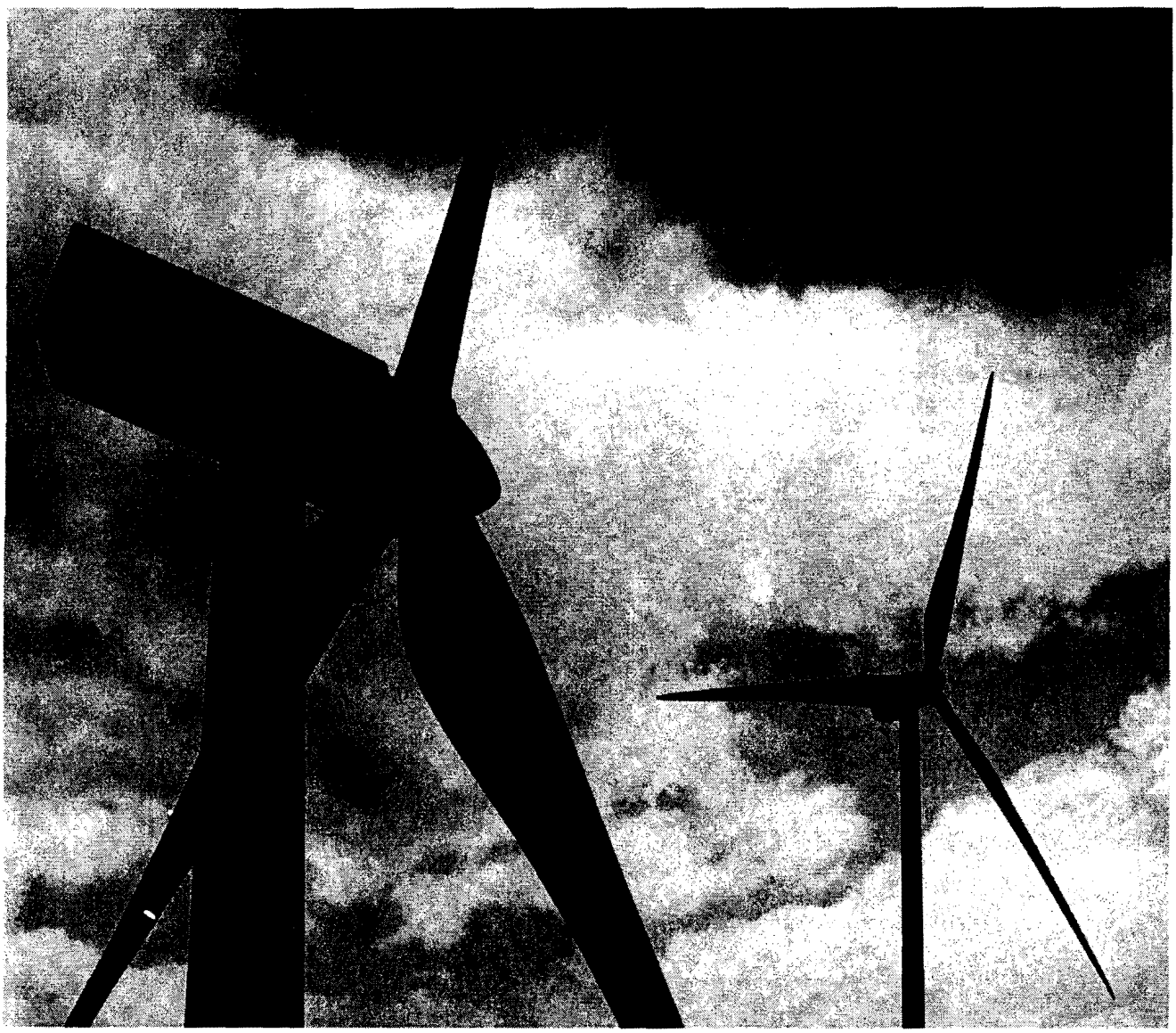
Prepared for:
GARET Enerji Üretim ve Ticaret A.Ş.
Ankara, Turkey

Environmental and Social Assessment for Sares Wind Power Plant in Turkey



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Contents

List of Tables

List of Figures

List of Acronyms

AEWA	Agreement on the Conservation of African-Eurasian Migratory Waterbirds
APCRH	Air Pollution Control Regulation for Heating Sources
AQAMR	Air Quality Assessment and Management Regulation
CHC	Central Hunting Commission
CITES	Convention on the International Trade in Endangered Species of Wild Flora and Fauna
CO	Carbon monoxide
SWPP	Sares Wind Power Plant
dB(A)	A-Weighted Decibel
DSI	State Hydraulic Works
E	East
EGECR	Exhaust Gases Emission Control Regulation
EIA	Environmental Impact Assessment
EIE	General Directorate of Electrical Power Resources Survey
EMRA	Energy Market Regulatory Authority
ESA	Environmental and Social Assessment Report
GARET	Garet Enerji Üretim ve Ticaret A.Ş
GDDA	General Directorate of Disaster Affairs
hr	hour
HASP	Health and Safety Plan
HCR	Hazardous Chemicals Regulation
HWCR	Hazardous Wastes Control Regulation
Hz	Hertz
IAPCR	Industrial Air Pollution Control Regulation
IBA	Important Bird Area
ICAO	International Civil Aviation Organization
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
kg	kilogram
km	kilometer
kV	kilovolt
kW	kilowatt
LC	Least concern
Leq	Equivalent Continuous Noise Level
M	meter
MENR	Ministry of Energy and Natural Resources
mg	milligram
mm	millimeter
MoEF	Ministry of Environment and Forestry
MSDS	Material Safety Data Sheets
MTA	General Directorate of Mineral Research and Exploration
MW	Megawatt

MWCR	Medical Waste Control Regulation
N	North
NE	Not Evaluated
NGCCPP	Natural Gas Combined Cycle Power Plant
NGO	Non-governmental organizations
NO_x	Nitrogen oxides
NSR	Noise Sensitive Receptor
NT	Near threatened
NWCC	National Wind Coordinating Committee
°C	Degree Celsius
PCB	Polychlorinated biphenyl
PDoEF	Provincial Directorate of Environment and Forestry
PDR	Project Description Report
PM	Particulate matter
PWCR	Packaging Waste Control Regulation
RAMEN	Regulation on Assessment and Management of Environmental Noise
RSPB	Society for the Protection of Birds
S	South
sec	second
SO_2	Sulphur dioxide
SPCR	Soil Pollution Control Regulation
SWCR	Solid Waste Control Regulation
SWPP	Sares Wind Power Plant
TOC	Total Organic Carbon
TUIK	Turkish Statistical Institute
USEPA	U.S. Environmental Protection Agency
UTM	Universal Transverse Mercator
VOC	Volatile organic carbon
VU	Vulnerable
W	West
WHO	World Health Organization
WOCR	Waste Oil Control Regulation
WPCR	Water Pollution Control Regulation
WPP	Wind Power Plant
WWF	World Wildlife Fund

EXECUTIVE SUMMARY

GARET Enerji Üretim ve Ticaret A.Ş (GARET) proposes to install Sares Wind Power Project (SWPP) with 22.5 MW installed capacity in Çanakkale Province of Turkey. The SWPP will have 9 turbines, each having an output of 2.5 MW. Power will be connected via a 9 km transmission line to the 154 kV Ezine Transformer Station. GARET obtained the "Electric Power Generation License" from the Energy Market Regulatory Authority (EMRA) for the proposed project site. A 49-Year License (License No. EU/1632/5/1193, dated June 5, 2008) is granted for the proposed Project by the opinion of EMRA under the provisions of Law No. 4628 governing the electricity market in the Republic of Turkey. The purpose of this proposed Project is to utilize wind energy potential in Turkey and to compensate energy requirement through a sustainable, environmentally and cost effective way.

The proposed Sares WPP will be located between Kayacık Village and Şapköy Village that are both situated in Ezine District of Çanakkale Province. Çanakkale Province is located to the northwest of Turkey in the Marmara Region. A Project Description Report (PDR) was prepared and submitted to Çanakkale Provincial Directorate of Environment and Forestry (PDoEF). The PDoEF reviewed the PDR for the Project and decided that a detailed EIA report was not required for the Project.

This Environmental and Social Assessment (ESA) report is prepared according to the Equator Principles (EP). The purpose of the ESA is to identify potential environmental and social impacts of the Project on the local environment and community during construction, operation and decommissioning phases. The ESA also aims at providing mitigation measures to eliminate potential adverse impacts and propose a management and monitoring plan. The report is also prepared in accordance with the host country Turkish Legislation and International Finance Corporation (IFC)-World Bank Group Guidelines. The report includes a comprehensive description of Turkish Environmental Legislation and IFC/WB Guidelines relevant with the proposed Project.

AECOM conducted a detailed environmental baseline study in the scope of the ESA study. General climatology, air quality, land use, noise, geology, flora, fauna, naturally protected areas, archeologically protected areas specific to the Project site were assessed in the scope of this study. When general climatology of the region is assessed, it was observed that the average temperature, wind, precipitation and humidity data recorded in the vicinity of the project site is in the range of operation parameters of turbines and the proposed Project site is suitable for turbine operation in terms of general climatology. In terms of air quality, the proposed Project site can be regarded to be located in a non-degraded air-shed. As for land use, all turbines except Turbine 8 and Turbine 9 are located on forest land. Turbine 8 and Turbine 9 are situated on pasture land. The Project area is located on a state-owned land. The Project area is a rural land and it is not used for any purpose of economic income or settlement.

Background noise level monitoring studies were undertaken for two days at the closest noise sensitive receptor. Ambient noise levels were continuously measured for 48 hours and the levels were logged for ten minute sampling interval. Concurrent wind speeds and direction and rainfall data were recorded on a free standing approximately 10 m anemometer mast. Wind speed and direction

data and rainfall data were collected over a similar period and averaged over the same ten minute periods as the noise data to allow analysis of the measured background noise as a function of wind speed. The results of the background noise level measurements are compared with respect to both IFC/World Bank Group Environmental, Health and Safety Guidelines – Wind Energy (April 30, 2007) and Turkish Regulation on Assessment and Management of Environmental Noise (RAMEN). Results demonstrated that the background noise levels are below the limits set by Turkish RAMEN and daytime IFC/World Bank at most of the measurement time.

As for the geology of the Project area, the Biga Peninsula comprises the Edremit Graben, which is one of the largest east-west trending, offshore grabens of the western Anatolia. The northern margin of the graben is bounded by the Kazdağ Mountain. The Kestanbol Granitoid is the main geological unit in southwest of the Ezine Region. The Kestanbol Granitoid, which is located south of Ezine-Çanakkale, is one of the post-collision intrusive units of western Anatolia, which have been related to the collision between Anatolide-Tauride platfortm and Pontides, occurred during the late Cretaceous. Tectonic activity of Biga Peninsula is controlled by North Anatolian Fault System. Ezine Town of Çanakkale Province is under the effects of southwest part of the North Anatolian Fault System. Çanakkale City and the Project area are located in the 1st Degree Seismic Zone according to the earthquake zones determined by the General Directorate of Disaster Affairs.

Flora inventory was prepared by gathering data from site survey, literature studies and referencing floristic studies of the similar ecological characteristics. Site survey was conducted within the scope of the PDR. As a result of this inventory study, 327 species belonging to 52 families are identified in the Project area and its vicinity. No threatened or endangered flora species were identified in the Project area in accordance with the Red Data Book (IUCN) and Bern Convention. Among these species, *Thymus atticus* is classified as VU (vulnerable) and *Colchicum burttii* is classified as LC (Least concern) and endemic according to the Red Data Book of Turkish Plants. Although *Colchicum burttii* is endemic, it is abundant in Western and Central Anatolian according to the official website of Turkish Plants Data Service (TUBIVES).

In order to determine terrestrial fauna species within the Project site and its vicinity data from site survey, literature studies and referencing studies were gathered. Site survey was conducted within the scope of the PDR. As a result of this study, 4 amphibian, 20 reptile and 49 mammal species are identified as most likely to exist in the proposed Project site and its vicinity. All amphibian species that are likely to exist in the Project site and its close vicinity are classified as LC (least concern) according to IUCN Red List. Among these species, *Elaphe quatuorlineata* (Four-lined Rat Snake) and *Vipera xanthina* (Armenian Viper) are the species classified as NT (Near threatened) and *Testudo graeca* (Common Tortoise) is classified as VU (vulnerable) category according to IUCN Red List. However, *Elaphe quatuorlineata* (Four-lined Rat Snake) and *Testudo graeca* (Common Tortoise) are abundant and widely seen in Turkey. According to site survey and literature review 80 bird species have been identified at the Project region. Some of these species prefer to live in terrestrial and some prefers aquatic habitats. The Project site is not located on a major migration route.

In accordance with the national environmental legislation, there are no national parks, nature reserves, natural monuments, wildlife protection areas and wildlife improvement areas within the Project site and its close vicinity.

There are no archeological remains within the Project site. However, there exist several archeological sites in close vicinity to the Project site. The closest archaeologically protected sites to the proposed Project site are Nameless 3rd Degree Archaeologically Protected Site and Neandreia Castle 1st Degree Archaeologically Protected Site which are located approximately 70 m and 750 m, respectively, to the closest turbine.

The ESA report also provides mitigation measures to eliminate potential adverse impacts and propose a management and monitoring plan. The following topics have studied in the ESA report: noise, air emissions, water supply and wastewater, hazardous wastes, non-hazardous wastes, soil and groundwater, biological resources (including bird collision risk and avian mortality), cultural and historical resources, visual impacts, shadow flicker and blade glint, socio-economic impact. It was estimated that the construction period of the Project will take 12 months and the operation period of the Project will take 49 years.

It is calculated that the noise generated during construction will be temporary and will comply with the noise limits stipulated by Turkish Regulation on Assessment and Management of Environmental Noise (RAMEN). The potential noise impact of the wind turbines on sensitive receptors during operation phase is determined by noise modeling. Commercially available WindPro version 2.6 noise propagation model, which is based on ISO 9613-2, is used in this project. ETSU-R-97, The Assessment and Rating of Noise from Wind Farms (1996), noise assessment methodology was used in this study. ETSU methodology allows users to account for the affect of wind speed on noise evaluations. The results were compared with Turkish RAMEN and IFC/World Bank noise guidelines. Noise generated by the turbines complies with both Turkish limits and IFC/World Bank guideline values.

AECOM evaluated the air emissions that will be generated during construction. It was concluded that the proposed Project will not have adverse effects on local air quality during the construction, taking into account the dispersion effect of the wind in the Project area and short duration of the construction. Mitigation measures will be taken to reduce the amount of dust generated and therefore it is not expected that dust generated during construction activities will create any adverse effects on the local air quality. Besides, no air emissions will be generated during operation.

Only domestic wastewater will be generated during construction and operation. During construction a leak-proof septic basin will be built for the disposal of domestic wastewater since the Project area is located in the rural area and there is no municipal sewer system in the vicinity of the Project area. The water required for the construction works and dust suppression will be carried in by tanker trucks. Wastewater will be collected in the septic tank and disposed periodically during operation. Drinking water demand of workers will be supplied via bottled water during construction and operation. The domestic wastewater generated during the construction and operation phase will not create any adverse impact on the local environment and natural resources.

Minor amounts of hazardous wastes and waste oil will be generated during construction period of the Project. The proposed Project will not create any adverse impact in the local environment due to the handling, storage, transport and disposal of the hazardous waste and waste oil generated during the construction. Waste oils resulting from yearly maintenance works will be collected by a qualified personnel working at the oil provider company. These wastes will be removed from the Project site in accordance with the Waste Oil Control Regulation. Any hazardous waste will be collected in leak-proof containers and removed to a licensed disposal facility by licensed transporters. Thus, an adverse impact on the local environment is not expected during construction. Non-hazardous wastes will also be generated during construction and operation periods. Recyclable wastes will be segregated from other wastes and stored temporarily on site for eventual recycling process. Excavated soil will be re-used for the filling of the turbine foundation and site leveling purposes. Non-recyclable and non-hazardous solid wastes will be collected within closed bags and these wastes will be collected and properly disposed. It is expected that no medical waste will be generated at the Project site during the construction and operation phase. Health center located at the nearest town will be used for health care purposes.

The proposed Project is located on a green field and visual inspections of the Project site did not result in any potentially contaminated areas. An adverse impact to soil or groundwater is not expected during the construction and operation phases since proper precautions such as using proper secondary containments while storing chemicals will be taken to prevent potential releases from reaching the environment.

The proposed Project is not expected to create significant impacts on the local biological resources and wildlife in or close proximity to the Project site. Vegetation loss will be limited to the access roads and tower bases and moreover topsoil will be removed and stored on site for future landscaping purposes. There will be an impact on the existing vegetation during site preparation and excavation activities. The most important potential concern of the Project is the risk of collision of birds and bats with the wind turbines. Turbines will be painted and lighting will be installed properly to minimize bird collision risk.

Visual impact of the proposed Project is also assessed. The Project site is not located in a protected area or a tourist/resort area; it is mostly rural and not considered as an aesthetically significant place. Thus, potential visual impact is not considered as significant.

For shadow flicker effect of the Project, a modeling study is performed in order to estimate the shadow casting areas and to create a shadow model for each of the wind turbines. Two shadow receptors, which are closest permanent residences, are selected for the modeling. The modeling results revealed that in realistic case the shadow impact is negligible and it can be stated that the proposed wind farm Project will not cause significant shadow flickering on the closest settlements. In addition, blade glint is not expected to be important since the blades will be made of and painted non reflective materials.

Socio-economic impacts of the Project are assessed for construction, operation and decommissioning phases of the Project. There is not a directly affected community from the Project

as the Project area is located on a state-owned land. The socio-economic impacts of the Project are minor and indirect. Employment opportunity during construction and operation phases might provide positive socio-economic impact to the Project area when a recruitment approach to hire construction workers from region and especially from project-affected communities is applied. Land expropriation is not an issue during construction and operation phases of the Project as the Project area is a state-owned land. There will be no physical or economic resettlement associated with the proposed Project.

Safety risk to local community may arise during construction phase due to increase in traffic and open trench or pit. These impacts will be mitigated by informing public about the traffic flow and restricting access of non-authorized people to project area during construction. During operation phase, safety risk to local community will be mitigated by restricting access of non-authorized people to the Project area.

Occupational and community health and safety issues are also assessed in the scope of the ESA study. Working at heights, air craft safety, blade/ice throw, electromagnetic interference and public access issues are addressed in terms of occupational and community health and safety. All the precautions related with working at heights will be taken throughout the construction and operational phases of the proposed Project in accordance with the Turkish Health and Safety laws and regulations and the IFC/WB Guidelines. With the proper implementation of health and safety plans and taking the necessary precautions given in the regulations, potential accidents associated with working height are expected to be eliminated.

Proposed Project area is located approximately 48 km south-west to the Çanakkale Airport. Within the Project, the edges of the turbine blades will be painted by a reflecting color and lightening system will be installed. The Civil Aviation Law and related international laws will be complied in the scope of the proposed Project for aviation safety. Since, in general the Mediterranean climate is dominant in the region; blade/ice throw will not be a potential risk to threat public safety. There is no aviation radar in the close vicinity of the proposed Project site. The proposed Project is not expected to interfere with the telecommunication systems. The proposed Project will not cause any risk in terms of public access. All the necessary precautions will be taken in order to prevent non-authorized access to project site. There will be security personnel during the operation period. Hence, entrance of non-authorized people to the wind turbine area will be prevented.

The technology and site alternatives are also evaluated in the scope of the ESA study. Due to the environmental benefits and wind being a renewable power source, generation of electricity with wind turbines is selected as the proposed technology. The proposed site was selected due to the wind potential. GARET constructed a meteorological tower/mast at the proposed Project site in order to evaluate wind energy potential of the region. The mast continues recording data at present. The data acquired from the mast revealed that the area has sufficient wind energy potential to construct wind power plant.

An Action Plan, including Environmental Management System, which addresses the impacts, significance of the impacts, mitigation measures, responsible parties, monitoring methods and frequencies and costs, is also prepared for the proposed Project.

The proposed wind power Project will comply with all relevant Turkish environmental as well as the EP, IFC/WB Guidelines during construction and operation phases. As stated above, potential adverse environmental and social impacts associated with the proposed Project are expected to be generally negligible and will be mitigated fully by GARET.

1.0 INTRODUCTION

1.1 Background to the Project

GARET Enerji Üretim ve Ticaret A.Ş (GARET) proposes to install a wind power plant (Project) with 22.5 MW installed capacity in Çanakkale Province of Turkey. GARET has already obtained the "Electric Power Generation License" from the Energy Market Regulatory Authority (EMRA) for the proposed Project. A 49-year license (License No. EU/1632/5/1193, dated June 5, 2008) is granted for the proposed Project by the EMRA under the provisions of Law No. 4628 governing the electricity market in the Republic of Turkey.

According to the Turkish Environmental Impact Assessment (EIA) Regulation, an environmental Project Description Report (PDR) was required for the Project. The PDR was prepared by a local environmental consulting company and submitted to Çanakkale Provincial Directorate of Environment and Forestry (PDoEF). The PDoEF reviewed the PDR for the Project and decided that a detailed EIA report was not required for the Project. This decision was sent to GARET on April 15, 2009.

The proposed Project is being developed in accordance with the national energy strategy of the Republic of Turkey that enhances diversifying resources for electricity generation and encourages use of renewable energy. The need and objectives of the Project are fully discussed in Section 3.0 of the Environmental and Social Assessment (ESA) report.

GARET Enerji Üretim ve Ticaret A.Ş. was founded in March 29, 2006 to develop and invest in wind energy projects. Application has been submitted to the EMRA for eight wind power projects with a total installed capacity of 220.50 MW. GARET is a subsidiary of GAMA Enerji A.Ş (GEAŞ). The shareholders of GEAŞ are GAMA Holding and General Electric Energy Financial Services, each holding 50% stake in the company. GAMA Holding is pursuing activities over a wide geographical area, covering the Middle East, Russia, CIS Countries, South East Asia, North Africa and Ireland for the last 50 years (see, www.gama.com.tr). GE-EFS is a business unit of the General Electric (GE). GEEFS employs 350 professionals to invest in the energy and water sector.

The ESA report for the Project has been prepared by AECOM Turkey. AECOM is a global leader in providing fully integrated engineering, design and program management services for a broad range of markets, including architecture, building engineering, design and planning, economics, energy, environment, government services, program management, transportation and water. With more than 43,000 employees around the world, AECOM serves clients in more than 100 countries (see, www.aecom.com).

1.2 Purpose and Scope of the ESA

The Project owner, GARET, plans to apply international finance institutions for financing of the proposed Project. Therefore, GARET has initiated this ESA to be prepared according to the Equator Principles (EP). The "Equator Principles" is a financial industry benchmark for determining, assessing and managing social and environmental risk in project financing. The Equator Principles are based on

the IFCs Environmental and Social Safeguard Policies. Thus, this report has been also prepared according to IFCs requirements.

The purpose of the ESA is to identify potential environmental and social impacts of the Project to the local ecosystem and community during construction, operation and decommissioning phases of the Project. The ESA also aims at providing mitigation measures to eliminate potential adverse impacts and propose a management and monitoring plan. The ESA evaluates potential impacts in terms of additionally caused by the Project. Thus, an environmental and social baseline data is also assessed within the scope of the ESA. The ESA was carried in the following stages:

- Review of applicable national and international regulations and standards, industry best practice.
- Compilation of a technical description of the project.
- Description of the existing (baseline) environmental conditions within the project area.
- Identification, characterization and quantification of all emissions to air, water and soil during construction, operation and decommissioning phases of the Project.
- Assessment of the environmental impacts of the Project.
- Identification of mitigation measures that minimize or eliminate potential impacts.
- Provision of plans for monitoring programs, auditing and feedback.

The Project is categorized as a "Category B" according to IFC/WB guidelines. The ESA report includes following sections:

1. Executive summary,
2. Policy, legal and administrative framework,
3. Project description,
4. Baseline data,
5. Environmental impact assessment,
6. Analysis of alternatives,
7. Environmental management plan, and
8. Public consultation.

Following issues are addressed in the ESA:

a) Assessment of the baseline social and environmental conditions,

b) Consideration of feasible environmentally and socially preferable alternatives,

c) Requirements under Turkish laws and regulations, applicable international treaties and agreements;

d) Community health and safety,

e) Protection of cultural property and heritage,

f) Protection and conservation of biodiversity, including endangered species and sensitive, ecosystems in modified, natural and critical habitats, and identification of legally protected areas,

g) Sustainable management and use of renewable natural resources,

h) Use and management of dangerous substances,

i) Occupational health and safety,

j) Socio-economic impacts,

k) Cumulative impacts of existing projects, the proposed Project, and anticipated future projects,

l) Consultation and participation of affected parties in the design, review and implementation of the project,

m) Pollution prevention and waste minimization, pollution controls (liquid effluents and air emissions) and solid and chemical waste management.

2.0 LEGAL FRAMEWORK

2.1 Turkish Environmental Legislation

The Environmental Law (No. 2872), which was published in Turkish Official Gazette No. 18132 dated August 11, 1983 and lastly revised in Turkish Official Gazette No. 26167 dated May 13, 2006 (Law No. 5491) provides the legislative framework for the regulation of industries and their potential impact on the environment. Industrial projects are subject to varying levels of review that begin while projects are in the development and pre-operation phases. Additional regulations apply to facilities once they are in operation.

The Environmental Law authorized the promulgation of a number of regulations. Those that pertain to development and operation of wind projects are the following:

- Environmental Impact Assessment Regulation, Official Gazette No. 26939 dated July 17, 2008.
- Regulation on Assessment and Management of Environmental Noise, Official Gazette No. 26809 dated March 07, 2008;
- Water Pollution Control Regulation, Official Gazette No. 25687 dated December 31, 2004 and revised in Official Gazette No. 26786 dated February 13, 2008;
- Regulation on Construction of Cesspits where there is no Wastewater Collection System, Official Gazette No. 13783 dated March 13, 1971;
- Hazardous Chemicals Regulation, Official Gazette No.21634 dated July 11, 1993 and revised in Official Gazette No. 27092 dated December 26, 2008;
- Regulation on General Principles of Waste Management, Official Gazette No. 26927 dated July 5, 2008;
- Hazardous Wastes Control Regulation, Official Gazette No. 25755 dated March 14, 2005 and revised in Official Gazette No. 27339 dated September 04, 2009;
- Waste Oil Control Regulation, Official Gazette No. 26952 dated July 30, 2008 and revised Official Gazette No. 27305 dated July 31, 2009;
- Vegetative Waste Oil Control Regulation, Official Gazette No. 25791 dated April 19, 2005; and revised Official Gazette No. 27305 dated July 31, 2009
- Solid Waste Control Regulation, Official Gazette No. 20814 dated March 14, 1991 and revised in Official Gazette No. 25777 dated April 5, 2005;
- Regulation on Protection of Wetlands, Official Gazette No. 25818 dated May 17, 2005;
- Medical Waste Control Regulation, Official Gazette No. 25883 dated July 22, 2005;
- Regulation for Control of the Tires Which Have Completed Their Life, Official Gazette No. 26327 dated November 25, 2006;

- Packaging Waste Control Regulation, Official Gazette No. 26562 dated June 24, 2007 and revised in Official Gazette No. 27046 dated November 6, 2008;
- Waste Batteries and Accumulators Control Regulation, Official Gazette No. 25569 dated August 31, 2004 and revised in Official Gazette No. 25744 dated March 03, 2005;
- The Excavation, Construction and Demolition Waste Control Regulation, Official Gazette No. 25406 dated March 18, 2004;
- Soil Pollution Control Regulation, Official Gazette No. 25831 dated May 31, 2005;
- Regulation Related to Workplace Opening and Operation Permits, Official Gazette No. 25902 dated August 10, 2005 and revised in Official Gazette No. 26492 dated April 13, 2007;
- Industrial Air Pollution Control Regulation, Official Gazette No.27277 dated July 3, 2009
- Air Quality Assessment and Management Regulation, Official Gazette No. 26898 dated June 6, 2008 and revised in Official Gazette No. 27219 and dated May 5, 2009;
- Air Pollution Control Regulation For Heating Sources, Official Gazette No. 25699 dated January 13, 2005 and revised in Official Gazette No. 27134 dated February 07, 2009; and
- Exhaust Gases Emission Control Regulation, Official Gazette No. 27190 dated April 04, 2009.

In addition to the Environmental Law and its associated regulations, there are several other laws that directly or indirectly include environmental review, and thus, are applicable to the proposed Project. The Project will comply with the 4857 numbered Labor Law and its regulations stated below:

- Occupational Health and Safety Statute, Official Gazette No. 14765 dated April 11, 1974;
- Health and Safety Regulation for Construction Works, Official Gazette No. 25325 dated December 23, 2003;
- Regulation on Health and Safety Regarding Temporary Works, Official Gazette No. 25463 dated May 15, 2004.

Other regulations that the Project will comply with can be listed as follows:

- 5346 numbered Utilization of Renewable Energy Resources for the Purpose of Generating Electrical Energy;
- Regulation on Protection and Usage of Agricultural Lands, Official Gazette No. 25766 dated March 25, 2005;
- 2863 numbered Law on Protection of Cultural and Natural Heritage (revised by 5226 numbered Law);
- 4342 numbered Pasture Law;
- 6831 numbered Forestry Law (amended by 5192 numbered Revision in Forestry Law);

- Regulation on Buildings located on the Disaster Areas, Official Gazette No. 26582 dated July 14, 2007;

The following sections provide brief explanations of the regulations that are relevant to the proposed Sares Wind Power Project (SWPP).

2.1.1 Environmental Impact Assessment

The first Environmental Impact Assessment (EIA) Regulation was published in Official Gazette No. 21489 dated February 7, 1993. The EIA regulation was subsequently revised three times and reissued in Official Gazette on June 23, 1997, June 6, 2002 and December 16, 2003. The final version of EIA Regulation was published on July 17, 2008 in Official Gazette No. 26939. The purpose of the EIA regulation is to define the administrative and technical aspects that must be followed during an environmental impact assessment process.

The scope of the EIA regulation includes the following:

- Determination of the type of projects required to prepare an environmental impact assessment report or a project description report and the issues to be covered in these applications or reports;
- The technical, administrative and legal aspects related to the environmental impact assessment process;
- The work related to the establishment of the Scope Definition, Review and Evaluation Committee; and
- Monitoring and auditing of the projects subject to this regulation, prior to the commissioning phase, during the operational phase and the decommissioning phase.

According to Article 6 of the EIA Regulation, projects should either submit an Environmental Impact Assessment (EIA) Report or Project Description Report (PDR) based on the classification of the projects listed in Annex I and Annex II of the EIA regulation. Annex I and Annex II define the type and projects that are subject to preparing and submitting an EIA Report and PDR, respectively.

The projects that are listed in Annex II should prepare a PDR and apply to the Provincial Environment and Forestry Directorate by submitting a report that includes a project description and information according to the format given in the Annex IV of EIA Regulation. The Directorate reviews the report in 5 days and may ask for detailed information on the project or request analysis or measurements in the project area. The Directorate gives a final decision in as "EIA is not required" or "EIA is required" for the project after the submission of the final Project Description Report.

An "EIA is not required" opinion means that the proposed Project does not need to prepare and submit a detailed EIA report to the MoEF. The project can obtain other resources permits as required by the relevant Turkish regulations. An "EIA is required" opinion means that the EIA procedures

outlined in the EIA regulation should be followed to prepare a detailed EIA report and to obtain an approval for the project from the MoEF.

The wind farm projects are included in Annex II of the EIA Regulation. Thus, a PDR is required for the proposed SWPP. The PDR was prepared by a local environmental consulting company and submitted to Çanakkale Provincial Directorate of Environment and Forestry (PDoEF). The PDoEF has reviewed the PDR for the Project and has decided that a detailed EIA report is not required for the Project. The decision was sent to GARET on April 15, 2009.

2.1.2 Air Quality

The Industrial Air Pollution Control Regulation (IAPCR) was published in the Official Gazette No. 25606 on October 7, 2004 and revised and re-issued in Official Gazette No. 26236 dated July 22, 2006. This regulation was abolished currently by a new Industrial Air Pollution Regulation published in the Official Gazette No. 27277 dated July 3, 2009. Similar to previous regulation, the purpose of the new IAPCR is to control soot, fume, dust, gas, vapor, and aerosols emitted to the atmosphere resulting from the activities of industrial and energy production facilities, to protect and prevent the environment and human beings from atmospheric pollution hazards, to eliminate adverse impacts due to air pollution which cause harm to the general public and to ensure that such impacts do not emerge.

The Air Quality Assessment and Management Regulation (AQAMR) was published in the Official Gazette No. 26898 on June 6, 2008. The regulation amended and re-issued in Official Gazette No. 27219 and dated May 5, 2009. The purpose of the AQAMR is to define and establish objectives for ambient air quality designed to prevent or reduce harmful effects on human health and the environment, to assess the ambient air quality on the basis of common methods and criteria, to maintain air quality where it is good and improve it in other cases and to obtain adequate information on ambient air quality and ensure that the such information on ambient air quality is available to the public.

Air Pollution Control Regulation for Heating Sources (APCRH) was published in the Official Gazette No. 25699 dated January 13, 2005. The regulation amended and re-issued firstly in Official Gazette No. 25758 dated March 17, 2005 and secondly in Official Gazette No.26522 dated May 14, 2007. The Regulation recently amended on February 7, 2009 in Official Gazette No. 27134. The purpose of the APCRH is to reduce and control harmful effects of soot, fume, dust, gas, vapor, and aerosols emitted to the atmosphere resulting from the heating sources used in places such as residences, schools, universities, hospitals, offices, social facilities and industrial facilities. Exhaust Gases Emission Control Regulation (EGECR) was published in the Official Gazette No. 27190 dated April 04, 2009 and supersedes the Regulation on Control of Exhaust Emissions of Motorized Vehicles published in the Official Gazette No. 25869 dated August 7, 2005. The purpose of the EGECR is to determine the necessary methods and principles regarding reduction of the exhaust gas pollutants and control of the pollutants via measurements to protect the living organisms and environment from the air pollution and its effects of exhaust emission caused by the motorized vehicles in traffic. This regulation does not cover the construction vehicles.

The proposed Sares Wind Power Project (SWPP) will generate fugitive dust emission due to excavation works, exhaust emissions due to heavy construction vehicles and heating sources emission, in case the construction worker camping area is established at the Project site, during the construction phase. The proposed SWPP will not have any point or fugitive emission and heating source emissions during operation other than an emergency diesel generator.

Emission Limits

The IAPCR defines emission limits according to the industrial activity and the type of combustion unit and the fuel used. The regulation sets emission limits for the following pollutants: sulfur dioxide (SO_2), nitrogen oxides (NO and NO_2), particulate matter (PM), carbon monoxide (CO), formaldehyde and hydrogen sulfur (H_2S). In addition, the IAPCR also provides emission limits for hazardous (non-carcinogenic) and carcinogenic organic gas and vapor emissions. The IAPCR categorizes hazardous and carcinogenic organic compounds into three groups.

The proposed SWPP will not generate any emission due to its operation. As indicated above, air emissions are generated only during the construction phase. In accordance with the IAPCR, monthly average settled dust amount generated due to loading, unloading, sieving, transporting, crushing and milling activities of particulates should not exceed 450 mg/m^2.day. There is no limit value defined for the exhaust emissions of heavy construction vehicles in the Turkish Environmental Legislation.

Ambient Air Quality

Air Quality Assessment and Management Regulation defines ambient air quality limits for two regulatory periods. The first period is transitional period which is until December 31, 2013. The transitional period ambient air quality standards are given in Annex-IA of AQAMR. Limit values for ambient air quality standards after transitional period are given in Annex I of AQAMR.

Wind power generation is a non-combustion process that relies on the direct conversion of mechanical energy into electrical energy and no air emission will be generated due to operation of the plant and thus the Project will not have any impact on the local ambient air quality. The emission generated in the construction phase will be temporary and will have minor effect on the local ambient air quality.

2.1.3 Wastewater

Water Pollution Control Regulation (WPCR) was published in Official Gazette No. 25687, dated December 31, 2004 and revised and re-issued in Official Gazette No. 26786 dated February 13, 2008. The aim of the WPCR is to determine the necessary legal and technical principles in order to protect surface and groundwater resources, provide sustainable water use and prevent water pollution in harmony with sustainable development objectives.

The WPCR covers water quality classes and utilization purposes, planning principles and prohibitions concerning protection of water quality, wastewater discharge principles and discharge permits, applications in wastewater infrastructure facilities and monitoring and auditing principles in order to prevent water pollution. Industries are categorized according to their sectors in the WPCR. The

WPCR presents "sector-specific" discharge limits for numerous types of wastewater discharges. The WPCR also sets the discharge limits for domestic wastewaters according to pollution load.

For facilities, located in an area where sewer collection system in not available and having a population less than 84 employees, the WPCR allows the construction of an impervious septic tank or basin for disposal of domestic wastewaters. Wastewater in the septic tank should be pumped out with a vacuum truck and wastewater should be transported to a wastewater treatment plant. In addition, the wastewater generators collecting their domestic wastewaters in an impervious cesspit and discharging to wastewater infrastructure system through transporting by vacuum trucks should keep the protocol with Wastewater Administration and the receipts of disposal of wastewater by vacuum truck for five years and declare them to the officials during audits.

The proposed SWPP will not generate industrial wastewater. Only domestic wastewater will be produced during the construction and operation phases. Since domestic wastewater will not be directly discharged to the receiving environment, the wastewater discharge standards for the domestic wastewater given in the WPCR are not applicable for the proposed Project.

2.1.4 Soil Pollution

The Soil Pollution Control Regulation (SPCR) was published in Official Gazette No. 24609, dated December 10, 2001 and re-issued in Official Gazette No. 25831 dated May 31, 2005. The purpose of the SPCR is to prevent soil pollution and to undertake required measures to clean up soil contamination.

In accordance with the SPCR, it is obligatory to prevent pollution, stop pollution in the polluted areas and determine the extent of pollution and carry out. The facility is liable to assure that any type of waste and residue are not discharged, stored directly or indirectly to the receiving environment incompliant with the standards and procedures stated in the Environmental Law and the relevant Regulations in a way that they do not harm soil and cause soil pollution. According to the SPCR, it is the responsibility of the facility owner to remediate (i.e., clean-up) contaminated soil. In addition, after remediation parameters listed in the regulation should be analyzed and the samples should comply with the limit values for these parameters.

The proposed Project must comply with the SPCR during the construction and operation phases.

2.1.5 Noise

Regulation on Assessment and Management of Environmental Noise (RAMEN) published in Official Gazette No. 26809 dated March 7, 2008. The purpose of the RAMEN is to take necessary precautions in order to prevent the disturbance of the comfort and tranquility of public and ensure physical and mental health of human beings due to exposure to environmental noise.

The RAMEN covers principles and criteria regarding environmental noise to which humans are exposed in particular in built-up areas, in public parks or other quiet areas in an agglomeration, in

quiet areas in open country, near schools, hospitals and other noise sensitive buildings and areas and environmental vibration causing damages to the buildings.

The RAMEN lists the facilities that should secure noise control permit. The wind farm projects are not included in this list. Thus, the proposed Project is not obliged to secure a noise control permit. However, the Project must prepare environmental noise assessment reports during "workplace opening and operation permitting" phase and/or during programmed, not programmed or complaint basis audits if the competent authority requests.

The SWPP site is located in the rural area. The nearest settlements to the Project site are Şapköy, Kayacık, Kızıltepe and Yaylacık Villages. According to the RAMEN, the noise level criteria (for night, day and evening periods) for the industrial facilities are categorized into four groups according to sensitivity of the area (Table 2-1). The Project is subject to limits given in the category which is referred to as "noise sensitive areas such as place of education, cultural activities, health center and summer resorts and camping sites". Noise levels due to industrial sources for the areas included in this category should not exceed the daytime (07.00–19.00) limit of 60 dBA, the evening time (19.00-23.00) limit of 55 dBA and the night time (23.00-07.00) limit of 50 dBA at the closest sensitive receptor. Thus, the proposed Project should not exceed these limits during operation.

Table 2-1 Turkish Noise Level Limits

Areas	L_{day} (dBA)	$L_{evening}$ (dBA)	L_{night} (dBA)
Noise sensitive areas such as place of education, cultural activities, health center and summer resorts and camping sites	60	55	50
Areas with both noise sensitive areas and industrial activities (predominantly residential)	65	60	55
Areas with both noise sensitive areas and industrial activities (predominantly industrial)	68	63	58
For each facilities that are in organized industrial zone or industrial region	70	65	60

The RAMEN also sets the noise level limits for construction sites. The limits are given in Table 2-2. The proposed Project should comply with these limits during construction phase.

Table 2-2 Noise Limits for Construction Sites

Type of Activity (construction, demolition, restoration)	L_{day} (dBA)
Building	70
Road	75
Other Resources	70

Various equipment and machinery will be used during the construction phase of the Project. Thus, the Project should also comply with the limits stated in the Regulation on Noise Emission by Outdoor Equipment which was published in the Official Gazette No. 26392 dated December 30, 2006.

In accordance with Regulation on Management and Assessment of Environmental Noise, information related to starting and finishing dates and working durations of the construction and the permits obtained from municipalities should be displayed on a signboard that can easily be seen by everyone.

2.1.6 Waste

Regulation on General Principles of Waste Management was published in Official Gazette No 26927 dated on June 5, 2008. The purpose of the regulation is to provide waste management without causing harm to the environment and human health.

It is indicated in Article 5 of the Regulation that waste generators are obliged to decrease the amount of waste and its hazardous properties, utilize methods for separation, collection, transportation, recycling and disposal operations that will not cause a risk for water, air, soil, flora and fauna. In addition, according to Article 11 of the Regulation, the waste generating facilities should record the waste quantity, source, type and the corresponding waste code given in the annex part of this regulation, disposal facility the waste was sent and applied processes and keep the records for at least five years; submit them to the Ministry on periods determined by Ministry; and make them accessible for the inspection of Ministry.

The regulation also includes the list of hazardous and non-hazardous wastes and their waste codes, their way of recycling and disposal methods and properties of hazardous wastes. The proposed Project must comply with the Regulation on General Principles of Waste Management.

2.1.6.1 Solid Waste

Solid Waste Control Regulation (SWCR) was published in Official Gazette No. 20814 dated March 14, 1991 and amended in Official Gazette No. 25777 dated April 5, 2005. The aim of the SWCR is to prohibit the disposal of any kinds of wastes and residues to receiving bodies directly or indirectly in a manner harmful for the environment. In addition, the storage, transportation and removal of the waste should be conducted such that damages of pollutants which make permanent effects in air, water, earth and on animals, plants, natural resources and ecological balance should be prevented.

In accordance with Article 4 of the SWCR, facilities generating solid wastes are liable to choose the technology generating the least quantity of solid waste, to reduce the amount of solid waste quantity of the existing production, to eliminate harmful materials from the solid wastes and participate in and contribute to the efforts of recycling of materials.

According to Article 8 of SWCR, domestic solid wastes and the used batteries, used accumulators, medical wastes, used vehicle tires, packaging wastes and recyclables wastes should be disposed of separately. In addition, it is also indicated that disposal of solid wastes by waste generating or transporting parties to seas, lakes and similar receiving environments, streets, forests and other places where environment would be adversely affected is prohibited.

According to the SWCR, facilities generating domestic wastes and industrial sources with domestic wastes are required to collect their solid wastes in the facilities where they are produced, as required by the municipalities. Within the municipality boundaries, the municipality is responsible for providing collection services and the disposal of domestic waste from industrial sources. However, industrial facilities out of municipal borders are responsible for transportation of their wastes. The generators are obliged to keep the garbage containers closed in such manner not to cause any harm to the environment and to make them ready on the street at the time of collection of garbage.

Excavation, Construction and Demolition Wastes

The Excavation, Construction and Demolition Waste Control Regulation was published in Official Gazette No. 25406 dated March 18, 2004. The aim of this regulation is to set the principles and procedures firstly to minimize the excavation, construction and demolition wastes at the source of generation and to collect, temporarily store, transfer, recycle, reuse and dispose them in a manner not to cause harm to the environment.

In accordance with Article 9 of the regulation, excavation, construction and demolition generating facilities are obliged to provide the waste management in a way that will minimize the adverse effects of wastes on the environment and human health. The facilities must acquire the necessary permissions that concern the generation, transportation and storage operations of the wastes. The facilities are not allowed to dump construction wastes to the sites/locations and facilities other than the permitted ones by the municipal or other authorities.

The regulation also stipulates that the project owner is responsible for having precautions in order to minimize noise or visual impacts and dust emissions during removal of excavation soil and for closing the sides of the operation area. In addition, planning should be done in a way that the amount of excavation soil is equalized to the filling volume and excavation soils are utilized within the operation area. In addition, in accordance with the regulation, top soil should be collected separately from subsoil during excavation. The slope of the area where top soil will be stored could not be more than 5 percent. Any loss during storage of topsoil should be prevented and quality of the soil should be preserved. In case, topsoil will be left open for a long time, surface of the topsoil should be covered with fast growing plant.

Packaging Wastes

The Packaging Material and Packaging Waste Control Regulation (PWCR) was published in the Official Gazette No. 26562 dated June 24, 2007. The aim of the PWCR is to provide production of packages with certain environmental criteria, requirements and characteristics; to prevent direct and indirect release of package wastes causing environmental damage; to prevent formation of package wastes; and to reduce the amount of those, which cannot be prevented, by means of reuse, recycling and recovery methods.

Article 26 of PWCR states that the package wastes should be collected and stored separately from the other wastes at source in order to ensure their disposal without causing any environmental damage; to reduce environmental pollution; to benefit from the landfills at maximum levels; and to

contribute to the economy. Packaging waste generating parties located in the boundaries of districts which conduct separate collection at source is obliged to deliver the packaging wastes to the responsible municipalities or their contracted and licensed collection/separation entities.

The Project must comply with the Solid Waste Control Regulation, the Excavation, Construction and Demolition Waste Control Regulation and the Packaging Material and Packaging Waste Control Regulation during the construction and operation phases.

2.1.6.2 Hazardous Waste

The Hazardous Wastes Control Regulation (HWCR) was published in Official Gazette No. 25755 dated March 14, 2005 and revised in Official Gazette No. 27092 dated December 26, 2008. The purpose of the HWCR is to prevent direct and indirect disposal of hazardous wastes in a manner that can adversely affect human health and the environment; control the production of and transportation of hazardous wastes; minimize production of hazardous wastes at the source and specify that disposal of hazardous wastes be at the closest appropriate location to the site of generation. The regulation aims to determine the principles and procedures in order to provide the management of hazardous wastes in conformity with the environment from the generation phase until the final disposal phase.

According to Article 9 of HWCR, the hazardous waste producers are obliged to take the required precautions in order to minimize hazardous waste generation; to provide waste management in a way that minimizes the adverse affects of wastes on human health and environment; to prepare 3-year waste management plan within six months from the issue date of this Regulation and obtain approval from the Governorate; to record the hazardous wastes generated, prepare Waste Declaration Form in Annex 8 in January of each year for the last year's information and submit to the Ministry within two months; to provide proper packaging and labeling; and to dispose and transfer the hazardous wastes in conformity with the principles stated in the regulation.

According to HWCR, facilities are required to secure a permit from local Governorate in case of temporary onsite storage of their wastes. However, facilities producing less than 1,000 kg/month of hazardous wastes may store these waste temporarily onsite for up to 180 days without obtaining a permit from the local Governorate. In this situation, the total amount of the collected waste must not exceed 6,000 kg at any time.

In case of temporary onsite storage of hazardous wastes, the hazardous wastes should be stored in containers that are non-damaged, leak-proof, safe and appropriate for the international standards, on concrete place within the land of the facility, away from the plants and buildings. "Hazardous waste" label should be placed on the containers and this label should also indicate the amount of stored waste as well as the storage time of the hazardous waste. In case the containers are damaged, wastes should be transferred to the other containers with the same properties. Containers should be kept closed and wastes should be stored in a way that they will not go in chemical reactions.

Transportation of the wastes should be done by the licensed persons and entities with appropriate vehicles for the properties of the transported waste. The vehicles that are used to transport

hazardous wastes should carry a waste transport form as specified in the regulation. The HWCR also contains a list of hazardous materials, their properties and their way of disposal.

Battery and Accumulator Wastes

The Waste Batteries and Accumulators Control Regulation was published in Official Gazette No. 25569 dated August 31, 2004 and amended in Official Gazette No. 25744 dated March 03, 2005. The purpose of this Regulation is to arrange legal and technical principles to determine principles, policies and programs for used batteries and accumulators from their production to their final disposal; to ensure production of batteries and/or accumulators with certain criteria and basic conditions and characteristics in terms of the environment; to prevent the discharge to the receiving environment directly or indirectly damaging human health and the environment; to ensure technical and administrative standards necessary in their management; to establish a collecting system for the recovery and final disposal of used batteries and accumulators and compose a management plan.

According to Article 13 of the Waste Batteries and Accumulators Control Regulation the battery and accumulator consumers are obliged to collect used batteries separately from household wastes, and deliver used batteries to the collection points to be established by enterprises engaged in the distribution and sales of battery products, or by municipalities; to deliver the old accumulator when replacing their vehicles' accumulators to the temporary storage places established by the enterprises engaged in the distribution and sale of accumulator products and enterprises operating vehicle maintenance/repair sites free of charge; and pay a deposit if a new accumulator is to be purchased when delivering the old one and not to keep accumulators of benches, facilities, forklift, tractors and other motor vehicles, power supplies and transformers used in the production processes of consumer industrial facilities after the accumulators become a waste longer than 90 days on impervious ground within the factory site until they are delivered to the producer. The Article 15 of the Regulation stipulates that the transportation of waste accumulators from the point of collection to the temporary storage or to the disposal facility by the highway should be carried out using an appropriate vehicle according to the type of waste by real and legal entities who have obtained a transportation license from the Governorate.

Some minor amount of hazardous waste will be generated during construction and operation of the proposed SWPP. The Project must comply with the requirements of the Hazardous Wastes Control Regulation and the Waste Batteries and Accumulators Control Regulation during construction and operation phases.

2.1.6.3 Waste Oil

Waste Oil Control Regulation (WOCR) was published in the Official Gazette No. 26952 dated June 30, 2008. The purpose of the WOCR is to prevent direct and indirect disposal of waste oils to receiving environment; to ensure temporary storage, transportation and disposal thereof without causing harm to environment and human health; to set up necessary technical and administrative standards in management of waste oils; to determine the required principles and programs in order to establish temporarily storage, handling and disposal facilities and manage these facilities in an environmental friendly manner.

According to Article 9 of WOCR, waste oil producers are obliged to take required measures to minimize the generation of waste oils including waste motor oils and residues resulting from processing of waste oils. Waste oil producers must conduct waste oils analyses once at licensed laboratories in case there is no change in the oil type used, and declare to the Ministry of Environment. The waste oils of different category should not be mixed with each other, PCB and other hazardous wastes. Waste oils contaminated with hazardous wastes should be disposed in accordance with the Hazardous Waste Control Regulation. Waste oils should be transported by licensed transporters to the licensed processing and disposal facilities. The National Transportation Form in the case of transporting the waste oil out of the facility and waste oil declaration form annually must be prepared and submitted to the competent authority before the end of February. All records including waste oil declaration forms, analyses report and national waste transportation form should be kept for at least five years.

Waste oil should be collected in tanks/containers placed on an impermeable ground whose thickness is at least 25 cm and covered by epoxy, geomembrane and similar insulation materials and waste accumulation areas should be protected from the rain. Furthermore it is required to store waste oils in red colored tanks/ containers with a label of "Atık Yağ" ("Waste Oil") on it. Waste oils of different categories should not be mixed with each other. Any foreign substance like water, gasoline, fuel-oil, dye, detergent, solvent, antifreeze and diesel oil should not be mixed with the oil in these tanks/containers.

The Project must comply with the requirements stated in the Waste Oil Control Regulation.

2.1.6.4 Medical Wastes

The Medical Waste Control Regulation (MWCR) was published in Official Gazette No. 25883 dated July 22, 2005. The purpose of the MWCR is to establish principles, policies, and programs along with legal, administrative, and technical fundamentals to prevent direct or indirect discharge of medical waste into receiving environment in any way that could harm the environment or human heath. The Regulation also requires that medical waste must be collected separately at source and be transported, temporarily stored and disposed of without causing harm to environment or human health.

The Project must comply with the Medical Waste Control Regulation during the construction and operation phase of the project.

2.1.7 Hazardous Chemicals

The Hazardous Chemicals Regulation (HCR) was published in Official Gazette No. 21634, dated July 11, 1993 and amended in Official Gazette No. 26450 dated March 02, 2007. The purpose of the HCR is to set forth the principles and procedures in order to control hazardous chemicals so that they will not cause harm to the environment and human health.

According to HCR, hazardous materials and products cannot be dumped in the environment in the form of piles without packaging and storage. The facilities which store hazardous chemicals should

comply with the principles stated in the regulation. Necessary precautions, such as thermal isolation, ventilation, lightning protection, alarm and fire extinguishing systems, should be provided areas where hazardous chemicals are stored. Proper labels showing the possible hazards from the handling and usage of the hazardous chemicals and the required precautions should be placed at the storage areas.

Material Safety Data Sheets (MSDS) for the hazardous chemicals should be maintained and stored onsite. MSDS's should contain information about the characteristics and properties of the hazardous chemicals, possible hazards and the necessary precautions, which should be taken at the facility.

There will be a minor amount of hazardous material stored and used during construction and operation of the proposed Project. The Project must comply with the requirements of the Hazardous Chemicals Regulation.

2.2 International Conventions Adopted by Turkey

Turkey signed the many international conventions and agreements to protect its environment and biodiversity. Potential related international conventions with wind energy plants are the following:

- Convention on Biological Diversity, approved by 4177 numbered Law dated August 29, 1996 and published in the Official gazette No. 22860 and dated December 27, 1996, Ratified 1997;
- Convention on the International Trade in Endangered Species of Wild Flora and Fauna (CITES), published in the Official Gazette No.22672 and dated June 20, 1996, Ratified 1996;
- Convention On The Conservation Of European Wildlife And Natural Habitats (Bern), published in the Official Gazette No. 18318 and dated February 20, 1984, Ratified 1984;
- Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar), published in the Official Gazette No. 21937 and dated May 17, 1994, Ratified 1994;
- International Convention For the Protection of Birds, published in the Official Gazette No. 12480 and dated December 17, 1966, Ratified 1967; and
- Convention Concerning the Protection of the World Cultural and Natural Heritage, published in the Official Gazette No. 17959 and dated February 14, 1983.

The Project will comply with the relevant provisions of conventions mentioned above.

2.3 Equator Principles

The Project is assessed in accordance with the Equator Principles. The "Equator Principles" is a financial industry benchmark for determining, assessing and managing social and environmental risk in project financing. The Principles apply to all new project financings globally with total project capital costs of US$10 million or more, and across all industry sectors.

The Equator Principles (2006) that are adopted by the Equator Principles Financial Institutions (EPFIs) are listed below:

- **Principle 1: Review and Categorisation**

The project is categorised based on the magnitude of its potential impacts and risks in accordance with the environmental and social screening criteria of the International Finance Corporation (IFC).

- **Principle 2: Social and Environmental Assessment**

A Social and Environmental Assessment is prepared to address the relevant social and environmental impacts and risks of the proposed. The Assessment should also propose mitigation and management measures relevant and appropriate to the nature and scale of the proposed project.

- **Principle 3: Applicable Social and Environmental Standards**

The Social and Environmental Assessment refers to the applicable IFC Performance Standards and the applicable IFC Industry Specific EHS Guidelines.

- **Principle 4: Action Plan and Management System**

The Action Plan describes and prioritises the actions needed to implement mitigation measures, corrective actions and monitoring measures necessary to manage the impacts and risks identified in the Social and Environmental Assessment. Borrowers establish a Social and Environmental Management System that addresses the management of these impacts, risks, and corrective actions required to comply with applicable host country social and environmental laws and regulations, and requirements of the applicable IFC Performance Standards and EHS Guidelines, as defined in the Action Plan.

- **Principle 5: Consultation and Disclosure**

Project affected communities are consulted with in a structured and culturally appropriate manner. For projects with significant adverse impacts on affected communities, the process ensures their free, prior and informed consultation.

- **Principle 6: Grievance Mechanism**

Grievance mechanism allows the borrower to receive and facilitate resolution of concerns and grievances about the project's social and environmental performance raised by individuals or groups from among project-affected communities.

- **Principle 7: Independent Review**

For all Category A projects and, as appropriate, for Category B projects, an independent social or environmental expert not directly associated with the borrower reviews the Assessment, Action Plan and consultation process documentation in order to assist EPFI's due diligence, and assess Equator Principles compliance.

- **Principle 8: Covenants**

For Category A and B projects, the borrower covenants in financing documentation; a) to comply with all relevant host country social and environmental laws, regulations and permits in all material respects, b) to comply with the Action Plan during the construction and operation of the project in all material respects, c) to provide periodic reports in a format agreed with EPFIs,

d) to decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan.

- **Principle 9: Independent Monitoring and Reporting**

For all Category A projects, and as appropriate, for Category B projects, in order to ensure ongoing monitoring and reporting over the life of the loan, EPFIs require appointment of an independent environmental and/or social expert, or require that the borrower retain qualified and experienced external experts to verify its monitoring information which would be shared with EPFIs.

- Principle 10: EPFI Reporting

Each EPFI adopting the Equator Principles commits to report publicly at least annually about its Equator Principles implementation processes and experience, taking into account appropriate confidentiality considerations

The Equator Principles are based on the IFCs Environmental and Social Safeguard Policies. Thus, the IFC/World Bank environmental, health and safety guidelines are described in the following section.

2.4 World Bank/IFC Environmental, Health, and Safety Guidelines

The Project is assessed in accordance with the IFC guidelines, performance standards and their related guidance notes, and manuals related to environmental, social, health and safety issues. The documents guided the ESA study are listed in the following sections.

Guidelines:

- IFC Environmental, Health, and Safety General Guidelines (2007); and
- IFC Environmental, Health, and Safety Guidelines for Wind Energy (2007)

The IFC EHS Guidelines for wind energy defines the environmental issues specific to the operation of wind energy projects and facilities as visual impacts, noise, species mortality or injury and disturbance, light and illumination issues, habitat alteration and water quality. The Guidelines state that wind energy facilities do not normally generate process emissions and effluents during their operation and it also emphasizes that guideline values for process emissions and effluents in this sector are indicative of good international industry practice as reflected in relevant standards of countries with recognized regulatory frameworks. Air emissions, wastewater discharges, and solid wastes related to construction and decommissioning activities are evaluated in accordance with the EHS General Guidelines.

The Guidelines also addresses the occupational and community health and safety hazards during the construction, operation, and decommissioning of wind energy conversion projects which are generally similar to those of most large industrial facilities and infrastructure projects. The occupational health and safety hazards may include physical hazards such as working at heights, working in confined

spaces, working with rotating machinery and falling objects. According to the guidelines occupational health and safety hazard specific to onshore wind energy facilities is working at heights. Whereas the major community health and safety hazards are aircraft safety, blade and ice throw, electromagnetic interference and radiation and public access.

Performance Standards:

- IFC Performance Standards on Social and Environmental Sustainability (2006),
    - Performance Standard 1 - Social and Environmental Assessment and Management Systems
    - Performance Standard 2 - Labor and Working Conditions
    - Performance Standard 3 - Pollution Prevention and Abatement
    - Performance Standard 4 - Community Health, Safety and Security
    - Performance Standard 5 - Land Acquisition and Involuntary Resettlement
    - Performance Standard 6 - Biodiversity Conservation and Sustainable Natural Resources Management
    - Performance Standard 7 - Indigenous People
    - Performance Standard 8 - Cultural Heritage
- IFC Guidance Notes: Performance Standards on Social and Environmental Sustainability (2007).

IFC's Performance Standards and related guidance notes are followed in the ESA. The overall content of the ESA is formulated in accordance with the Guidance Note on Performance Standard 1. Guidance notes for Performance Standard 2 to 8 are addressed when applicable. Performance Standard 7 is not applicable to the Project.

Good Practice Manuals:

- A Good Practice Manual: Doing Better Business through Effective Public Consultation and Disclosure,
- A Good Practice Note: Addressing the Social Dimensions of Private Sector Projects (2003),
- Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets (2007).

These manuals are used to prepare public consultation and social assessment sections of the ESA.

Operational Manuals:

- Operational Manual OP 4.01 – Environmental Assessment (1999).

The Operational Manual and Annex A, Annex B and Annex C of the Manual are followed in the ESA.

In general, content of the ESA was in accordance with the "IFC Environmental, Health, and Safety Guidelines for Wind Energy" (IFC, 2007a). "IFC Environmental, Health, and Safety General Guidelines" (IFC, 2007b) are also followed in the ESA. Following sections provide a brief explanation of the IFC's General EHS Guidelines.

2.4.1 Noise

Wind turbines produce noise when operating. The noise is generated primarily from mechanical and aerodynamic sources. The Noise Guidelines addresses the impacts of noise beyond the property boundary of the facilities. According to the Guidelines, noise impacts should not exceed the levels presented in Table 2-3 below, or result in a maximum increase in background levels of 3 dBA at the nearest receptor location off-site.

Table 2-3 Noise Limits

Receptor	One Hour L_{Aeq} (dBA)	
	Day Time (07:00-22:00)	Night Time (22:00-07:00)
Residential; Institutional; Educational	55	45
Industrial, Commercial	70	70

Measures to prevent and control noise are mainly related to engineering design standards. For example, broadband noise is generated by air turbulence behind the blades and increases with increasing blade rotational speed. This noise may be controlled through the use of variable speed turbines or pitched blades to lower the rotational speed.

Additional recommended noise management measures by IFC include:

- Proper siting of wind farms to avoid locations in close proximity to sensitive noise receptors (e.g. residences, hospitals, and schools);
- Adherence to national or international acoustic design standards for wind turbines (e.g. International Energy Agency, International Electrotechnical Commission [IEC], and the American National Standards Institute).

2.4.2 Air Emissions and Ambient Air Quality

The proposed facility should avoid, minimize, and control adverse impacts to human health, safety and the environment from emissions to air. If this is not possible the generation and release of emissions should be managed through a combination of energy use efficiency, process modification, selection of fuels or other materials that may result in less polluting emissions, application of emission control techniques.

According to the General EHS Guidelines, projects with significant sources of air emissions and potential for significant impacts to ambient air quality should prevent or minimize these impacts. In this respect, the emissions of the projects should not result in pollution concentrations that reach or exceed relevant ambient air quality guidelines and standards by applying national legislated standards or in their absence, the current WHO Air Quality Guidelines or other internationally recognized sources. In addition, the emissions should not contribute a significant portion to the

attainment of relevant ambient air quality guidelines and standards. The air pollutant limit levels presented in WHO Ambient Air Quality Guidelines are given in Table 2-4 below.

Table 2-4 WHO Ambient Air Quality Guidelines Air Pollutant Limit Levels

Pollutant	Averaging Period	Guideline Value (µg/m³)
Sulfur dioxide (SO_2)	24-hour	125 (Interim target-1)
		50 (Interim target-2)
		20 (guideline)
	10 minute	500 (guideline)
Nitrogen dioxide (NO_2)	1 year	40 (guideline)
	1 hour	200 (guideline)
Particulate Matter PM_{10}	1 year	70 (Interim target-1)
		50 (Interim target-2)
		30 (Interim target-3)
		20 (guideline)
	24 hour	150 (Interim target-1)
		100 (Interim target-2)
		75 (Interim target-3)
		50 (guideline)
Particulate Matter $PM_{2.5}$	1-year	35 (Interim target-1)
		25 (Interim target-2)
		15 (Interim target-3)
		10(guideline)
	24 hour	75 (Interim target-1)
		50 (Interim target-2)
		37.5 (Interim target-3)
		25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1)
		100 (guideline)

Wind farm projects are superior amongst other energy production plants in terms of release of emissions. The proposed Project is not expected to have a significant effect on air quality and any degradation in the existing ambient air quality and airshed.

2.4.3 Wastewater and Ambient Water Quality

The IFC Wastewater and Ambient Water Quality Guidelines are applicable to projects that have either direct or indirect discharge of process wastewater or wastewater from utility operations to the environment and industrial discharges to sanitary sewers that discharge to the environment without any treatment. The guideline provides information on common techniques for wastewater management, water conservation, and reuse that can be applied to a wide range of industry sectors. According to the guidelines the projects with the potential to generate process wastewater, sanitary (domestic) sewage, or storm water should incorporate the necessary precautions to avoid, minimize, and control adverse impacts to human health, safety, or the environment.

In accordance with the guidelines, the septic systems should be properly designed and installed in accordance with local regulations and guidance to prevent any hazard to public health or contamination of land, surface or groundwater, well maintained to allow effective operation, installed in areas with sufficient soil percolation for the design wastewater loading rate, installed in areas of stable soils that are nearly level, well drained, and permeable, with enough separation between the drain field and the groundwater table or other receiving waters.

The guidelines also state that if sewage from the industrial facility is to be discharged to a septic system, treatment to meet applicable national or local standards for sanitary wastewater discharges is required. The wastewater from the septic tank will be transported to a treatment plant where it will be treated to meet the standards in accordance with the guidelines.

2.4.4 Hazardous Materials

The Hazardous Material Management guidelines apply to projects that use, store, or handle any quantity of hazardous materials, defined as materials that represent a risk to human health, property, or the environment due to their physical or chemical characteristics. Hazardous materials can be classified according to the hazard as explosives; compressed gases, including toxic or flammable gases; flammable liquids; flammable solids; oxidizing substances; toxic materials; radioactive material; and corrosive substances.

According to the guidelines the overall objective of hazardous materials management is to avoid or, when avoidance is not feasible, minimize uncontrolled releases of hazardous materials or accidents (including explosion and fire) during their production, handling, storage and use. Projects which manufacture, handle, use, or store hazardous materials should establish management programs that are commensurate with the potential risks present. The main objectives of projects involving hazardous materials should be the protection of the workforce and the prevention and control of releases and accidents. These objectives should be addressed by integrating prevention and control measures, management actions, and procedures into day-to-day business activities.

The guidelines also address preventive measures for hazardous materials transfer. It states that uncontrolled releases of hazardous materials may result from small cumulative events, or from more significant equipment failure associated with events such as manual or mechanical transfer between storage systems or process equipment. It is recommended to use dedicated fittings, pipes, and hoses

specific to materials in tanks and maintaining procedures to prevent addition of hazardous materials to incorrect tanks, to use of transfer equipment that is compatible and suitable for the characteristics of the materials transferred and designed to ensure safe transfer, to regular inspect, maintain and repair of fittings, pipes and hoses, to use secondary containment, drip trays or other overflow and drip containment measures for hazardous materials containers at connection points or other possible overflow points.

There will be a minor amount of hazardous material stored and used during construction and operation of the proposed Project. The Project will comply with the requirements of the Hazardous Materials Management Guidelines.

2.4.5 Waste Management

Waste Management Guidelines apply to projects that generate, store, or handle any quantity of waste across a range of industry sectors. It emphasizes that the facilities should establish a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal of wastes, avoid or minimize the generation waste materials as far as practicable, recover or reuse waste where waste generation cannot be avoided, treat, destroy and dispose wastes in an environmentally sound manner where waste can not be recovered or reused.

The guidelines stipulate that the facilities that generate waste should characterize their waste according to composition, source, types of wastes produced, generation rates, or according to local regulatory requirements. It also requires that the processes of the facilities should be designed and operated to prevent, or minimize, the quantities of wastes generated and hazards associated with the wastes generated. It is also essential to implement recycling plans in order to reduce the total amount of waste. If waste materials are still generated after the implementation of feasible waste prevention, reduction, reuse, recovery and recycling measures, waste materials should be treated and disposed of and all measures should be taken to avoid potential impacts to human health and the environment.

Solid (non-hazardous) Wastes

According to the guidelines solid wastes generally include any garbage, refuse. Examples of such waste include domestic trash and garbage; inert construction / demolition materials; refuse, such as metal scrap and empty containers (except those previously used to contain hazardous materials which should, in principle, be managed as a hazardous waste).

Very small amount of solid waste will be generated throughout the construction and operational phases of the Project. They will be managed with the provisions stated in the guidelines.

Hazardous Wastes

According to the guidelines hazardous wastes share the properties of a hazardous material (e.g. ignitability, corrosivity, reactivity, or toxicity), or other physical, chemical, or biological characteristics that may pose a potential risk to human health or the environment if improperly managed. Wastes

may also be defined as" hazardous" by local regulations or international conventions, based on the origin of the waste and its inclusion on hazardous waste lists, or based on its characteristics.

The guidelines state that the hazardous wastes should always be segregated from nonhazardous wastes and its management should focus on the prevention of harm to health, safety, and the environment. It is crucial that the potential impacts and risks associated with hazardous wastes should be completely understood, the hazardous wastes are handled, treated and disposed by reputable and legitimate enterprises licensed by the relevant regulatory agencies and they should be stored so as to prevent or control accidental releases to air, soil and water resources. On-site and off-site transportation of wastes should be conducted so as to prevent or minimize spills, releases, and exposures to employees and the public.

3.0 PROJECT DESCRIPTION

3.1 Proposed Project

GARET Enerji Üretim ve Ticaret A.Ş (GARET) proposes to install Sares Wind Power Project (SWPP) with 22.5 MW installed capacity in Çanakkale Province of Turkey. The SWPP will have 9 turbines, each having an output of 2.5 MW. Power will be connected via a 9 km transmission line to the 154 kV Ezine Transformer Station. GARET obtained the "Electric Power Generation License" from the Energy Market Regulatory Authority (EMRA) for the proposed Project site. A 49-Year License (License No. EU/1632/5/1193, dated June 5, 2008) is granted for the proposed Project by the opinion of EMRA under the provisions of Law No. 4628 governing the electricity market in the Republic of Turkey.

3.2 Project Objective

Gross electricity consumption of Turkey (Gross electricity generation of Turkey + import/export) has reached 198.1 billion kWh in 2008 with an increase of 4.2% compared to the 2007 level. The net electrical energy consumption in Turkey (internal consumption, network loss and electricity leakage) has been 161.9 billion kWh in 2008 (Turkish Electricity Transmission Company, 2009).

Instantaneous peak demand and energy demand of Turkey interconnected electricity system is presented Table 3-1 (Turkish Electricity Transmission Company, 2009) and in Figure 3-1. In 2007, the peak demand was 29,249 MW and the minimum load was 11,100 MW. In 2008, the peak demand was 30,517 MW and the minimum load was 10,409 MW.

Table 3-1 Interconnected Electricity Power System Peak Power and Energy Demand

Years	Peak Demand (MW)	Increase (%)	Energy Demand (GWh)	Increase (%)
1997	16926	11.1	105517	11.3
1998	17799	5.2	114023	8.1
1999	18939	6.4	118485	3.9
2000	19390	2.4	128276	8.3
2001	19612	1.1	126871	-1.1
2002	21006	7.1	132553	4.5
2003	21729	3.4	141151	6.5
2004	23485	8.1	150018	6.3
2005	25714	7.2	160794	7.2
2006	27594	9.6	174230	8.3
2007	29249	6.0	190000	8.8
2008	30,517	4.3	198,085	4.2

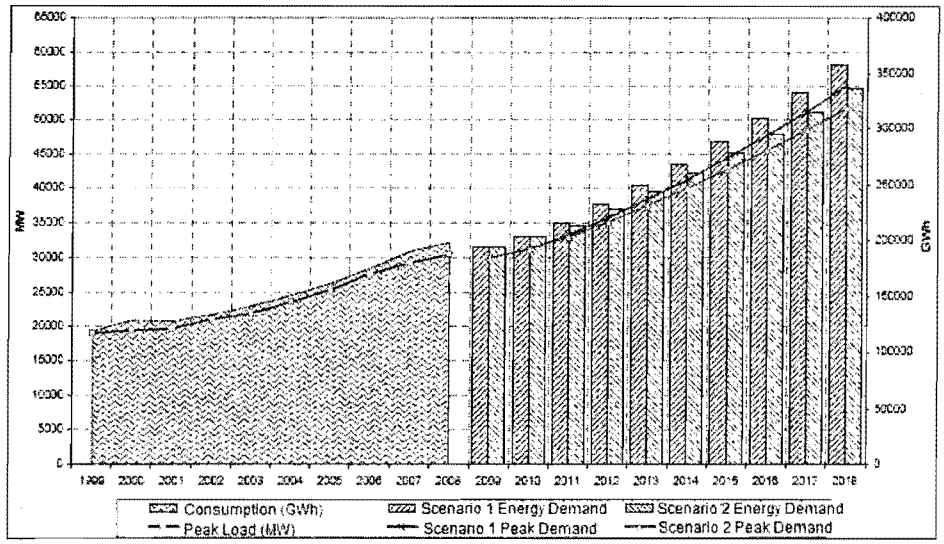


Figure 3-1 Interconnected Electricity Power System Peak Power and Energy Demand

By the end of 2008, the installed power capacity of Turkey was 41,817.2 MW. The total installed wind power capacity is 433.35 MW in Turkey. In addition to this installed power, it was reported that wind farm projects with 402.40 MW capacity is under construction and the total capacity including the projects with a turbine supply contract has reached to 1503.35 MW (TUREB, 2009). According to the Ministry of Energy and Natural Resources (MENR), the potential wind power in Turkey is prescribed to be a total of 8,000 MW of installed capacity for high efficient regime facilities and a total of 40,000 MW of installed capacity for moderately efficient facilities.

The purpose of this Project is to utilize wind energy potential and to compensate energy requirement through a sustainable, environmentally and cost effective way by using wind energy.

3.3 Project Background

Wind speed and frequency are the most important factors to determine the power that can be generated from a wind turbine. GARET installed a wind measurement system namely Wind Mast 2400 at the Project site on May 24, 2007 in order to evaluate wind energy potential of the region. Meteorological sensors were positioned on this wind mast so as to collect data at 10 m, 30 m, 50 m and 51 m above ground. The data acquired from the masts was used to assess the location of the turbines and feasibility of the Project. View of the wind mast 2400 installed for the proposed Project is shown in Figure 3-2.

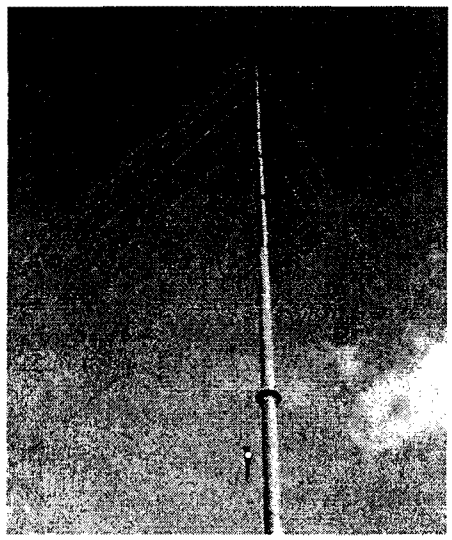


Figure 3-2 Wind Mast 2400

3.4 Project Location

The proposed Sares WPP will be located between Kayacık Village and Şapköy Village that are both situated in Ezine District of Çanakkale Province. Çanakkale Province is located to the northwest of Turkey in the Marmara Region. Ezine District, which is situated in south of Çanakkale Province, is about 40 km away from the Çanakkale Province Center. The Project site is located in the south of Ezine District. It is about 9 km from the Ezine District Center and about 49 km from the Çanakkale Province Center. The nearest settlements to the Project site are Kayacık Village and Şapköy Village. The closest turbine to Kayacık Village is Turbine 9 (T9) with a distance of about 1.66 km. Turbine 2 (T2) is the nearest turbine to Şapköy Village Center with a distance of about 1.69 km. The Project location map is given in Figure 3-3 and the map of turbine locations and access roads of the Project site are given in Figure 3-4. General views of Project site and view of Kayacık Village are shown in Figure 3-5 and Figure 3-6. Moreover, a site photolog is presented in Appendix A.

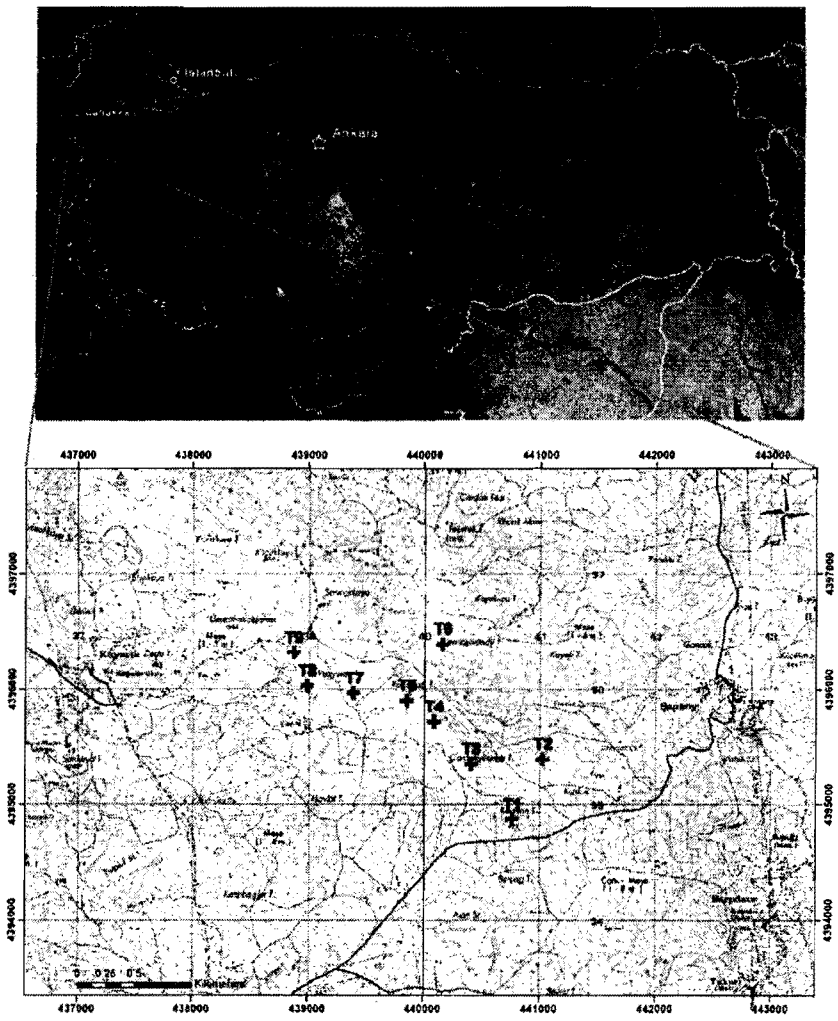
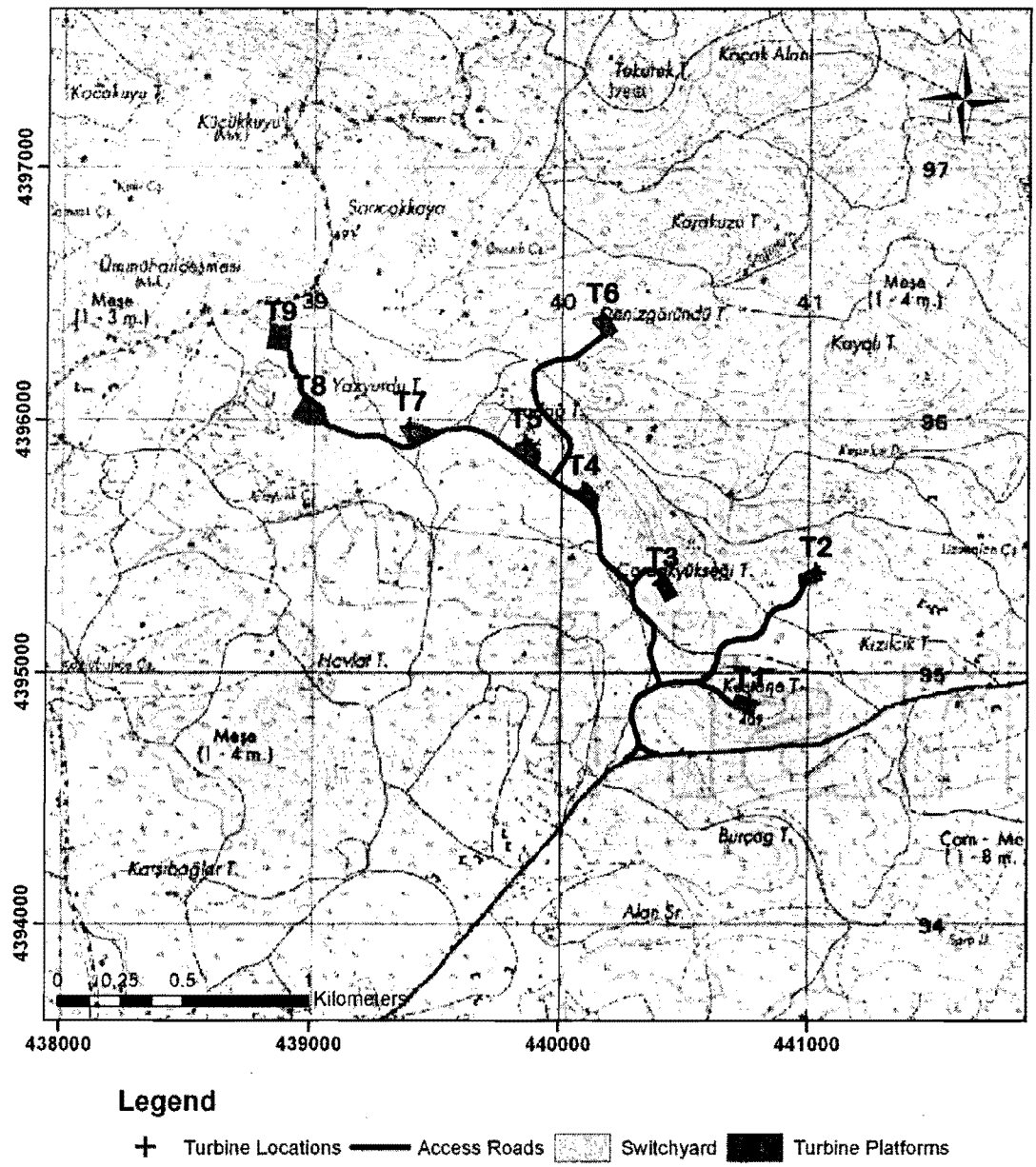


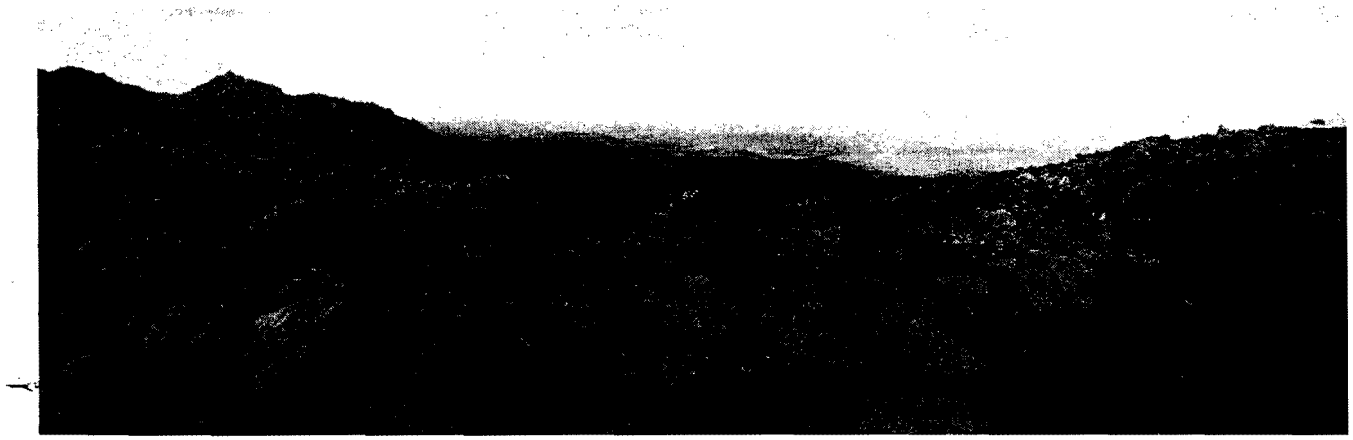
Figure 3-3 Project Location



Legend

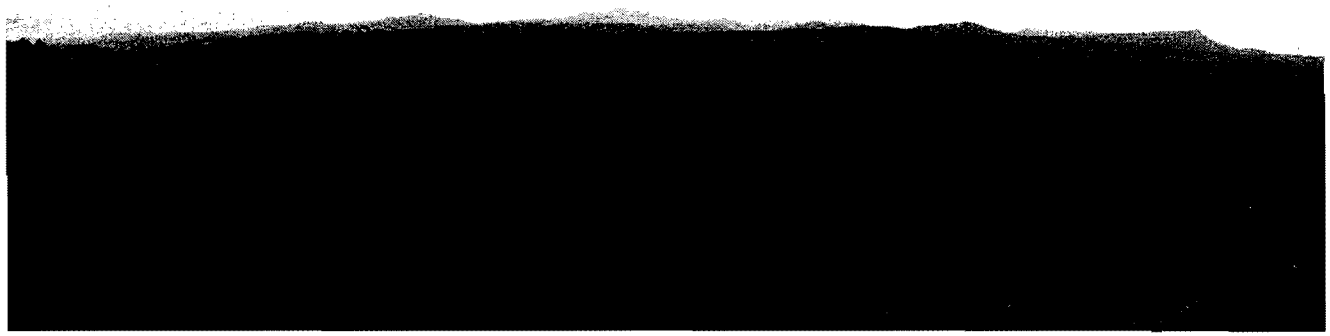
+ Turbine Locations — Access Roads Switchyard Turbine Platforms

Figure 3-4 Turbine Locations and Access Roads



View of Northern Part of the Project Site from Turbine 7 Location Looking North

View of Eastern Part of the Project Site from Turbine 7 Location Looking East



View of Southern Part of the Project Site from Turbine 7 Location Looking South

View of Western Part of the Project Site from Turbine 7 Location Looking West

Figure 3-5 Project Site Views

Figure 3-6 View of Kayacık Village

Site Topography

The coordinates (UTM Projection, ED50 Datum) of the turbines are given in Table 3-2. Locations of the turbines are shown in two and three dimensional topography maps. Figure 3-7 shows two-dimensional topography map, Figure 3-8 and Figure 3-9 show three-dimensional topography maps.

Table 3-2 Turbine Coordinates

Turbine	Northing (m)	Easting (m)
1	4,394,874.553	440,767.403
2	4,395,393.813	441,028.663
3	4,395,351	440,412
4	4,395,717.682	440,093.382
5	4,395,903	439,859
6	4,396,398	440,165
7	4,395,969.445	439,393.833
8	4,396,030.63	438,992.979
9	4,396,323.81	438,876.345

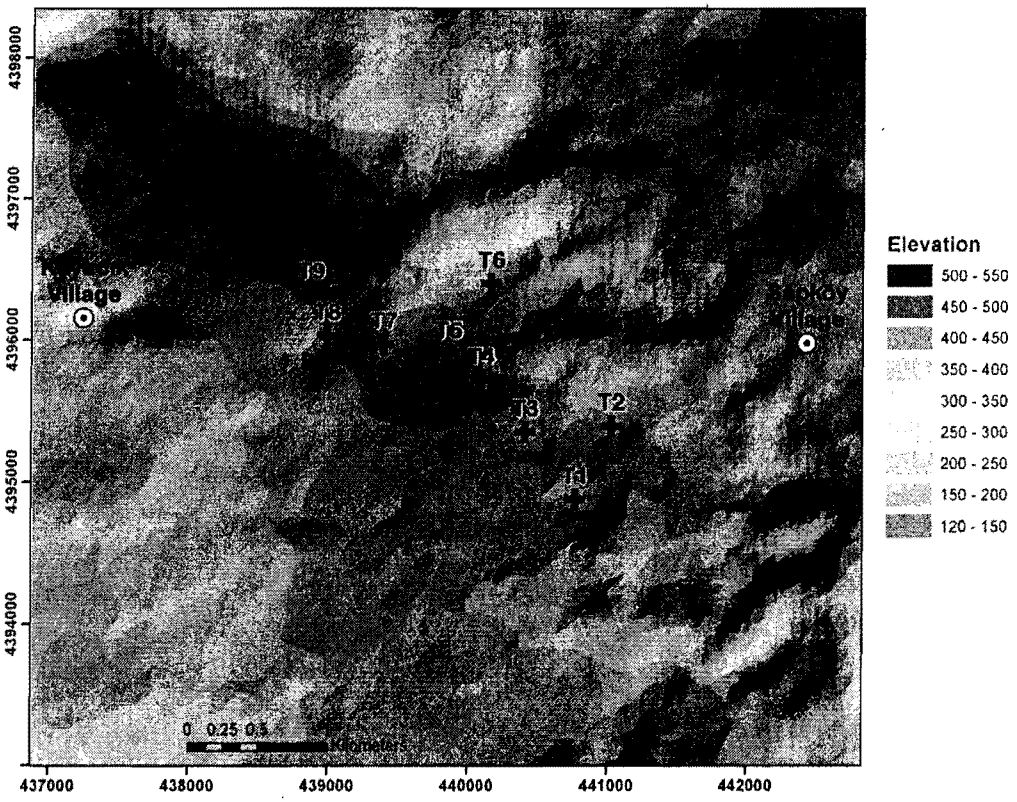


Figure 3-7 Two Dimensional Topography Map

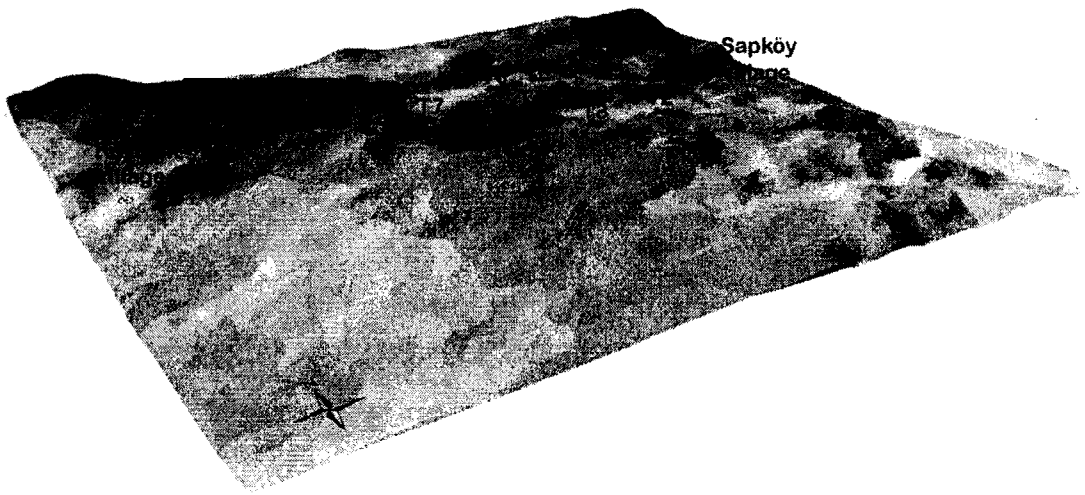


Figure 3-8 Three Dimensional Topography Map Looking Northeast

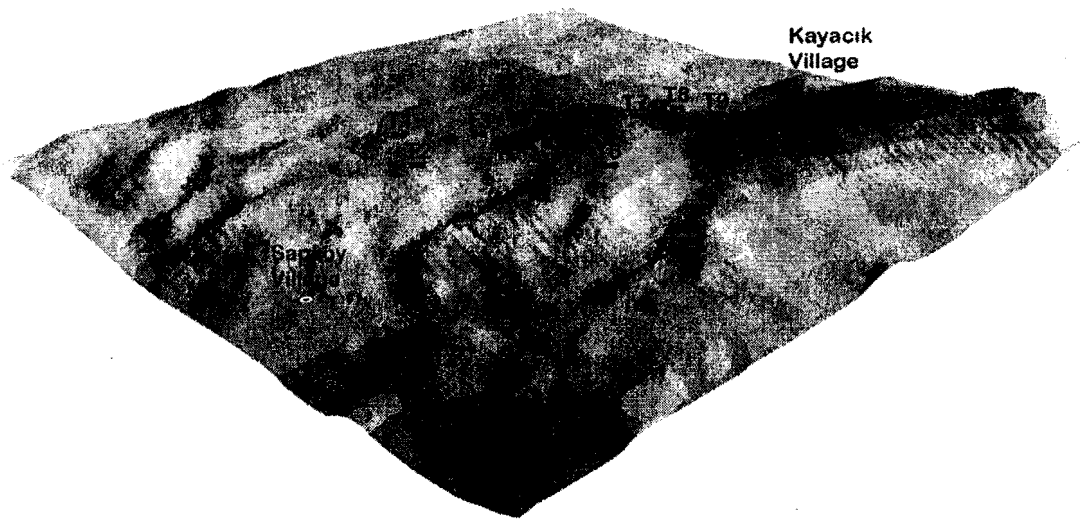


Figure 3-9 Three Dimensional Topography Map Looking Southwest

3.5 Project Technical Characteristics

GE 2.5XL wind turbine with 85 m hub height will be used in the proposed Project. Each turbine will have 2.5 MW rated capacity. The Sares WPP will generate 90.5 GWh electrical energy annually on the average basis with these turbines.

GE 2.5XL wind turbine excels on sites that are constrained by environmental regulations. GE's innovative and patented rotor blade technology provides the 2.5 MW wind turbine with very competitive acoustic performance. In fact, with the optional noise-reduced operation modes, the 2.5 MW wind turbine can be deployed even at sites with the most stringent noise restraints, while simultaneously maintaining a high energy yield. In addition, GE wind turbine will operate at wind velocity of between 3 m/s and 25 m/s.

The rotor swept of the turbines is 7854 m^2 with a rotor diameter of 100 m. Each turbine will have 3 rotor blades. The technical characteristics of the turbine are presented in Table 3-3. The view GE 25xl and the view of the nacelle of the GE 25XL can be seen in Figure 3-10 and Figure 3-11, respectively (GE Energy, 2009).

Table 3-3 Turbine Technical Characteristics

Design Limits	
Rotor Diameter	100 m
Cut-in Wind Speed	3.0 m/s
Cut-out Wind Speed	25 m/s
Rated Power Output	2.5 MW
Minimum ambient temperature operation	-15 °C / -20°C
Maximum ambient temperature operation	+ 40 °C
Minimum Humidity	5 g/m^3
Maximum number of grid-induced disconnections per year	30
Maximum altitude with no deareting	1000 m
Tower	
Type	Tubular Steel Tower
Hub Height	85 m
Yaw System	
Yaw rate	0.5 °/sec
Rotor	
Diameter	100 m
Number of rotor blades	3
Swept area	7854 m^2
Rotor speed range	5-14 min^{-1}
Rotational Direction	Clockwise looking downwind
Maximum speed of the blade tips	73.6 m/s
Orientation	Upwind
Speed regulation	Pitch-controlled
Aerodynamic brake	Blades in feathering position
Cone angle	3°
Inclination angle of rotor axis	4°
Rotor Blades	
Length (blade root – tip)	48.7 m
Pitch System	
Principle	Single blade pitch control
Main Gearbox	
Rated Power	2750 kW
Type	Multi-stage system
Lubrication	1 mechanical and 1 electrical pump
Brake System	
Primary brake system	Single blade pitch control
Secondary brake system	Single blade pitch control
Holding brake	Hydraulically driven brake caliper on high-speed shaft
Generator	
Type	Permanent magnet generator
Rated output	2640 KW
Rated speed	1650 min^{-1}
Rated voltage	710 V
Apparent Power	2808 kVA
Frequency at rated output	110 Hz
Protection Class	IP54
Insulation Class	F
Function type	S1
Standard	EN 60034-1
Converter System	
Type	Voltage source converter
Rated voltage, line slide	690 V +/-10 %
Rated frequency	50 Hz / 60 Hz

Protection class of the electronics	IP54

Figure 3-10 View of GE 2.5XL

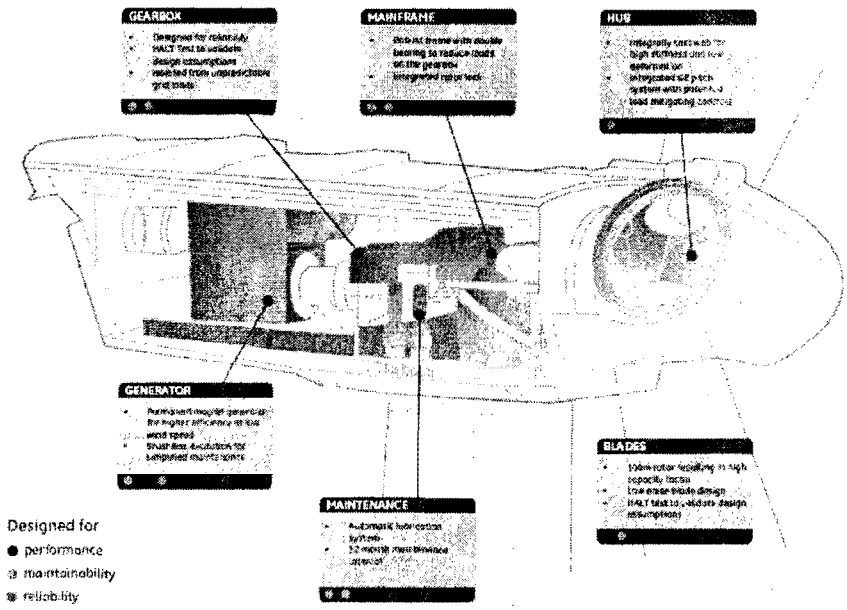


Figure 3-11 View of Nacelle

3.6 Shipment and Access

The turbines for the proposed Project will be purchased in Germany and shipped to the Çanakkale Port (Kepez Port). A Route and Site Assessment study was conducted in order to determine the transport route, hand-over point, access roads and site roads that that would allow the delivery, storage and transportation of the units to the project site with a minimum of handling of the components and required construction work.

Main transport route from Çanakkale port to the hand-over point is presented in the Figure 3-12. Access road, which is the road from the handover point to the site access road, is also shown in this figure. According to Route and Site Assessment study, the distance between Çanakkale Port and the site access is approximately 50 km and the transit time between Çanakkale Port and the site access is estimated as four hours.

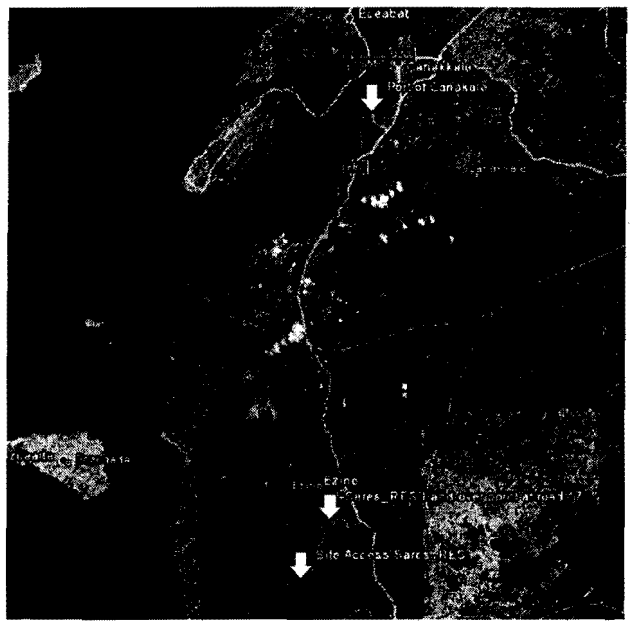


Figure 3-12 Main Transport Route and Access Road for the Proposed Project

As a result of this study, several curves at the road between Yavaşlar and Kayacık have to be enlarged. Significant environmental impacts are not expected with this road modifications. In addition, in order to access to the individual units' locations, site access roads will also be constructed within the Project site.

3.7 Project Construction

A total of 9 turbines each having an output of 2.5 MW will be constructed in this Project. The total installed capacity and the power generation of the Project will be 22.5 MW and 90.5 GWh,

respectively. The height of the turbine towers will be 85 m. Approximately 400 m^2 area will be excavated for each turbine foundation. Turbines, transformers, powerbus, switchyard and administrative units will be placed on this area.

The following works will be performed during the construction of the proposed Project:

- Preparation of site, site compound/laydown area;
- Excavation activities for turbine tower foundations and control building pad foundations;
- Site access roads preparation;
- Preparation of crane pads at each wind turbine location;
- Service road construction between turbines;
- Construction of turbine/tower foundations;
- Construction of auxiliary units and control building;
- Transportation and construction of the towers;
- Transportation and assembly of the turbines, rotors and blades;
- Installation of the electricity (underground lines) and control system;
- Connection to the system;
- Commissioning and energizing the plant; and
- Site re-instatement and restoration.

A temporary site compound with a laydown area will be constructed for the parking of construction vehicles and equipment, staff vehicles, and the storage of materials including turbine blades and other components. A temporary office will also be installed. A crane pad will be constructed at the base of each turbine location.

Once the access roads and site compound are in place, turbine foundation construction will commence. In order to limit disturbance, the site access roads will be constructed first. It is not proposed to borrow pit to obtain materials and no crushing plant will be used on the sites. Construction of the foundation will comprise excavation of the hole using a digger, outer form setting, rebar and bolt cage assembly, casting and finishing concrete, removing the forms, backfilling, compacting and foundation site restoration. Excavation and foundation construction will be conducted in a manner that will minimize the size and duration of the excavated area. On-site excavated materials will be used for backfill as far as is possible. After the concrete foundation construction, the base of the towers will be backfilled according to the project requirements and the mounting platforms will be prepared.

Other remaining works such as tower and turbine installations, construction of substation, operation and management buildings and the transmission lines will be performed in parallel after completing the tower foundations.

Turbine erection will be performed in multiple stages including: erecting the tower (usually in three or four sections for this size), erecting the nacelle, assembling and erecting the rotor, connecting and terminating the internal cables and inspecting and testing the electrical system prior to operation. Towers, blades and turbine will be lifted and installed with a special high crane.

The feeders from wind towers will be connected via 34.5 kV underground cable channels parallel to the access roads, which will be prepared by an excavator and backfilled in compliance with the technical requirements of the project.

The electrical power generated by the wind turbines will be collected by the switchyard and connected to the 154 kV Ezine Transformer Station via a 9 km long overhead transmission line.

3.8 Project Operation and Maintenance

The operation period of the Project is planned to be 49 years. The operation of the wind power plant will be undertaken in accordance with an Environmental Management Plan that will be developed for the Project.

Typically modern wind turbines operate with an availability of 95 to 99% (i.e. the turbines are available to operate for this percentage of the year). Forced outages can occur mainly because of malfunctioning of mechanical or electrical components or computer controls. These are generally due to malfunction of auxiliaries and controls rather than with the heavy rotating machinery. Heavy rotating machineries are routinely inspected during planned maintenance or by condition monitoring.

Following the more frequent and detailed initial turbine inspections and maintenance in the first year of operation, a semi-annual service is usually expected. The actual service periods will be determined after the operations and maintenance (O&M) contract is finalized. The semi-annual inspection and maintenance generally include taking the wind turbine off-line for a day and consist of inspecting and testing safety systems, inspecting wear and tear on components such as seals and bearings, lubricating the mechanical systems, performing electronic diagnostics on the control systems; verifying pre-tension of the mechanical fasteners; gearbox oil change and inspecting the overall structural components of the wind turbines.

The turbines will need to be visited typically once per month for routine visual inspections. As far as is practical, short term routine maintenance procedures will need to be undertaken during periods of little or no wind to minimize the impact on electricity generation. Major maintenance/servicing are planned where practical during the months where low wind speeds are encountered.

In the event of a fault, the modular design of modern wind turbines allows most of the parts to be rapidly replaced, especially in the electrical and control systems.

Electrical equipment such as breakers relays and transformers require annual visual inspections which does not affect availability of the turbines. Basis testing and calibration of this equipment will require a short break in operation.

3.9 Project Decommissioning

The Project life will be 49 years. The main decommissioning activities will comprise of removal of tower, nacelle, blades; reuse/disposal of foundation, tower, nacelle, blades and removal of cable and ancillary structures.

There are several aspects of the decommissioning phase of the project that may have environmental impacts. Decommissioning will take account of the environmental legislation and the technology available at the time. Necessary notices will be given to the environmental authorities in advance of the commencement of the decommissioning work. Any necessary licenses or permits will be acquired prior to the decommissioning activities.

It is probable that most of the plant and equipment will be at the end of its useful operating life and will be obsolete and unsuitable for further use. Thus, it will need to be dismantled for recycling. Decisions on reuse of plant items, recycling of materials or the disposal to waste will be made at the time of decommissioning in the light of the technology then available, environmental and economic considerations and legislation. Unsalvageable material will be disposed of at a licensed landfill. A crane will be required to dismantle the turbines. Soil surface will be restored to its original condition. Disturbed areas will be re-vegetated or made available for any future intended use.

Compared to thermal power plants, wind turbines can be easily and economically decommissioned and removed from site at the end of their economic life and the site returned to its original condition. There will be little or no trace that the wind turbines had been there following decommissioning.

3.10 Work Force

The construction period of the Project will be one year and the operation period of the Project will be 49 years. It is estimated that 50 personnel will be employed during the construction phase of the Project. However, not all workers will be on-site at any one time. The peak workforce will be onsite during the busiest construction period when multiple disciplines of contractors complete work simultaneously. Local contractors will be encouraged to tender for the civil and electrical works. Electricians, riggers, crane operators and heavy equipment operators will also be required.

It is estimated that 7 personnel will be employed during the operation phase of the Project. The proposed work force details are given in Table 3-4.

Table 3-4 Estimate Work Force

	Duty	Number of Personnel
Construction Phase		
1	Engineer	8
2	Technician	5
3	Workers	37
	Total	*50*
Operational Phase		
1	Engineer	1
2	Administrative Officer	1
3	Operator	3
4	Security	2
	Total	*7*

4.0 ENVIRONMENTAL AND SOCIAL BASELINE

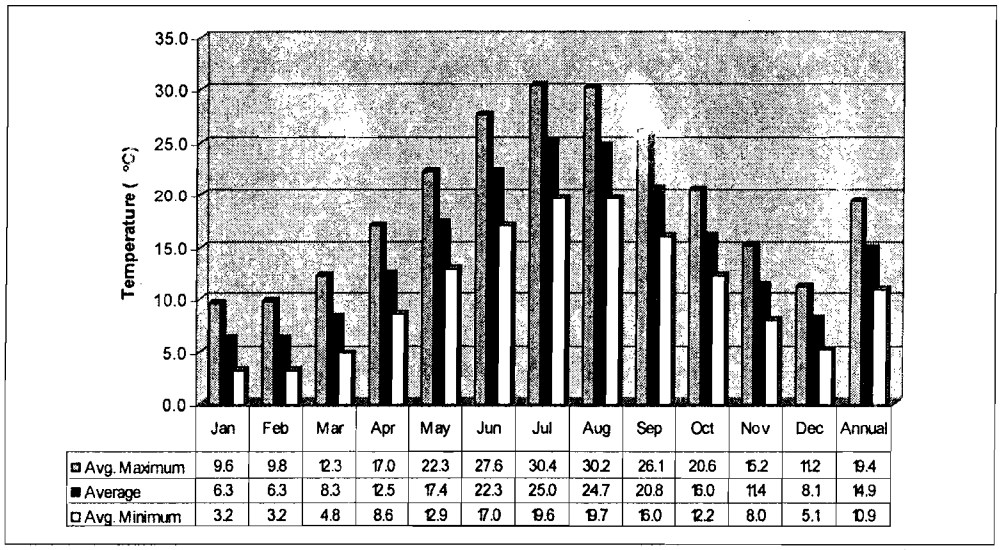
4.1 General Climatology of the Region

The climate of Çanakkale Province shows the properties of transition climate and in general the Mediterranean climate is dominant in the province. However, since the province is located in the northern part of Turkey, average temperature in the winter season is lower when compared with the provinces located in the southern part of Turkey. Windy days are observed in all districts throughout the whole year. Furthermore, except islands, Gelibolu Peninsula and the districts located on the coastal zone, the climate differs due to elevation difference. Temperature differences and numbers of snowy and frost days are high in inlands of the province. The proposed Project site is located in Ezine District of Çanakkale and the distance between the proposed Project site and the Çanakkale coast is approximately 11 km.

The meteorological data is obtained from the Çanakkale Meteorological Station which is located at 40.09 latitude and 26.25 longitude. In order to examine the meteorological elements of the Project site and its close vicinity, long-term meteorological data (1975-2006) recorded in this station is used.

Temperature

According to long-term meteorological data (1975-2006) recorded by the Çanakkale Meteorological Station, the annual average temperature is 14.9°C. As seen in Figure 4-1, the warmest months are June, July and August, whereas the coldest months are January and February. The maximum and minimum temperatures during the observation period (1975-2006) were recorded as 39°C on June 23, 2000 and -11.2°C on February 14, 2004, respectively.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. Maximum	9.6	9.8	12.3	17.0	22.3	27.6	30.4	30.2	26.1	20.6	15.2	11.2	19.4
Average	6.3	6.3	8.3	12.5	17.4	22.3	25.0	24.7	20.8	16.0	11.4	8.1	14.9
Avg. Minimum	3.2	3.2	4.8	8.6	12.9	17.0	19.6	19.7	16.0	12.2	8.0	5.1	10.9

Figure 4-1 Long Term Temperature Data

(Source: Çanakkale Meteorological Station (1975-2006)

The minimum ambient temperature for the operation of turbines is given as -15°C / -20°C. In addition, the maximum ambient temperature for the operation of turbines is given as +40°C. Since, the average temperature data recorded in the vicinity of the Project site is in the range of operation temperature limits, the Project site is suitable for turbine operation.

Wind

According to measurements conducted at the Çanakkale Meteorological Station (1975-2006), annual wind speed in the direction of south, south-southwest, south-southeast and southwest are considerably high (i.e., more than 5.5 m/sec). Prevailing annual wind direction is north-northeast for all seasons and the annual wind speed in this direction is 4.3 m/sec. The wind rose in Figure 4-2 depicts the annual and seasonal wind directions and intensity recorded at the proposed station.

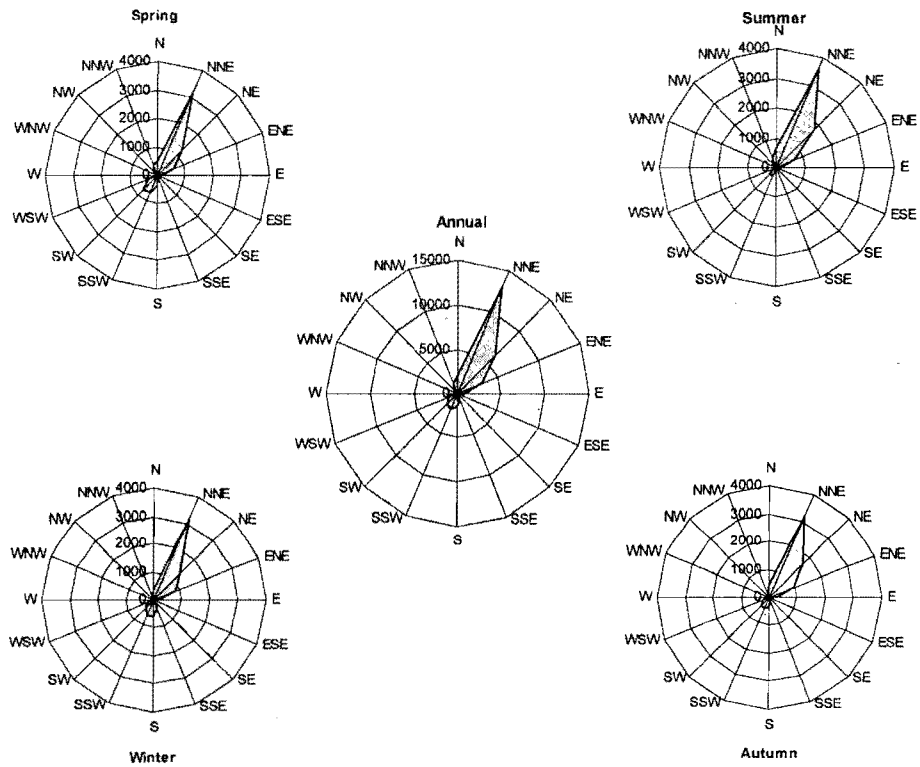


Figure 4-2 Annual and Seasonal Wind Roses

(Source: Çanakkale Meteorological Station (1975-2006)

The meteorological data recorded at 10 m height at Çanakkale Meteorological Station show that high wind speeds are observed in the region. According to Turkish General Directorate of Electrical Power Resources Survey and Development Administration, a wind speed of 7 m/s or more is required for feasible investments of wind power plants.

Wind speed increases with height. In order to investigate the wind speed data at higher elevations GARET installed a wind mast (Wind Mast 2400) in the Project site. The locations of the turbines were

determined theoretically by using this wind data measured at wind mast. Wind Mast 2400 has four wind sensors located at 10 m, 30 m, 50 m and 51 m elevations on the mast. This mast has been operational since 2007. The nominal wind distribution data obtained from the average wind speeds recorded at the sensor located at 50 m during the year 2008 is presented in Figure 4-3. It is calculated that approximately 49.5% of the wind has equal and greater speed than 7 m/sec. Hence, the site is found to be a suitable area in terms of wind energy potential.

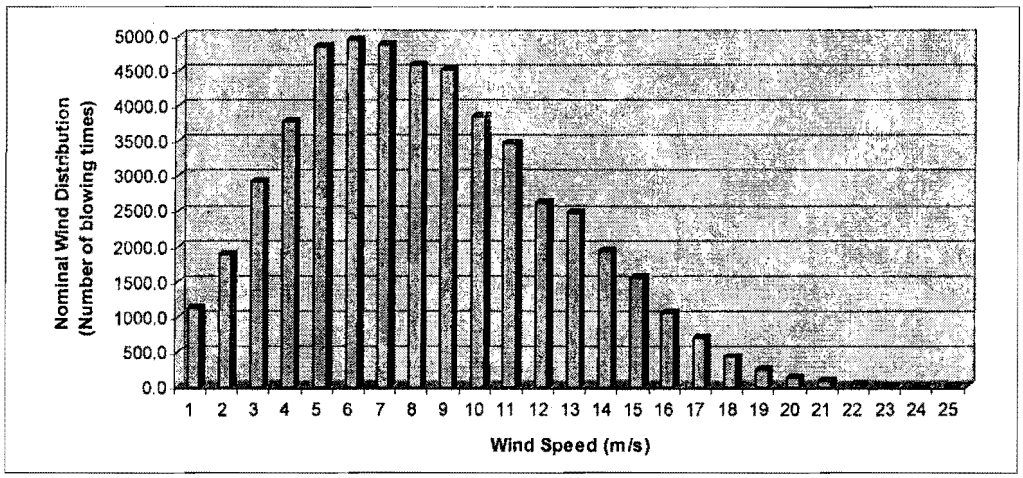
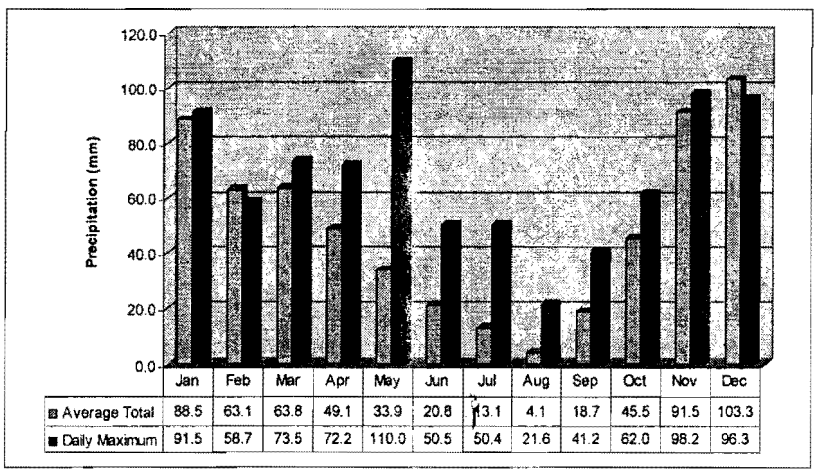


Figure 4-3 Average Nominal Wind Distribution at the Project Site

Precipitation

According to long-term meteorological data recorded at the Çanakkale meteorological station, amount of precipitation differs seasonally. Precipitation decreases dramatically in summer season and precipitation occurs in winter season in general. As seen in Figure 4-4, the rainiest month is December with 103.3 mm monthly average precipitation. On the other hand, the lowest precipitation falls in August which is 4.1 mm.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Total	88.5	63.1	63.8	49.1	33.9	20.8	13.1	4.1	18.7	45.5	91.5	103.3
Daily Maximum	91.5	58.7	73.5	72.2	110.0	50.5	50.4	21.6	41.2	62.0	98.2	96.3

Figure 4-4 Precipitation Data

(Source: Çanakkale Meteorological Station (1975-2006)

Humidity

According to long-term meteorological data recorded at the Çanakkale meteorological station, average relative humidity is considerably high throughout the whole year. Annual average relative humidity in Çanakkale Province is 76%. In addition, the highest average relative humidity value is observed in December and January as 83% whereas least humid month is July when average relative humidity is 68%.

4.2 Air Quality

Air quality is not expected to be an issue in wind power projects. However, brief background information about the local air quality is provided in this section.

Turkish Statistical Institute keeps air pollution statistics for each province center in Turkey. The statistical data include annual data for PM and SO_2 parameters recorded by the Ministry of Environment and Forestry. There is no air quality measurement station in Ezine District. The nearest station to the Project site is located in Çanakkale Central District. General statistical information on the PM and SO_2 are given in Table 4-1 for Çanakkale in 2008. As seen from the table, annual average SO_2 and PM concentrations are 69 µg/m³ and 62 µg/m³, respectively. The long-term limit values for SO_2 and PM are same and defined in Turkish Industrial Air Pollution Prevention Regulation as 150 µg/m³. Hence, annual average concentrations of SO_2 and PM measured in Çanakkale do not exceed the Turkish limit values.

Table 4-1 SO_2 and PM Concentrations Measured in Çanakkale in 2008

	Pollutant Parameters	
	SO_2	PM
Number of Days of Measurement	293	214
Annual Average Concentration (µg/m³)	69	62
Minimum Concentration (µg/m³)	1	19
Maximum Concentration (µg/m³)	516	258
Number of days exceeding the Target Limit Value (≥ 500 µg/m³ for SO_2 and ≥ 260 µg/m³ for PM)	1	0
Number of days exceeding the Short-Term Limits (≥370 µg/m³ for SO_2 and ≥260 µg/m³ for PM)	1	0

Potential emission generating industrial facilities located in the close vicinity of the proposed Project site is Granitürk Doğaltaş A.Ş located approximately 3 km west of the closest turbine (T-9). Granitürk operates a quarry and process the stone. Particulate matter (PM) results from the cracking ad mining processes and SO_2, NO_x and HC emissions result from heating and process operations.

No air emission will be generated due to operation of the wind power plant. Air emission will be generated temporarily only during the construction phase. Since, the construction period of the Project is approximately one year and the emission will be mainly generated due to operation of the construction vehicles at the site, effect on the air quality will be temporary and expected to be minor.

4.3 Land Use and Land Ownership

The Project area is located on a state-owned land. 1/25,000 and 1/5,000 scale Environmental Development Plans of the Project area were revised and includes the Sares WPP and approved by the Government.

The Law on the Use of Renewable Energy Resources for the Generation of Electricity numbered 5346 and dated May 10th, 2005 states that if the land required for the turbines, access roads and transmission line of a renewable energy plant (solar, wind, geothermal etc.) is state-owned, leasing or giving right of access of the required land to the project owner is conducted by the Ministry of Finance. All of the turbine locations and access roads are on state-owned land. Therefore, an expropriation of the private lands and thus involuntary resettlement will not be necessary.

The Project area is a rural land. All turbines except Turbine 8 and Turbine 9 are located on forest land. GARET has applied to the Ministry of Environment and Forestry and acquired a 24 month preliminary permission of usage of forest land. After preliminary permission is expired, permanent permission will be obtained from the Ministry of Environment and Forestry. Turbine 8 and Turbine 9 are situated on pasture land. It is not used for any purpose of economic income or settlement.

AECOM has conducted a Phase I subsoil investigation at the proposed Project site. AECOM did not observe any indication of potential contamination on the proposed site or any illegally dumped contaminated materials during the visual inspection of the site.

4.4 Background Noise Levels

The Project site is located on a hilly terrain and the closest settlement is Kayacık Village in the west. In order to determine existing ambient noise levels (background noise) at the nearest settlement, background noise monitoring studies are carried out at the closest noise sensitive receptor (NSR).

4.4.1 Noise Sensitive Receptor

The NSR is selected as the closest residential dwelling, where people permanently live, to the turbines. The coordinates (UTM Projection Zone 35, ED-50 Datum) of the NSR and its distance to turbines are given in Tables 4-2 and 4-3, respectively. The NSR location is shown in Figure 4-5.

Table 4-2 UTM Coordinates of Noise Sensitive Receptor

Noise Sensitive Receptor	X (East)	Y (North)
NSR	437,298	4,396,078

Table 4-3 Distance between Wind Turbines and Noise Sensitive Receptor (m)

	Turbines								
	T1	T2	T3	T4	T5	T6	T7	T8	T9
NSR	3,672	3,793	3,198	2,819	2,567	2,885	2,099	1,696	1,597

The selected NSR is situated in the east of Kayacık Village. It is the closest permanent residential house to the project site. There is a dirt road passing near the house. The closest turbine is Turbine 9 (T9) in a distance of 1,597 m. There were several buildings in the northwest of the NSR, however, there was no building structure, low or mature trees in the direction towards the location of Turbine 9 (T9). The closest building to the NSR was located in 10 m in northwest. The view of the receptor is given in Figure 4-6.

4.4.2 Noise Survey

Background noise level monitoring studies were undertaken for two days between November 17, 2009 and November 19, 2009. Ambient noise levels were continuously measured for 48 hours and the levels were logged for ten minute sampling interval. The noise measurements were undertaken with *Type 2 Quest 2900 Integrating/Logging Sound Level Meter*. The equipment used is in compliance with the standards of ANSI S1.4, IEC 651 and IEC 804. Calibration of the equipment was checked before and after each measurement with an acoustic calibrator that is *Quest QC/10 Calibrator*. The calibrator complies with the standards of ANSI S1.4 and IEC 942. All measurement systems were set to log the L_{min}, L_{max}, L_{Aeq}, L_{A90} noise levels over the required ten minute intervals over the deployment period.

The equipment used for the measurements set to a-weighted, fast response, continuously monitoring mode over ten minute sampling period. All noise measurements were performed with the following precautions;

- Field calibration checked before and after measurements,
- Windshield positioned over the microphone,
- Microphone was positioned approximately 1.5 m above local ground level (on a tripod),
- Microphone placed away from any significant vertical reflective surfaces, and
- Monitoring equipment was secured so as to avoid extraneous wind noise generated in close proximity to the microphone.

Concurrent wind speeds and direction and rainfall data were recorded on a free standing approximately 10 m anemometer mast located on the wind farm site. Wind speed and direction data and rainfall data were collected over the same period and averaged over the same ten minute periods as the noise data to allow analysis of the measured background noise as a function of wind speed. Background noise level measurement location is shown in Figure 4-7.

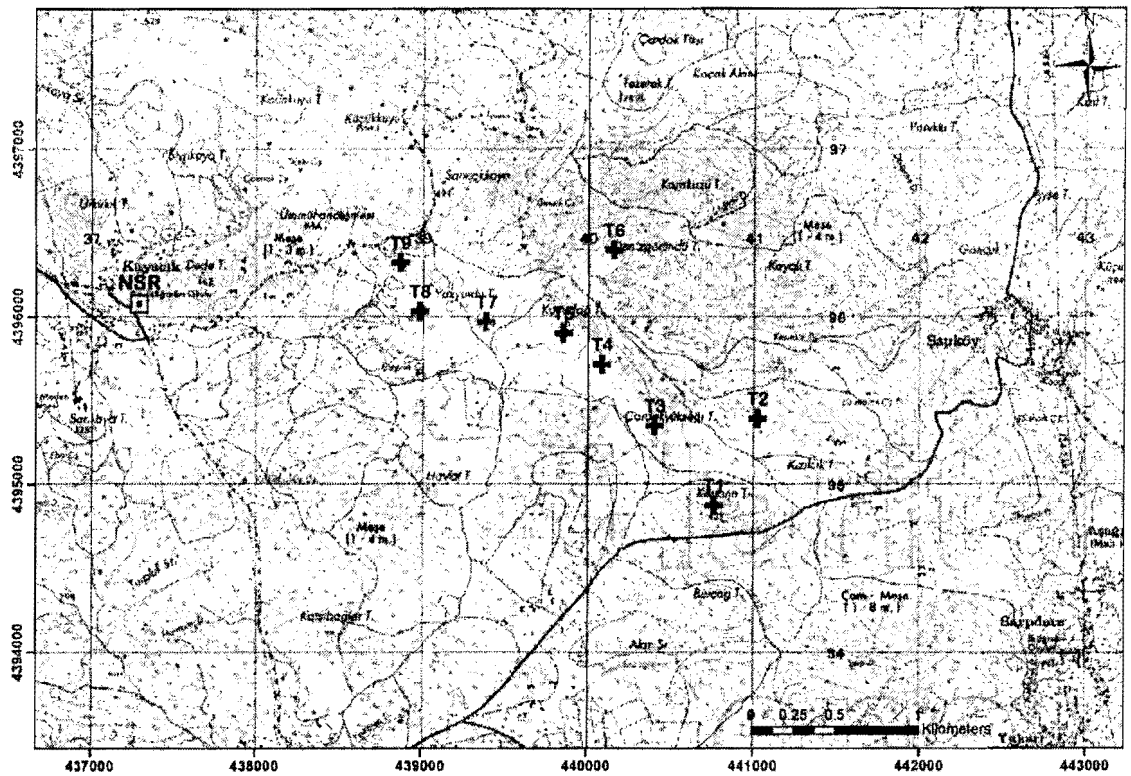


Figure 4-5 Location of Noise Sensitive Receptor

Figure 4-6 View of NSR from East Looking West

Figure 4-7 Background Noise Measurement

4.4.3 Measured Background Noise Levels

The results of the background noise level measurements are compared with respect to both IFC/World Bank Group Environmental, Health and Safety Guidelines – Wind Energy (April 30, 2007) and Turkish Regulation on Assessment and Management of Environmental Noise (RAMEN). Both IFC/WB and RAMEN provides noise limits in Equivalent Sound Level (L_{Aeq}) which is the average A-weighted sound pressure level that gives the same total energy as the varying sound level during the measurement period of time. Since both IFC/WB and RAMEN give the noise limits in L_{Aeq}, the comparisons are made with the L_{Aeq} values measured during the noise survey. However, as discussed in detail in the impact section, $L_{90,10min}$ descriptor should be used for both the background noise and the wind farm noise (ETSU-R-97, 1997; Rogers, et al, 2006; EPA 2008). The use of the $L_{90,10min}$ descriptor for wind farm noise allows reliable measurements to be made without corruption from relatively loud, transitory noise events from other sources.

4.4.3.1 Comparison with IFC/WB Environmental Noise Guidelines

The IFC/WB noise guideline provides limits for daytime (07:00-22:00) and nighttime (22:00-07:00). Since noise sensitive receptor is located in a residential area in this project, noise level limits of 55 dBA and 45 dBA are considered for daytime and nighttime guideline L_{Aeq} limits, respectively.

Daytime

The results of the daytime background noise levels are compared with the IFC/WB guideline values. In this regard, the daytime noise measurement results (L_{Aeq}) and IFC/WB guideline value of 55 dBA are plotted in the graphs and given in Figure 4-8 below.

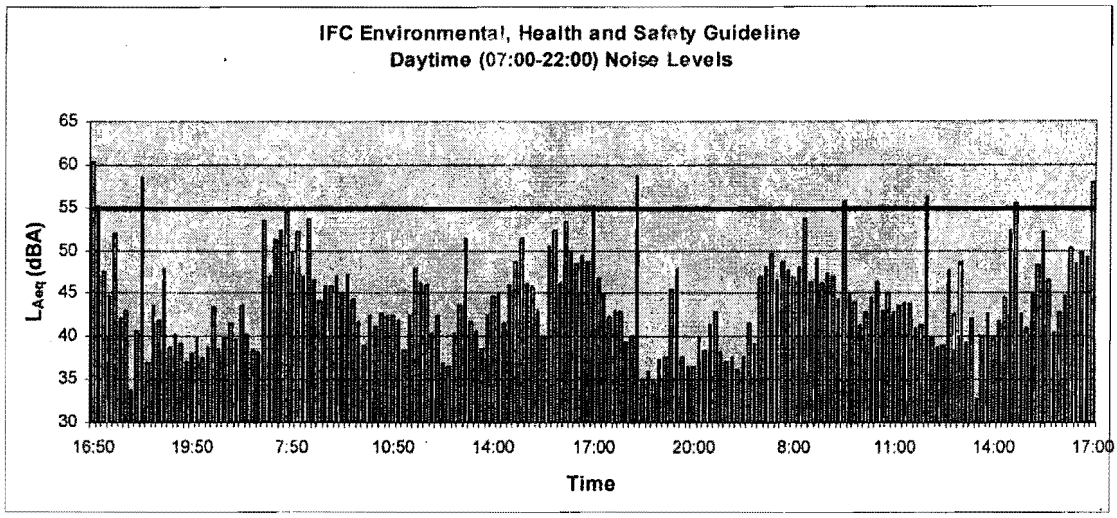


Figure 4-8 Daytime Background Noise Measurement Results compared to IFC/WB Guideline

As can be seen from the graph above, background noise levels at NSR are mostly below the IFC/WB daytime noise level limit of 55 dBA. Background noise levels measured ranges between 35 and 60 dBA. Since there is no industrial or another activity causing noise emission, it is normal to expect low background noise levels.

Nighttime

The results of the nighttime background noise levels are compared with the IFC/WB guideline values. The noise measurement results (L_{Aeq}) and IFC/WB guideline value of 45 dBA are plotted and given in Figures 4-9 below.

The nighttime measurement results show that background noise levels are mostly stable in the nighttime hours of 22:00 – 07:00. As can be seen in Figure 4-9, most of the measured nighttime background noise levels at NSR do not exceed the IFC/WB limit value of 45 dBA. As explained earlier, absence of any type of activities causing noise emission in close vicinity to NSR result in low and steady background noise levels.

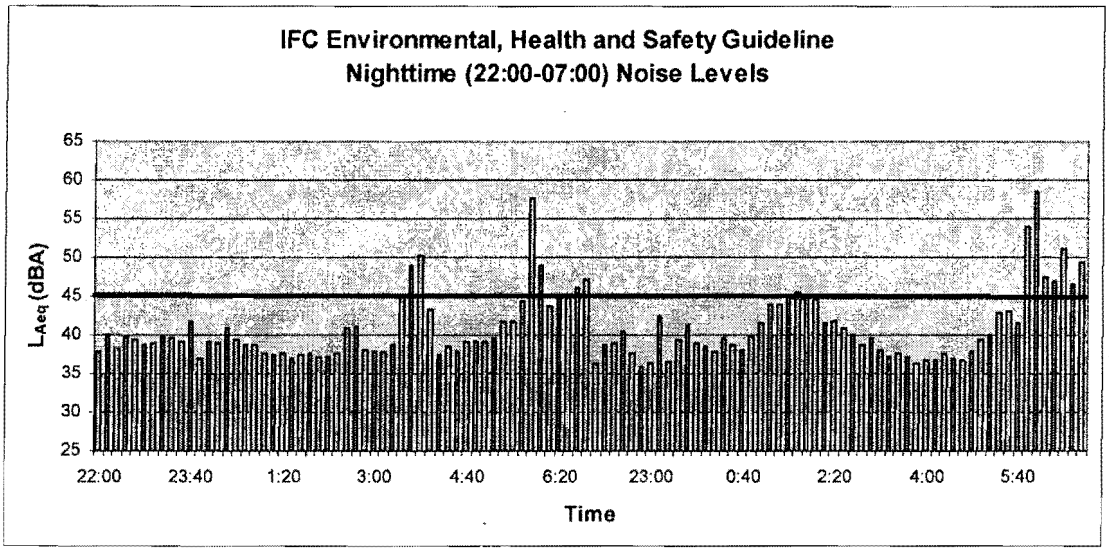


Figure 4-9 Nighttime Background Noise Measurement Results Compared to IFC/WB Guideline

4.4.3.2 Comparison with Turkish Noise Limits

RAMEN sets noise limits for daytime (07:00-19:00), evening time (19:00-23:00) and nighttime (23:00-07:00). Since the Project site is located in an area having residential area in the close vicinity, it is classified as "Noise sensitive areas such as place of education, cultural activities, health center and summer resorts and camping sites" according to RAMEN, and thus, the L_{Aeq} noise level limits of 60 dBA, 55 dBA and 50 dBA are considered for daytime, evening time and nighttime periods, respectively.

Daytime

The weekday and weekend daytime noise measurement results (L_{Aeq}) and RAMEN limit of 60 dBA are plotted in the graphs and given in Figure 4-10. As can be seen from figure, all daytime background noise levels at the NSR are below the RAMEN limit of 60 dBA.

Evening time

The results of the eveningtime background noise measurements are compared with the Turkish RAMEN. The evening noise measurement results (L_{Aeq}) and RAMEN limit of 55 dBA are plotted and shown in Figure 4-11. Background noise level measurements performed between 19:00 and 23:00 at NSR show that evening time background noise levels at the receptor are below the RAMEN evening time limit of 55 dBA.

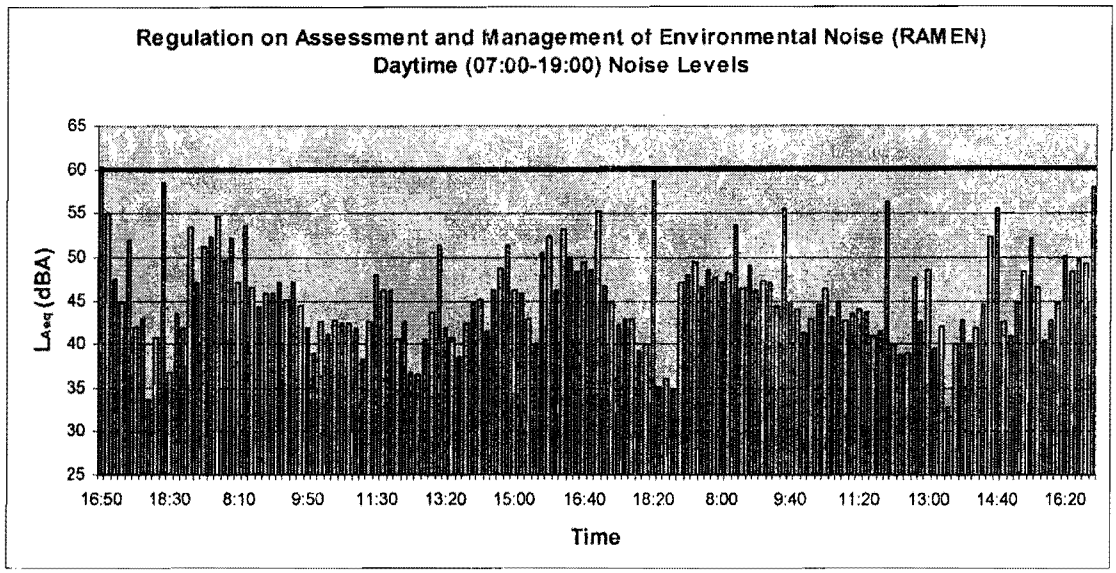


Figure 4-10 Daytime Background Noise Measurement Results compared to Turkish RAMEN

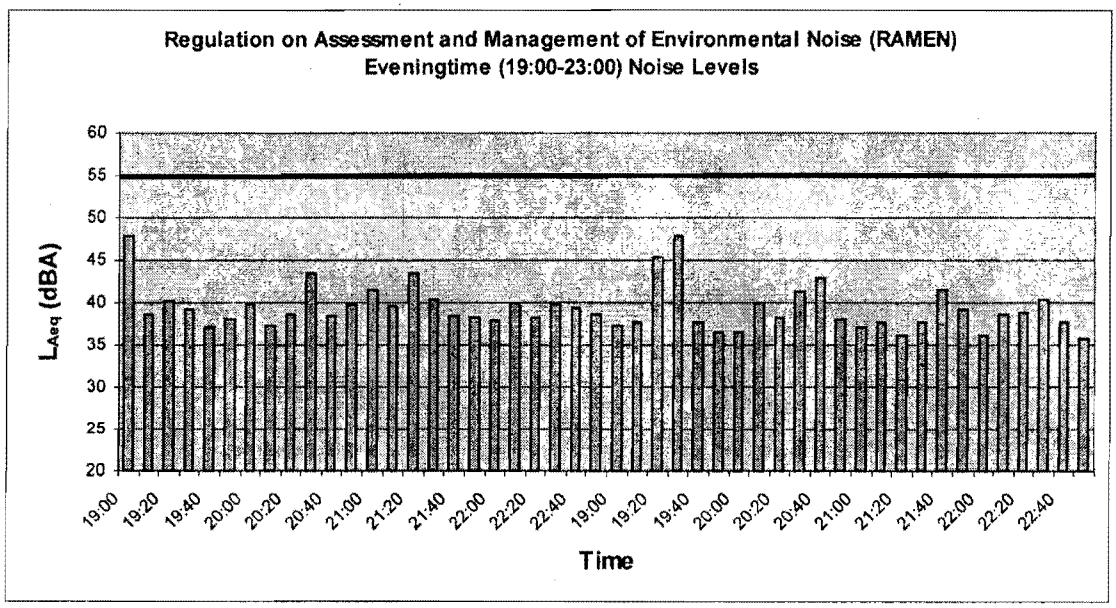


Figure 4-11 Eveningtime Background Noise Measurement Results compared to Turkish RAMEN

Nighttime

The results of the nighttime background noise measurements are compared with the Turkish RAMEN. The night noise measurement results (L_{Aeq}) and RAMEN limit of 50 dBA are plotted and shown in Figure 4-12.

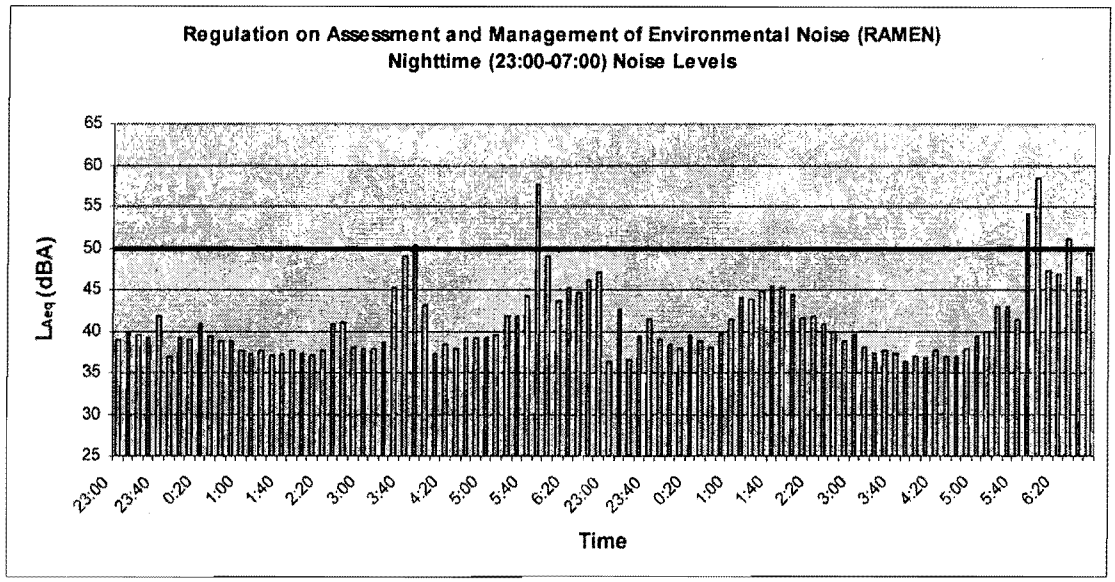


Figure 4-12 Nighttime Background Noise Measurement Results compared to Turkish RAMEN

Background noise level measurements performed between 23:00 and 07:00 at the NSR shows that nighttime background noise levels at the receptor are below the RAMEN evening time limit of 50 dBA as in the case of daytime and evening time measurements. There only four observations during nighttime background noise level measurements at the NSR that exceed the limit value.

4.4.4 Relationship between Wind Speed and Background Noise Level

In the absence of noise emitting activities, wind blowing at high speeds is the dominant parameter affecting the background noise levels in rural areas. In order to understand the effect of wind speed on background noise levels, 48-hr continuous wind direction and wind speed measurements at 10 m height above ground level were performed simultaneously with the noise level measurements. The wind rose according to the 48-hr wind measurement is given in Figure 4-13 below.

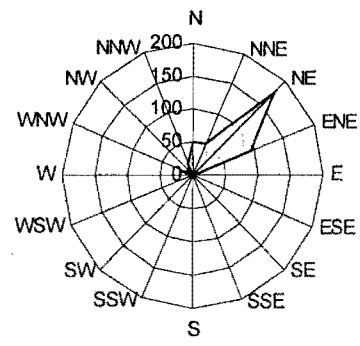


Figure 4-13 Wind Rose observed during Noise Survey

The wind rose provided above shows that prevailing wind direction was northeast (NE) during the 48-hr wind measurement period. Wind was blown 178 times from NE and 98 times from ENE. In

order to understand whether results of the 48-hr wind measurement represent seasonal, annual or long term wind pattern at the Project site, wind data measured by on site Wind Mast was acquired. Wind rose was drawn from the wind data of Wind Mast measured between January and December 2008 and shown in Figure 4-14 below.

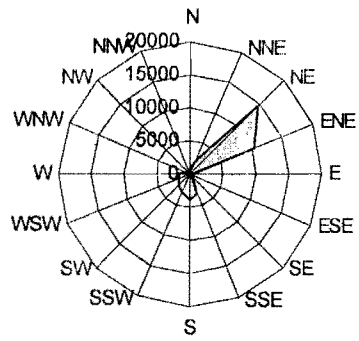


Figure 4-14 Wind Rose Drawn From 6 Months Wind Data of Wind Mast

As can be seen from the figure above, the 48-hr wind measurement results show similar wind direction characteristics with the 6-month wind measurement results of Wind Mast. The prevailing wind direction in both wind roses is northeast (NE).

4.5 Geology

4.5.1 Regional Geology

The Biga Peninsula comprises the Edremit Graben, which is one of the largest east-west trending, offshore grabens of the western Anatolia with its 80 km long and 20 km wide. The northern margin of the graben is bounded by the Kazdağ Mountain, rising steeply from sea level to over than 1000 meter and the southern margin has a more subdued topography where the coastline displays bays and inlets (Yılmaz, Y., 2000).

Genarale Directorate of Mineral Research and Exploration (MTA) reports explain Paleozoic aged metamorphic series, Mesozoic aged limestones, Tertiary aged detritic and lacustrine formations and Quaternary aged alluvials in the region. In addition to these units, Late Eocene aged intrusives, Miocene aged volcanic units and Mesozoic aged ophiolites comprise the rest of the main geological units of the region. Figure 4-15 shows the generalized regional geological map of the Ezine Region that is the western part of the Biga Peninsula (MTA, 2002).

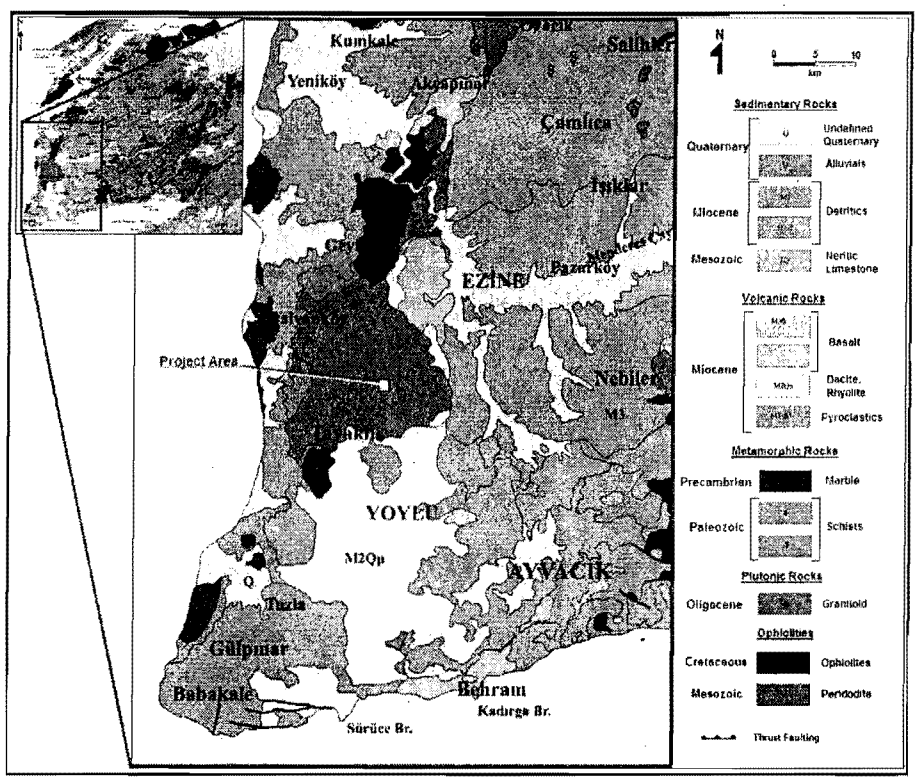


Figure 4-15 Regional Geological Map of the Biga Peninsula

(Source: Modified from MTA, 2002)

Paleozoic – Mesozoic Series

The main topographic feature of the region is the Kazdağ Mountain, which has the Horst form. Along this horst, basement metamorphic rocks of Paleozoic - Triassic age are exposed (Bingöl, 1973). The basement metamorphics include high-grade gneisses, schists, migmatites, metagabbros and low-grade phyllites, marbles and recrystallized limestones. Some contact-metamorphic rocks may be observed at the contact zones of large plutonic intrusives. Mineral arrangements can be classified mainly as quartz and mica schists in the schist series (Kalafatçıoğlu, A., 1963).

On the other hand, carbonates form the top rock group of the Permian-Triassic aged formations, which overlies the metamorphic schists unconformably in the region. This lithology is followed by the first brown-colored hard sandstone and massive crystalline limestone, presenting barely bedding but sometimes containing thin bands of shale. These limestones are followed by another limestones which are overlain by flysch sediments of marls, clays, limestones and sandstones that contain intercalations of ophiolitic series.

Limestones of similar facies, overlying metamorphic schists, but isolated from each other, have also been regarded of Permian – Triassic Epoch.

Tertiary (Cenozoic) Series

The Western Anatolia Region has been characterized by extensive magmatic activity that occurred during Late Eocene to Late Miocene Epoch. Plutonic rocks were emplaced into the metamorphic rocks from Paleogene to Neogene, the Karaköy-Evciler and Kestanbol Plutons, where the proposed wind turbines are located. This magmatic activity has been controlled by the regional tectonic evolution, resulted in coeval plutonism and volcanism with alkaline to calk-alkaline features (Yılmaz, Y., 2000).

Furthermore, Delaloye and Bingöl (2000) argue that the area has two large groups of granitoid units. The first group is comprised of young granitoids (From Late Cretaceous to Late Miocene) mainly distributed in the western part and the second unit consists of older granitoids (From Pre-Ordovician to Late Jurassic) concentrated in a belt in the northwestern and northern Anatolia. Also Permian aged granitoid units, which had affected Lower Paleozoic and Permian limestones by contact metamorphism were argued by Kalafatçıoğlu (1963).

A red-colored conglomerate with a thickness of 30 m forms the base rock group of the Eocene formations. A gray-colored conglomerate of approximately similar thickness overlies this formation, which is overlain by fossiliferrous limestones, consists of numerous organic shell fragments set in a cryptocrystalline and opaque matrix.

Neogene formations, which consist of sandstones, clays, marls, limestones, conglomerates, sands, tuffs and sandy limestones with beds of varying amounts of thicknesses, are usually found to be in horizontal bedding.

At Kızıltepe and to the NE of Pınarbaşı, sediments of Neogene are overlain by olivine-basalts, which are overlain by laminated limestone beds. At many localities, especially to the north of the area, volcanic rocks and sediments of Neogene age are found in forms of interbeddings. The young effusive rocks of the area are represented by andesites, dacites, basalts and tuffs. Intermediate lavas are intercalated with the sediments; they are lava flows, flow breccias and lahar breccias and accumulated along the northeast-southwest orientad faults. These belong to the post-tectonic phase and are mainly of Tertiary age. In the east of Ezine, much altered hornblende- andesites are found intermingled with tuffs and agglomerates

Quaternary (Cenozoic) Series

According to the previous studies, marine Quaternary sediments around the Sea of Marmara and Dardanelles were recorded. On platforms around Çanakkale, many fossils were identified and are believed to be the relatives of the present day dwellers of the Mediterranean (Kalafatçıoğlu, A., 1963).

Quaternary aged large alluvial flats cover wide areas of both flanks of Küçük Menderes River. There are also important alluvial deposits on the north of Geyikli.

Many researchers studied in the region and various theses were argued about magmatic intrusives that are overlain by recent sedimentary units and older metamorphic rocks occur in the region.

Tectonics and Paleogeography

The Edremit Graben area is close to the area of influence of the North Anatolian Transform Fault Zone (NAFZ). This transform fault zone, which splits into several strands in northwest Anatolia, has mini faults that trend toward the Edremit Graben.

The study area has been affected by the phases of Hercynian and Alpine orogenies. Rocks of the metamorphic series constitute the oldest tectonic unit of this area. The stratigraphically lowest portions of this metamorphic series are exposed on Kaz Dağı (Kazdağı Horst), southeast of the area. In this case, the south of the area has probably suffered a Caledonian orogeny. The metamorphic rocks are rather intensely folded along NNE-SSW-oriented axes (Kalafatçıoğlu, A., 1963).

The metamorphic series has first been folded by the early Varistic phase. This was followed by marine invasion during the Permian. The average strike direction of Permian strata is also NE-SW. They generally dip SE at 40-70 degrees. Once again, towards the end of Permian, the area was uplifted above the sea level. This was followed by the intrusions of ophiolites and acid igneous rocks, No Triassic, Jurassic or Cretaceous strata have been seen within the study area, though formations of these periods are known to exist in the neighboring areas. The Permian stratum is overlain by the basal conglomerates of marine Eocene. Following the Laramian orogenic phase, during the Lutetian, the area was once again covered by the sea. With the Post-Eocene tectonic movements the sea was completely withdrawn, which was followed by the most intensive tectonic phase (Pyrenean phase) of the Alpine orogeny.

4.5.2 Local Geology

Plutonic intrusives were emplaced into the metamorphic rocks during Neogene, the Karaköy-Evciler and Kestanbolu Plutons, isotopically dated at 25 Ma. The plutons are elliptical magmatic bodies that composed mainly of granodiorites and diorites enveloped by fine textured and volcanic rocks of similar compositions (Yılmaz et al, 2000). Figure 4-16 shows the local geology of the Project site and its vicinity.

The Kestanbol Granitoid is the main geological unit in southwest of the Ezine Region. The Kestanbol Granitoid, which is located south of Ezine-Çanakkale, is one of the post-collision intrusive units of western Anatolia, which have been related to the collision between Anatolide-Tauride platfortm and Pontides, occurred during the late Cretaceous. Magmatic activity during the early Miocene and this activity form as coeval magmatism from alkaline to calc-alkaline features and was controlled by the regional tectonic evolution. This plutonic unit was emplaced into the regionally metamorphosed basement rocks. In the area, plutonic unit is bordered by volcanic and clastic sedimentary rocks and also major faults. To the south, volcanic and volcano-clastic sedimentary rocks overlie this pluton. The proposed wind turbines are located on plutonic structure (Kestanbol Granitoid), which is located northeast boundary of the Kayacık Village.

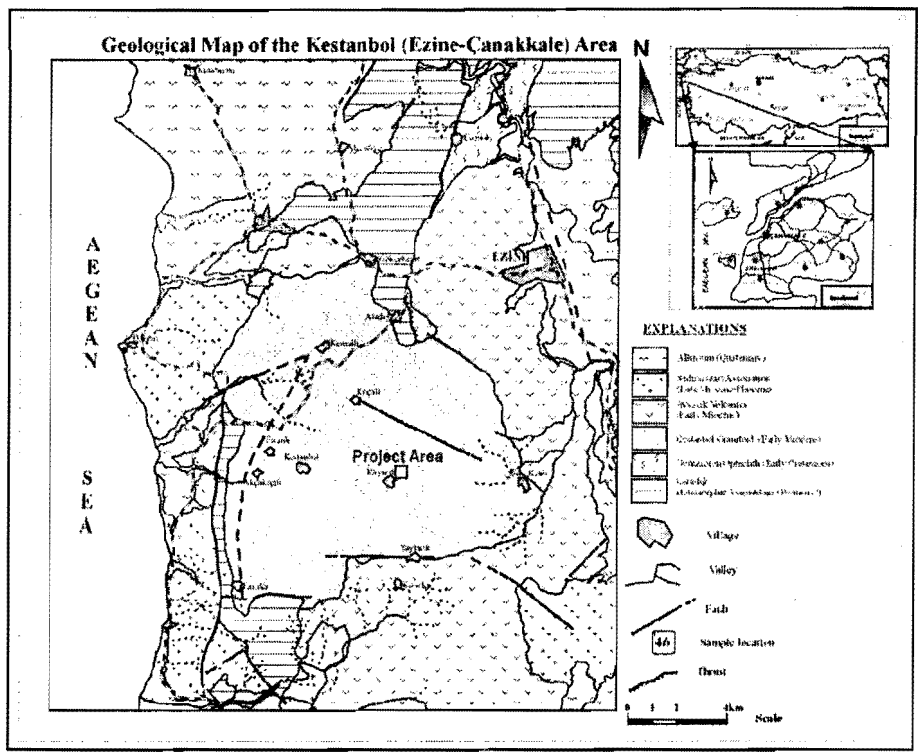


Figure 4-16 Local Geological Map of the Project Site and its Close Vicinity

(Source: Modified from Şahin, S.Y., 2007)

The Kestanbol granitoid covers an area of 200 km^2 to the southeast of Ezine, and is emplaced into the regionally metamorphosed basement rocks. The pluton is lithologically made up of monzonitic rocks and crosscut by a set of dykes of aplite, pegmatite, lamprophyre and latite porphyry. The plutonic rocks pass gradually into fine-textured porphyritic volcanic rocks. These are rhyolite, rhyodacite and dacite, and andesitic and trachyandesitic pyroclastic rocks (Şahin, S.Y., 2007).

4.6 Tectonics and Structural Geology

Different types of lithologies overlay in Biga Peninsula. Tectonic activity of Biga Peninsula is controlled by North Anatolian Fault System. Ezine Town of Çanakkale Province is under the effects of southwest part of the North Anatolian Fault System. The region is characterized by northeast-southwest trending strike slip and thrust fault zones. The best known fault zones near the Project site are Ezine-Etili and Yenice-Gönen Fault Zones located in the southeast of Ezine Town, Çan-Biga and Sarıköy Fault Zones located in the east of the Project site, and Saros-Gaziköy Fault Zone located in the north of the Project area. Figure 4-17 shows the main active faults at the Project site and its vicinity.

Ezine-Etili Fault Zone

Ezine-Etili Fault is a type of strike-slip fault, which is 40 km long in north-south trending. This fault has an earthquake risk, which might have a magnitude capacity between 6.5 and 7.0. The biggest earthquake with a magnitude of 5.0 had occurred in this zone in the year of 1972 (Demirci, A., 2007).

Çan-Biga Fault Zone

The fault is characterized by a group of northeast-southwest trending, parallel, strike-slip faults having different lengths (2-25 km). The biggest earthquake with a magnitude of 6.3 happened in 1953 (Demirci, A., 2007).

Sarıköy Fault Zone

The fault is a type of strike-slip fault, which is 60 km long in northeast-southwest trending. The biggest earthquake with magnitude of 4.9 happened in 1983 (Demirci, A., 2007).

Saros-Gaziköy Fault Zone

Saros-Gaziköy Fault is generally known as the northern arm of the NAF system. The fault extends towards the west through the Lake Sapanca, İzmit bay and Northern Marmara, and reaches to the Northern Aegean through the Saros Bay (Herece, E., 1990). The earthquake which has the greatest magnitude was measured 7.4 in 1905 (Demirci, A., 2007).

Yenice-Gönen Fault Zone

Yenice-Gönen Fault lies between the northeast and southwest direction with a length of 55 km. The biggest earthquake occurred in the area between Yenice and Gönen on March 18, 1953. The epicenter of the earthquake was in 12 km east of Yenice and the magnitude of the earthquake was 7.4 (Herece, E., 1990).

4.6.1 Seismicity

Çanakkale City and the Project area are located in the 1st Degree Seismic Zone according to the earthquake zones determined by the General Directorate of Disaster Affairs (GDDA) (see Figure 4-18). The Project site can be considered tectonically very active. There are a significant number of faults in this area, which are considered to be tectonically active. These faults constitute the southern flank of the North Anatolian Fault Zone (Herece, E., 1990).

The Region has experienced courses of major earthquakes which had magnitudes ranging between 3 and 7.9 throughout the history (Figure 4-19 and Figure 4-20). Historical earthquake data for the great magnitudes are listed in Table 4-4.

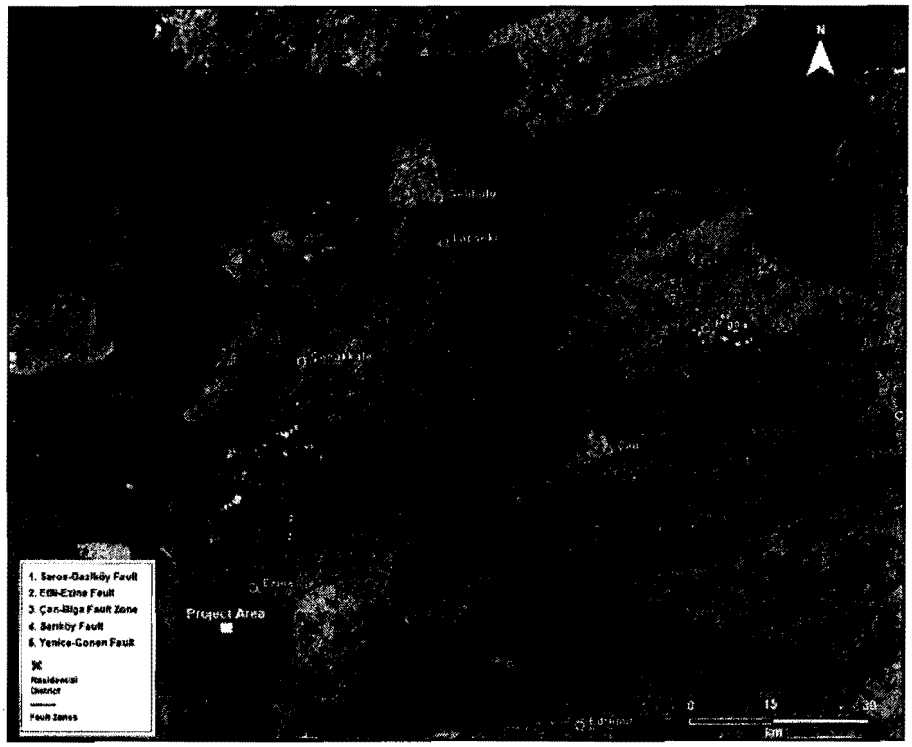


Figure 4-17 Main Active Faults around the Project Site

(Source: Modified from Google Earth, 2009)

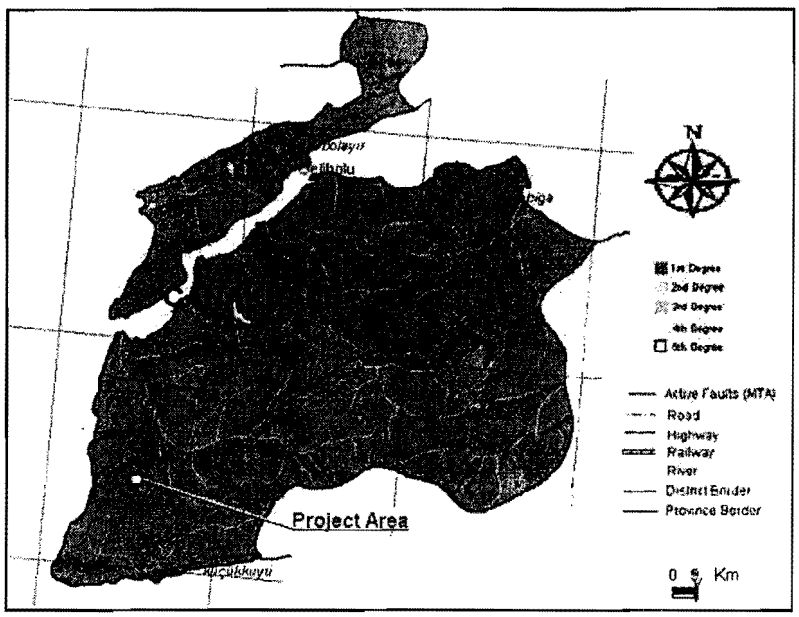


Figure 4-18 Earthquake Zone Map of Çanakkale Province

(Source: GDDA, 2009)

Table 4-4 Earthquake History for the Main Fault Zones

(Source: Demirci, A., 2007)

Date	Fault Zone	Epicenter Coordinates (Degrees, Lat-Long)	Focal Depth (Km)	Magnitude
8-Nov-1905	Saroz-Gaziköy	40.30-24.40	14	7.4
9-Aug-1912	Saroz-Gaziköy	40.60-27.20	16	7.3
10-Aug-1912	Saroz-Gaziköy	40.60-27.10	15	6.3
13-Sep-1912	Çan-Biga	40.10-26.80	15	6.9
4-Apr-1935	Sarıköy	40.30-27.45	20	6.3
18-Mar-1953	Yenice-Gönen	39.99-27.36	10	7.4
3-Mar-1969	Yenice-Gönen	40.08-27.50	6	5.7
26-Apr-1972	Ezine-Etili	39.50-26.30	25	5.0
5-Jul-1983	Çan-Biga	40.33-27.12	7	4.9

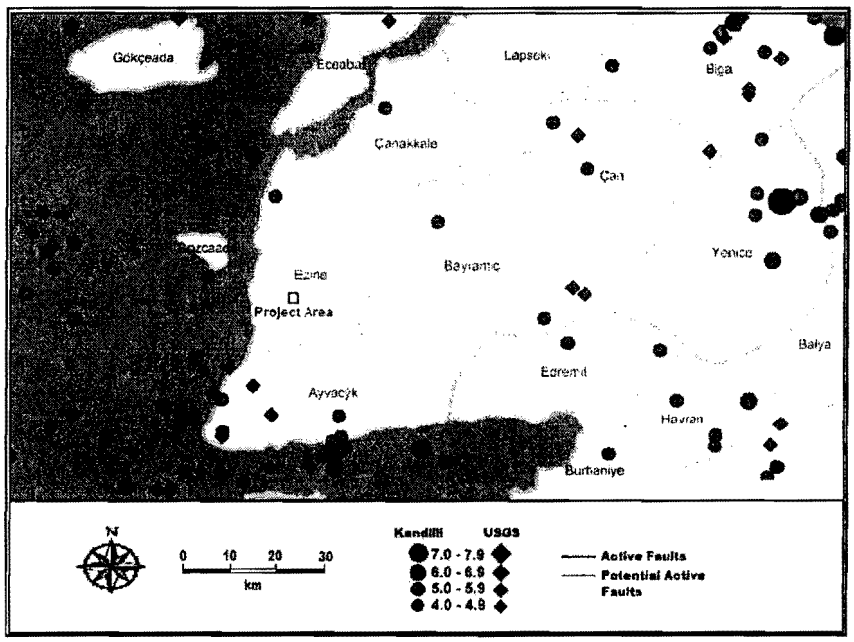


Figure 4-19 Distribution of Earthquakes with Magnitudes 4.0 or Higher Since the 20th Century

(Source: Sayısalgrafik, 2009)

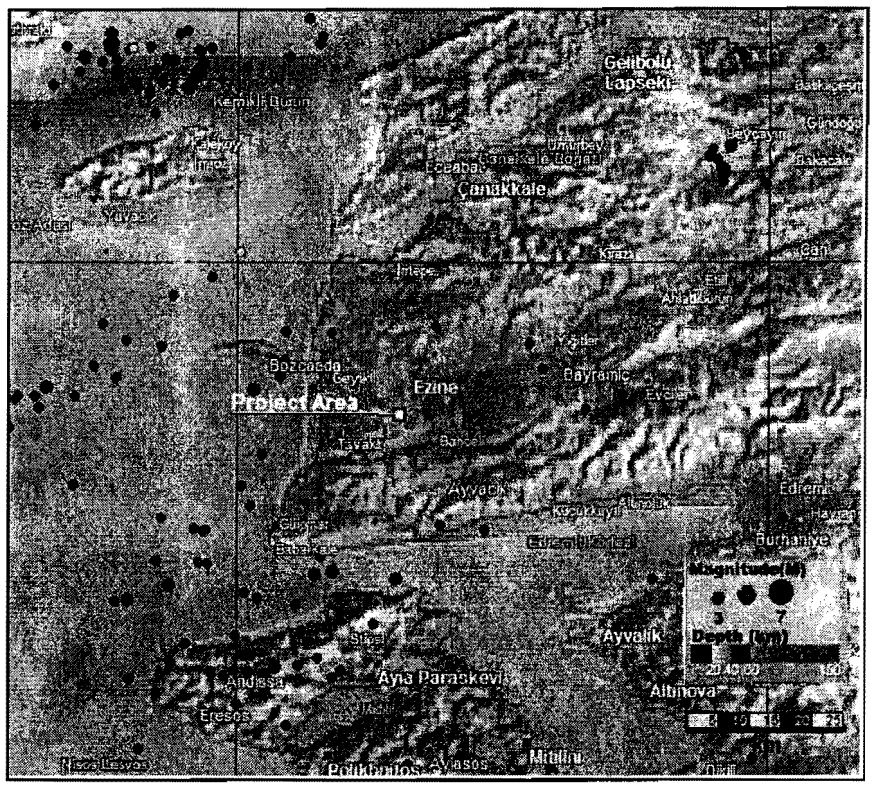


Figure 4-20 Earthquakes in the Last Year with Magnitudes Ranging from 3.0 and 7.0
(Source: Kandilli, 2009)

4.7 Hydrology and Hydrogeology

4.7.1 Surface Water

The Proposed wind turbines lie between the two sub basins of the Scattered Aegean Waters Basin (Müteferrik Ege Suları Havzası); West Bagin and North Aegean Basin (Figure 4-21). These following settlements: Ezine, Bayramiç, Truva (Troya), south of Çanakkale City, Geyikli, Kayacık, Edremit and Ayvalık lie within the these two sub basins. Proposed three wind turbines (T-7, T-8 and T-9) are located in the West Basin and other proposed turbines are located in the North Aegean Basin.

The main surface waters of North Aegean Basin are the Karamenderes River and its tributaries, which are namely Ilıca Creek, Kocadere Creek, Aydıncık Creek and Dümrek Creek. The Karamenderes River takes its name after small creeks that originate from the piedmont of Mt. Kaz, passing through the Bayramiç and Ezine Town and discharges into the Aegean Sea after passing through Truva and the south of Çanakkale city center. The Karamenderes River is fed by numerous tributary flows through Mt. Kaz. Figure 4-22 shows North Aegean Basin together with the surface water courses, dams and gauging stations. Furthermore, the main surface water of West Basin is the Tuzla Creek. The Tuzla Creek takes its name after small creeks that originate from the piedmont of Mt. Çalı, passing through the Ayvacık and discharges into the Aegean Sea. The Tuzla Creek is fed by

numerous tributary flows through the south of Biga Peninsula. Figure 4-23 shows West Basin together with the surface water courses, dams and gauging stations. Table 4-5 provides detailed information on DSI gauging stations.

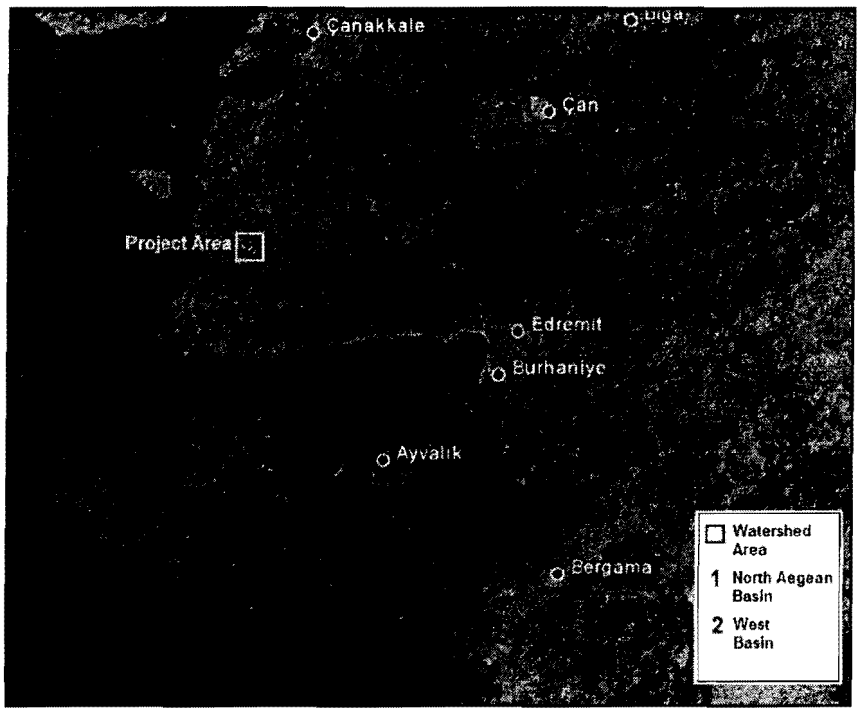


Figure 4-21 Basins in the Region

(Source: Modified from Google Earth, 2009)

Table 4-5 Detailed Information on DSI Gauging Stations

Stream	Gauging Station number (AGI)	Drainage Area (km^2)	Maximum Monthly Flow (m^3/s) / Month
Ilica Creek	4-41	50.80	
Kocadere Creek	4-35	41.10	
Karamenderes (EIE)	4-07	-	
Tuzla Creek	4-11	157.00	6.8 / February
Tuzla Creek	4-28	173.30	4.57 / February
Tuzla Creek	4-32	312.50	5.83 / February

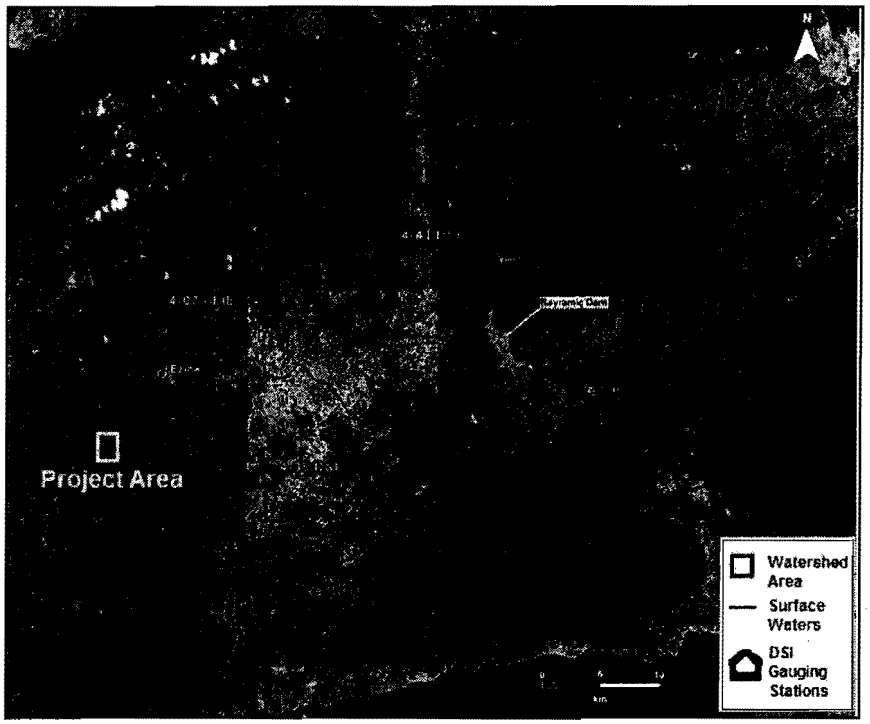


Figure 4-22 DSI Gauging Stations in the North Aegean Basin on Topographic View

(Source: Modified from Google Earth, 2009)

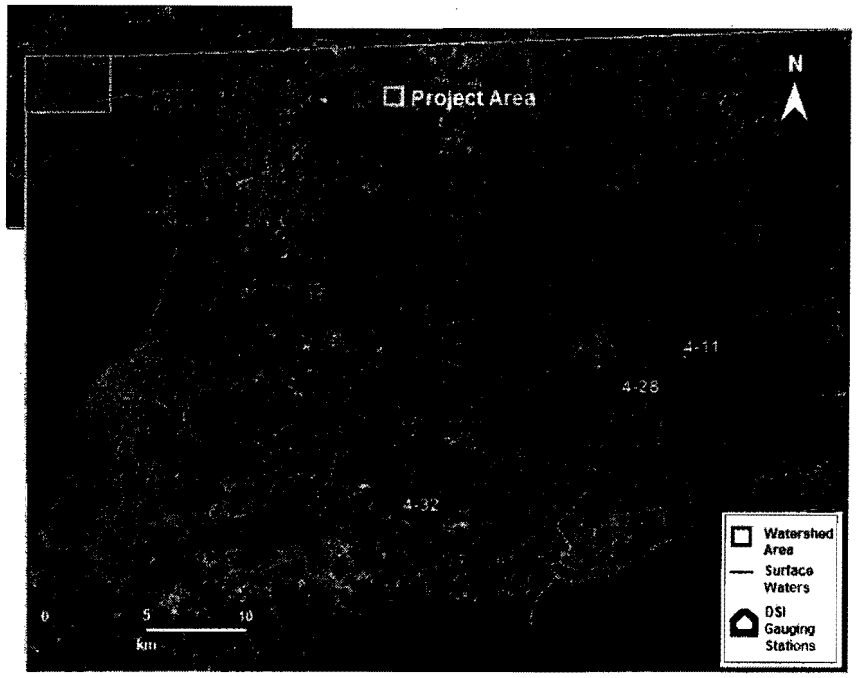


Figure 4-23 DSI Gauging Stations in the West Basin on Topographic View

(Modified from Google Earth, 2009)

4.7.2 Springs

Geothermal activities are controlled by thrust faults and strike-slip fault systems of Biga Peninsula. One of the geothermal fields in Biga Peninsula is Palamutova (Bayramiç) geothermal field which is located in Palamutova Village in 12 km northwest of Bayramiç Town. This hot spring comes out to the surface passing through the strike-slip fault zones. The average discharge of thermal water in Palamutova field is 0.3 l/s and the surface temperature of the spring ranges from 31 to 34°C. The catchment area of the spring is about 99 km^2 (Şanlıyüksel, D., 2007).

Another important geothermal field in the region is Kestanbol (Ezine) geothermal field. The highest measured temperature observed in the Kestanbol (Ezine) field is 75°C in the depth of 290 m. This field has two hot springs. Both springs were discovered by MTA (The General Directorate of Mineral Research and Exploration) in 1975. The average discharge of thermal water in Kestanbol field was measured as 25 l/s.

Külcüler (Mt. Kaz - Bayramiç) geothermal field located in Külcüler Village in 3 km southwest of Bayramiç Town can also be considered as an important geothermal field. Külcüler field is identified by three hot springs. The highest measured temperature observed in the Külcüler field is 35°C and the average discharge rate is 1 l/s (MTA, 1975).

Also, other geothermal fields are located around Ayvacık and Tuzla Village. One of the geothermal fields is Ayvacık spring. This spring comes out to the surface passing through the fault zones. The average discharge of thermal water in Ayvacık field is 3.7l /s and the surface temperature of the spring ranges from 51 to 97°C.

4.7.3 Groundwater and Wells

Groundwater reservoir of Çanakkale Province was reported as 66.5 hm^3/year (Ref.: Provincial Environmental Report of Çanakkale Province, prepared by Çanakkale Provincial Department of Environment and Forestry, 2007). Nearly all of this groundwater is discharged by the wells in the agricultural zones, again according to Provincial Environmental Report of Çanakkale Province.

According to the DSI records, there are 18 investigation and production wells in the portion of two basins where the Project area is included. These numbers do not include the private wells in the region (both registered and unregistered). The water bearing geological units are comprised of clay, sand, gravel, conglomerate and limestone and also volcanics and pyroclastics like tuff, basalt and ophiolites. The average depth of these wells is 133 m of which the shallowest one is 31 m and the deepest is 745 m. The average yield of the wells is 13.08 l/s. Well 37202 which lies to the southeast of the Project site has the highest yield of 31 l/s. Table 4-6 gives detailed information about the registered DSI wells in the basin. Total average yield of these wells is 13.08 l/sec.

Table 4-6 Records of DSI Wells

Well ID	Well Name	Town	Easting	Northing	Total Depth (m)	General Aquifer Lithology	Yield (l/s)
8257	Türkmenli	Bayramiç	454975	4404375	76	Intercalation between clay and gravel	15.50
37202	Orman Fidanlığı	Ezine	442750	4408725	70	Clay and sand	31.00
55687	Ezine-Karadağ	Ezine	439625	4407650	106	Tuff, sandstone, ophiolite, amphibolite	-
55870	Ezine-Çamköy	Ezine	439425	4409250	100	Limestone, schist	17.00
8256	Ezine Merkez	Ezine	445950	4404025	153	Clay	15.65
8260/A	Pınarbaşı	Ezine	437025	4416650	31	Clay	12.20
8260/B	Pınarbaşı	Ezine	437025	4416650	113	Clay with gravel	8.10
55960	Çamoba	Ezine	430540	4410280	160	Conglomerate and gravelstone	12.00
8259	Geyikli	Ezine	431075	4408850	152	Gravel	7.10
55687	Karadağ	Ezine	439625	4407650	106	Sandstone and ophiolite	-
55311	Gökçebayır	Ezine	437175	4404500	745	Conglomerate and limestone	27.12
55995	Kemalli	Ezine	435150	4401250	52	Granite	9.00
37450	Kumkale Tarım İşletmesi	Merkez	439350	4419150	63	Clay, Sand and Gravel	9.08
53868	Merkez Cezaevi	Merkez	452050	4404430	-	-	6.00
55961	Merkez Dümrek	Merkez	441125	4425275	80	Clay, conglomerate, sand and limestone	4.00
55962	Merkez Akçapınar	Merkez	441750	4420425	80	Basalt	-
55963	Merkez Tevfikiye	Merkez	436200	4423100	100	Clay, limestone, marl, sand and siltstone	10.10
56637	Merkez Çıplak	Merkez	436275	4423350	82	Clay and sandstone	12.30

4.8 Flora

Methodology

In order to determine the flora species within the Project site and its vicinity, a site survey was conducted within the scope of the Project Description Report (PDR) in July 2008 by a local consultancy company. Flora inventory was prepared by AECOM using the results of the site survey, literature studies and referencing floristic studies of the similar ecological characteristics. Flora inventory, conservation status of flora species, any risk related to them are presented in this section.

As a result of the survey and literature studies, an inventory of flora species identified on Project site is prepared and presented in Table 4-7. The flora species in the table are listed in alphabetical order. The flora table presents the family, scientific name, Turkish name, common name, endemism, relative abundance, and conservation status according to International Union for Conservation of Nature's (IUCN) Red List of Threatened Species and Bern Convention. In order to determine conservation status of the identified flora species "Red Data Book of Turkish Plants" (Ekim *et al.*, 2000) that is published by Turkish Association for the Conservation of Nature (*Türkiye Tabiatını Koruma Derneği*) and Turkish Taxonomic Species Data Base prepared by TUBITAK was utilized. The categories of conservation status according to Red Data Book are as follows:

EX: Extinct
EW: Extinct In The Wild
CR: Critically Endangered
EN: Endangered
VU: Vulnerable
NT: Near Threatened
LC: Least Concern
DD: Data Deficient
NE: Not Evaluated

Vegetation

Dominant vegetation type in the Çanakkale Province and in the Project site and its vicinity is assessed in this part. A total of 55% of the land is covered by forest in Çanakkale Province. The remaining parts are meadow and pasture land. In the forest areas, mixed types of trees exist. Dominant tree species in the forest areas are calabrian pine, black pine, fir tree, oak and beech. Dense forest area exists through the Kaz Mountain. Agricultural lands and meadows exist in the inner part of the province.

According to the vegetation map prepared by the Çanakkale Regional Directorate of Forestry (Official Website, 2009), Anatolian Oak (Vallonea Oak, *Quercus ithaburensis ssp. macrolepis*) and Turkish pine (*Pinus brutia*) dominates in the region where Project site is located. The natural vegetation map of the Çanakkale Province is shown in Figure 4-24.

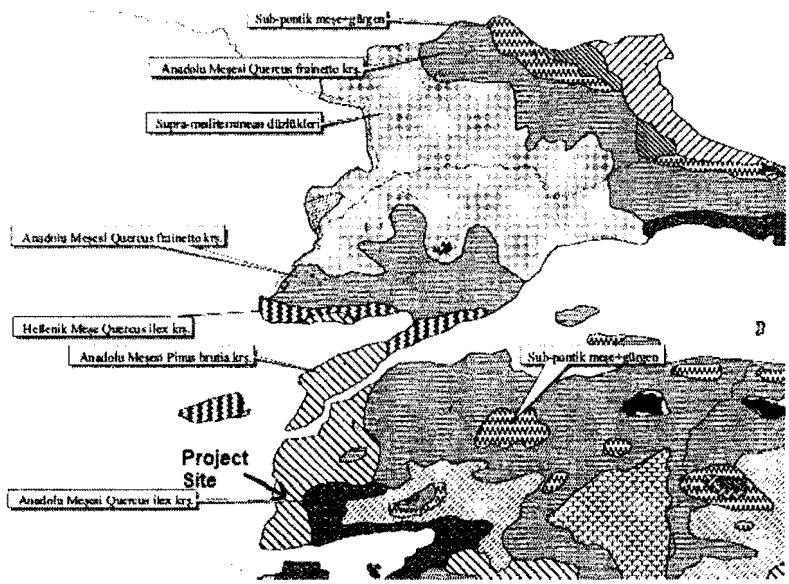


Figure 4-24 Natural Vegetation Map

(Source: Official Website of Canakkale Regional Directorate of Forestry)

According to 1/5,000 and 1/25,000 scaled topographic maps, the Project site is located mainly in the forest area. However, during the site visit, it was observed that the site is dominantly covered by maquis shrubs and a part of the Project site is covered with the rocks. The general view of the Project site is given in Figure 4-25.

Figure 4-25 General View of the Project Site

Floristic Analysis

As described in the methodology section, the flora table is prepared using the results of the site survey, literature studies and referencing floristic studies of the similar ecological characteristics. As a result of this inventory study, 327 species belonging to 52 families are identified in the Project area and its vicinity. Flora inventory is provided in Table 4-7.

As a result of this study, no threatened or endangered flora species were determined in the Project area in accordance with the Red Data Book (IUCN) and Bern Convention. Among these species, *Thymus atticus* is classified as VU (vulnerable) and *Colchicum burttii* is classified as LC (Least concern) and endemic according to the Red Data Book of Turkish Plants. Although *Colchicum burttii* is endemic, it is abundant in Western and Central Anatolian according to the official website of Turkish Plants Data Service (TUBIVES).

Table 4-7 Flora Species

Scientific Name	Turkish Name	Common Name	RDB* (IUCN)	BERN	Endemism
Aceraceae					
Acer campestre subsp. campestre	Akçaağaç	Field Maple	NE	-	-
Anacardiaceae					
Pistacia terebinthus subsp. palaestina	Menengiç	Terebinth	NE	-	-
Apiaceae					
Ammi visnaga	Diş otu (Kürdan)	Toothpickweed	NE	-	-
Anthriscus caucalis		Burr chervil	NE	-	-
Biforia testiculata			NE	-	-
Bupleurum flavum			NE	-	-
Bupleurum intermedium			NE	-	-
Bupleurum odontites		Narrowleaf thorow wax	NE	-	-
Bupleurum trichopodum			NE	-	-
Caucalis platycarpos	Küçük pıtrak	Carrot bur parsley	NE	-	-
Daucus guttatus			NE	-	-

Scientific Name	Turkish Name	Common Name	RDB* (IUCN)	BERN	Endemism
Eryngium campestre var. campestre	Boğa dikeni	Sea holy	NE	-	-
Eryngium creticum	Kaz ayağı		NE	-	-
Ferulago sylvatica			NE	-	-
Foeniculum vulgare	Rezene	Bronze fennel	NE	-	-
Hippomarathrum cristatum			NE	-	-
Lagoecia cuminoides			NE	-	-
Opopanax hispidus	Sarıot (Kaymakotu)		NE	-	-
Orlaya daucoides			NE	-	-
Scandix australis subsp. grandiflora			NE	-	-
Scandix pecten-veneris	Çoban tarağı	Shepherd's-needle	NE	-	-
Smyrnium olusatrum	Yabani kereviz	Alexanders	NE	-	-
Tordylium aegaeum			NE	-	-
Tordylium apulum	Küçük geyikotu	Mediterranean hartwort	NE	-	-
Torilis arvensis subsp. arvensis			NE	-	-
Torilis leptophylla			NE	-	-
Turgenia latifolia	Pıtrak	Broadleaf false carrot	NE	-	-
Araceae					
Dracunculus vulgaris	Yılan yastığı	Dragon arum	NE	-	-
Aristolochiaceae					
Aristolochia hirta	Acı kök-Develi otu	Birthwort	NE	-	-
Aspidiaceae					
Polystichum setiferum		Soft shield fern	NE	-	-
Asteraceae					
Aetheorhiza bulbosa subsp. microcephala			NE	-	-
Anthemis altissima		Tall chamomile	NE	-	-
Anthemis auriculata	İzmir papatyası	Australian chamomile	NE	-	-
Anthemis austriaca		Austrian chamomile	NE	-	-
Anthemis pseudocotula			NE	-	-
Anthemis tinctoria var. tinctoria			NE	-	-
Calendula arvensis	Aynısafa çiçeği (nergis)	Field marigold.	NE	-	-
Carduus nutans subsp. leiophyllus			NE	-	-
Carduus pycnocephalus subsp. pycnocephalus			NE	-	-
Carlina corymbosa		Corymbose carline thistle	NE	-	-
Carlina lanata	Keygana	Woolly carline thistle	NE	-	-
Carthamus dentatus	Aspir		NE	-	-
Centaurea cyanus	Peygamber çiçeği	Cornflower	NE	-	-
Centaurea diffusa	Zerdali dikeni	Diffuse knapweed	NE	-	-
Centaurea iberica	Deligöz dikeni	Iberian starthistle	NE	-	-
Centaurea salonitana			NE	-	-
Centaurea solstitialis L. subsp.	Güneş çiçeği	Yellow star-	NE	-	-
Cichorium intybus L.	Hindiba	Chicory	NE	-	-
Crepis micrantha			NE	-	-
Echinops microcephalus			NE	-	-
Echinops nitro	Küre deve dikeni	Globe Thistle	NE	-	-
Evax pygmea		Pygmy cudweed	NE	-	-

Scientific Name	Turkish Name	Common Name	RDB* (IUCN)	BERN	Endemism
Filago eriocephala	Keçe otu		NE	-	-
Filago pyramidata	Dağ pamuğu	Broad-leaved cudweed	NE	-	-
Hedypnois cretica		Crete weed	NE	-	-
Inula germanica	Andız otu		NE	-	-
Lactuca saligna			NE	-	-
Logfia arvensis			NE	-	-
Notobasis syriaca	Kenger	Syrian Thistle	NE	-	-
Rhagadiolus stellatus var. stellatus			NE	-	-
Senecio vernalis Waldst. et kit.	Kanarya otu	Eastern	NE	-	-
Taraxacum hellenicum			NE	-	-
Taraxacum minimum			NE	-	-
Tragopogon longirostris	Yemlik	Long-Beaked	NE	-	-
Urospermum picroides		Prickly goldenfleece	NE	-	-
Xanthium spinosum	Bıtırak otu	Spiny cocklebur	NE	-	-
Berberidaceae					
Leontice leontopetalum subsp. leontopetalum			NE	-	-
Boraginaceae					
Alkanna tinctoria subsp. tinctoria			NE	-	-
Anchusa azurea var. azurea	Sığır dili	Italian bugloss	NE	-	-
Anchusa undulata subsp. hybrida	Arı çiçeği	Alkanet	NE	-	-
Cynoglossum creticum	Mavi köpek dili	Blue hound's tongue	NE	-	-
Echium plantagineum		Purple viper's bugloss	NE	-	-
Heliotropium hirsutissimum	Bambıl		NE	-	-
Heliotropium supinum		Dwarf heliotrope	NE	-	-
Lithospermum purpurocaeruleum	Taşkesen otu	Purple gromwell	NE	-	-
Neatostema apulum		Yellow gromwell	NE	-	-
Nonea ventricosa			NE	-	-
Onosma aucheranum	Emzik otu		NE	-	-
Brassicaceae					
Arabidopsis thaliana		Thale cress	NE	-	-
Brassica nigra	Hardal	Black mustard	NE	-	-
Calepina irregularis		White ballmustard	NE	-	-
Capsella bursa-pastoris (L.)	Oban Çantası	Little Hogweed	NE	-	-
Clypeola jonthlaspi			NE	-	-
Conringia orientalis	Andrız	Hare's ear mustard	NE	-	-
Erophila verna subsp. verna			NE	-	-
Erysimum repandum	Pekmez hardalı	Spreading wallflowe	NE	-	-
Hirschfeldia incana		Shortpod mustard	NE	-	-
Hutchinsia petraea			NE	-	-
Raphanus raphanistrum	Yaban turbu	White charlock	NE	-	-
Sinapis arvensis	Yabani hardal	Wild mustard	NE	-	-
Sisymbrium altissimum	Süpürge otu	Tall mustard	NE	-	-
Sisymbrium officinale	Bülbül otu	Hedge mustard	NE	-	-
Sisymbrium orientale		Indian hedge mustard	NE	-	-
Campanulaceae					
Asyneuma limonifolium subsp. limonifolium			NE	-	-
Campanula delicatula	Çan çiçeği	Bellflower	NE	-	-
Legousia pentagonia	Kadınaynası		NE	-	-

Scientific Name	Turkish Name	Common Name	RDB* (IUCN)	BERN	Endemism
Caryophyllaceae					
Cerastium anomalum			NE	-	-
Minuartia hybrida subsp. hybrida			NE	-	-
Silene colorata	Renkli nakıl	Mediterranean catchfly	NE	-	-
Silene dichotoma subsp. dichotoma	Nakıl	Forked catchfly	NE	-	-
Silene gallica	"	Small flowered catchfly	NE	-	-
Chenopodiaceae					
Chenopodium ambrosioides			NE	-	-
Cistaceae					
Cistus creticus	Tüylü laden	Cistus	NE	-	-
Cistus salviifolius	Adaçayı yapraklı laden	Salvia cistus	NE	-	-
Fumana arabica var. arabica	Arap kayagülü	Arabian cistus	NE	-	-
Helianthemum salicifolium	söğüt yapraklı güneşgülü	Willowleaf frostweed	NE	-	-
Crassulaceae					
Sedum caespitosum	Damkoruğu	Broad-leaved Stonecrop	NE	-	-
Sedum hispanicum var. hispanicum		Spanish stonecrop	NE	-	-
Cupressaceae					
Juniperus oxycedrus subsp. oxycedrus	Katran ardıcı	Prickly juniper	NE	-	-
Cyperaceae					
Carex distachya var. distachya			NE	-	-
Carex distans			NE	-	-
Eleocharis palustris		Common spike-rush	NE	-	-
Dioscoreaceae					
Tamus communis subsp. communis	Dövülmüş avratotu	Black bryony	NE	-	-
Dipsacaceae					
Pterocephalus plumosus			NE	-	-
Scabiosa argentea	Uyuz otu		NE	-	-
Ericaceae					
Arbutus andrachne	Sandal ağacı	Greek strawberry tree	NE	-	-
Rhododendron luteum	Sarı çiçekli orman gülü	Yellow azalea	NE	-	-
Euphorbiaceae					
Chrozophora tinctoria	Bambul otu	Dyer's Litmus	NE	-	-
Euphorbia falcata L. subsp. falcata L.	Sütleğen	Sickle Spurge	NE	-	-
Euphorbia oblongata	Sütleğen	Eggleaf spurge	NE	-	-
Euphorbia peplus var. minima	"	Petty spurge	NE	-	-
Fabaceae					
Anagyris foetida	Zivircik	Stinking bean trefoil	NE	-	-
Anthyllis hermanniae	Kumtıfılı	Shrubby kidney vetch	NE	-	-
Astragalus hamosus		Dwarf yellow milkvetch	NE	-	-
Astragalus sinaicus	Geven		NE	-	-
Astragalus trojanus	Geven		NE	-	-
Calicotome villosa	Keçi boğan	Hairy thorn broom	NE	-	-
Cercis siliquastrum subsp. siliquastrum	Erguavan	Judas Tree	NE	-	-
Cicer montbretii			NE	-	-
Coronilla scorpioides		Yellow crownvetch	NE	-	-
Dorycnium graecum			NE	-	-

Scientific Name	Turkish Name	Common Name	RDB* (IUCN)	BERN	Endemism
Gonocytisus angulatus			NE	-	-
Lathyrus sphaericus		Grass pea	NE	-	-
Lens ervoides			NE	-	-
Medicago constricta			NE	-	-
Medicago disciformis			NE	-	-
Medicago orbicularis	Düğmeli yonca	Button clover	NE	-	-
Medicago sativa subsp. sativa	Yonca	Alfalfa	NE	-	-
Melilotus indica	Taş yoncası	Sweet clover	NE	-	-
Onobrychis aequidentata	Korunga	Sainfoin	NE	-	-
Onobrychis caput-galli	Korunga	Cockscomb sainfoin	NE	-	-
Onobrychis gracilis			NE	-	-
Ononis ornithopodioides			NE	-	-
Ornithopus compressus		Yellow bird's-foot	NE	-	-
Psoralea bituminosa	Katran yoncası	Pitch trefoil	NE	-	-
Scorpiurus muricatus var. subvillosus		Scorpion's tail	NE	-	-
Trifolium angustifolium var. angustifolium	Üçgül	Narrow clover	NE	-	-
Trifolium campestre	Tırfıl	Hop trefoil	NE	-	-
Trifolium speciosum	"		NE	-	-
Trifolium spumosum	"	Mediterranean clover	NE	-	-
Trifolium stellatum var. stellatum	Yıldızsı üçgül	"	NE	-	-
Trifolium uniflorum	"	One flowered clover	NE	-	-
Trigonella foenum-graecum	Çemen otu	Fenugreek	NE	-	-
Trigonella gladiata			NE	-	-
Vicia narbonensis var. narbonensis	Koca fiğ	Purple broad vetch	NE	-	-
Fagaceae					
Quercus cerris var. cerris	Saçlı meşe	Turkish oak	NE	-	-
Quercus coccifera	Kermes meşesi	Kermes oak	NE	-	-
Quercus frainetto	Macar meşesi	Hungarian oak	NE	-	-
Quercus ilex	Pırnal meşesi	Holm oak	NE	-	-
Quercus ithaburensis subsp. macrolepis	Anadolu palamut meşesi	Anatolian oak	NE	-	-
Quercus pubescens	Tüylü meşe	Downy oak	NE	-	-
Gentianaceae					
Centaurium erythraea subsp. Erythraea	Kırmızı Kantaron	Common centaury	NE	-	-
Centaurium maritimum	Kantaron	Yellow centaury	NE	-	-
Centaurium tenuiflorum subsp. tenuiflorum	"	Slender centaury	NE	-	-
Geraniaceae					
Erodium ciconium	Katır tırnağı	Common stork's bill	NE	-	-
Erodium gruinum		Iranian stork's bill	NE	-	-
Geranium molle L. subsp. molle L.	Kılçıksız	Dovefoot	NE	-	-
Geranium dissectum L.	Turna gagası	Cutleaf Geranium	NE	-	-
Geranium rotundifolium L.		Roundleaf	NE	-	-
Guttiferae					
Hypericum empetrifolium	Kargaüzümü yapraklı kılıç otu	St. John's wort	NE	-	-
Hypericum olympicum	Sarı kantaron otu		NE	-	-
Illecebraceae					
Herniaria hirsuta	Kasık otu	Hairy rupturewort	NE	-	-
Lamiaceae					
Ajuga chamaepitys subsp. chia var. chia	Mayasılotu	Yellow bugle	NE	-	-

Scientific Name	Turkish Name	Common Name	RDB* (IUCN)	BERN	Endemism
Ajuga laxmannii	"	Common bugle	NE	-	-
Ballota acetabulosa			NE	-	-
Lamium moschatum var. moschatum	Ballıbaba	Musk deadnettle	NE	-	-
Lamium purpureum var. purpureum	Eflatun çiçekli ballıbaba	Red deadnettle	NE	-	-
Marrubium peregrinum	Köpek otu	Horehound	NE	-	-
Marrubium vulgare	Köpek otu	White horehound	NE	-	-
Micromeria juliana			NE	-	-
Origanum vulgare subsp. gracile	Keklikotu	Oregano	NE	-	-
Prasium majus	Akdeniz prasiyumu	Mediterranean prasium	NE	-	-
Salvia aethiopis	Yünlü adaçayı	Sage	NE	-	-
Salvia amplexicaulis			NE	-	-
Salvia pinnata			NE	-	-
Sideritis montana subsp. montana		Mountain ironwort	NE	-	-
Teucrium chamaedrys subsp. chamaedrys	Adi kısamahmut	Wall germander	NE	-	-
Thymbra spicata var. spicata	Karabaş kekik	Spiked thymbra	NE	-	-
Thymus atticus			VU	-	-
Ziziphora capitata	Dağ Reyhanı		NE	-	-
Lauraceae					
Laurus nobilis	Akdeniz defnesi	Laurel	NE	-	-
Liliaceae					
Allium amethystinum		Round-headed leek	NE	-	-
Allium cyrilli			NE	-	-
Allium sphaerocephalon subsp. sphaerocephalon		Round-headed leek	NE	-	-
Asparagus acutifolius	Yabani kuşkonmaz	Wild asparagus	NE	-	-
Colchicum bivonae			NE	-	-
Colchicum burttii			LC	-	+
Muscari comosum	Arap sümbülü	Tufted grape hyacinth	NE	-	-
Ornithogalum armeniacum	Tükrükotu	Ornithogalum	NE	-	-
Ornithogalum comosum	"	"	NE	-	-
Ornithogalum fimbriatum	"	"	NE	-	-
Ornithogalum narbonense	"	"	NE	-	-
Ornithogalum nutans	Akyıldız	Star of Bethlehem	NE	-	-
Scilla autumnalis	Yılan soğanı	Autumn Squill	NE	-	-
Linaceae					
Linum austriacum subsp. austriacum		Asian flax	NE	-	-
Linum bienne	Keten	Pale Flax	NE	-	-
Malvaceae					
Althaea hirsuta	Hatmi çiçeği	Rough marsh mallow	NE	-	-
Malope malacoides			NE	-	-
Myrtaceae					
Myrtus communis subsp. communis	Mersin	Common myrtle	NE	-	-
Oleaceae					
Olea europaea L. var. europaea	Zeytin	Olive	NE	-	-
Phillyrea latifolia	Akça kesme		NE	-	-
Orchidaceae					
Anacamptis pyramidalis	Piramit orkide	Pyramidal orchid	NE	-	-
Cephalanthera damasonium		White helleborine	NE	-	-
Cephalanthera epipactoides	Orkide	Orchid	NE	-	-
Dactylorhiza romana subsp. romana	"	Roman	NE	-	-

Scientific Name	Turkish Name	Common Name	RDB* (IUCN)	BERN	Endemism
		dactylorhiza			
Neotinea maculata	"	Dense-flowered orchid	NE	-	-
Ophrys fusca	"	Dark bee orchid	NE	-	-
Ophrys mammosa	Orkide		NE	-	-
Ophrys tenthredinifera	"		NE	-	-
Ophrys umbilicata subsp. umbilicata	"		NE	-	-
Ophrys vernixia subsp. vernixia	"		NE	-	-
Orchis italica	İtalya orkidesi		NE	-	-
Orchis punctulata	Benli orkide		NE	-	-
Orchis simia	Maymun orkidesi	Monkey orchid	NE	-	-
Spiranthes spiralis		Autumn lady's-tresses	NE	-	-
Orobanchaceae					
Orobanche aegyptiaca		Egyptian broomrape	NE	-	-
Orobanche mutelii	Canavarotu	Broomrape	NE	-	-
Papaveraceae					
Fumaria kralikii	Anadolu şehretesi		NE	-	-
Fumaria parviflora		Fineleaf fumitory	NE	-	-
Glaucium corniculatum subsp. corniculatum	Boynuzlu Gelincik	Blackspot hornpoppy	NE	-	-
Hypecoum imberbe		Sicklefruit hypecoum	NE	-	-
Papaver gracile Boiss.	Kara gelincik		NE	-	-
Papaver lacerum			NE	-	-
Papaver rhoeas	Gelincik	Corn poppy	NE	-	-
Roemeria hybrida			NE	-	-
Pinaceae					
Pinus nigra Arn. subsp.	Kara Ağaç	Austrian Pine	NE	-	-
Pinus brutia Ten.	Kızıl Çam	Calabrian Pine	NE	-	-
Poaceae					
Aegilops biuncialis			NE	-	-
Aegilops markgrafii			NE	-	-
Aegilops triuncialis subsp. triuncialis		Barbed goatgrass	NE	-	-
Aegilops umbellulata subsp. umbellulata			NE	-	-
Avena barbata subsp. barbata		Slender oat	NE	-	-
Briza maxima	Zembilotu	Great Quaking Grass	NE	-	-
Briza media		Quaking-grass	NE	-	-
Bromus hordeaceus subsp. hordeaceus	Brom otu	Soft brome	NE	-	-
Bromus intermedius	"		NE	-	-
Bromus lanceolatus	"	Mediterranean brome	NE	-	-
Bromus madritensis	"	Compact brome	NE	-	-
Bromus tectorum	"	Drooping brome	NE	-	-
Cynosurus echinatus		Bristly dogtail grass	NE	-	-
Cynosurus effusus			NE	-	-
Echinaria capitata	Dikenbaş çimi		NE	-	-
Eragrostis cilianensis .	Çayır güzeli		NE	-	-
Eragrostis minor		Little lovegrass	NE	-	-
Hordeum geniculatum			NE	-	-
Lolium temulentum var. temulentum		Darnel	NE	-	-
Molineriella minuta			NE	-	-
Phalaris brachystachys			NE	-	-

Scientific Name	Turkish Name	Common Name	RDB* (IUCN)	BERN	Endemism
Phalaris canariensis		Common canary grass	NE	-	-
Phalaris minor		Little seed canary grass	NE	-	-
Phalaris paradoxa	Kuş otu	Hood canarygrass	NE	-	-
Phleum exaratum subsp. exaratum			NE	-	-
Piptatherum coerulescens			NE	-	-
Poa annua	Salkım otu	Annual meadow grass	NE	-	-
Poa bulbosa	Yumrulu salkım otu		NE	-	-
Stipa bromoides			NE	-	-
Trachynia distachya		Purple false brome	NE	-	-
Tragus racemosus		Stalked bur grass	NE	-	-
Polygalaceae					
Polygala anatolica	Anadolu süt otu		NE	-	-
Polygala monspeliaca			NE	-	-
Polygonaceae					
Polygonum cognatum Meissn	Madımak	Indian knotgrass	NE	-	-
Rumex pulcher	Kuzukulağı	Fiddle dock	NE	-	-
Rumex tuberosus subsp. tuberosus	"		NE	-	-
Portulacaceae					
Portulaca oleracea L.	Semiz otu		NE	-	-
Primulaceae					
Anagallis foemina	Mavi fare kulağı	Blue pimpernel	NE	-	-
Ranunculaceae					
Adonis flammea	Çin lalesi		NE	-	-
Adonis microcarpa		Pheasant's eye	NE	-	-
Ceratocephalus falcatus			NE	-	-
Clematis cirrhosa	Aksama	Traveller's joy	NE	-	-
Consolida hellespontica			NE	-	-
Consolida orientalis		Eastern larkspur	NE	-	-
Consolida regalis subsp. regalis		Forking larkspur	NE	-	-
Nigella arvensis var. glauca	Yabani çörekotu	Wild fennel	NE	-	-
Nigella elata			NE	-	-
Ranunculus arvensis	Düğün çiçeği	Corn Buttercup	NE	-	-
Ranunculus constantinopolitanus	Düğün çiçeği	Constantine	NE	-	-
Ranunculus gracilis	"		NE	-	-
Ranunculus rumelicus	"		NE	-	-
Rosaceae					
Cydonia oblonga	Ayva ağacı	Quince	NE	-	-
Rosa canina	Kuşburnu	Rosa canina	NE	-	-
Sarcopoterium spinosum		Thorny burnet	NE	-	-
Rubiaceae					
Asperula rumelica			NE	-	-
Crucianella angustifolia		Narrowleaf crucianella	NE	-	-
Galium aparine	Yoğurt otu	Cleavers	NE	-	-
Galium verum L. subsp. verum L.	Sarı Yoğurt Otu	Yellow	NE	-	-
Rubia peregrina		Wild Madder	NE	-	-
Rubia tenuifolia subsp. tenuifolia			NE	-	-
Sherardia arvensis		Blue fieldmadder	NE	-	-
Valantia hispida		Hairy Valantia	NE	-	-
Santalaceae					
Osyris alba	Süpürge çalısı	Osyris	NE	-	-
Thesium bergeri			NE	-	-

Scientific Name	Turkish Name	Common Name	RDB* (IUCN)	BERN	Endemism
Scrophulariaceae					
Bellardia trixago		Mediterranean lineseed	NE	-	-
Digitalis ferruginea subsp. ferruginea	Paslı yüksük otu	Digitalis	NE	-	-
Digitalis lanata	Yüksük otu	Digitalis	NE	-	-
Kickxia commutata subsp. commutata			NE	-	-
Kickxia elatine subsp. crinita		Sharpleaf cancerwort	NE	-	-
Linaria chalepensis var. chalepensis			NE	-	-
Linaria pelisseriana		Pelisser's Toadflax	NE	-	-
Linaria simplex			NE	-	-
Verbascum lasianthum	Sığır kuyruğu	Mullein	NE	-	-
Verbascum mucronatum	"	"	NE	-	-
Verbascum orientale	"	"	NE	-	-
Verbascum sinuatum var. sinuatum	"	"	NE	-	-
Verbascum speciosum	"	"	NE	-	-
Verbascum xanthophoeniceum	"	"	NE	-	-
Solanaceae					
Atropa belladonna	Güzelarvatotu	Belladonna	NE	-	-
Hyoscyamus niger	Siyahbanotu	Stinking nightshade	NE	-	-
Hyoscyamus reticulatus			NE	-	-
Thymelaeaceae					
Thymelaea passerina		Mezereon	NE	-	-
Ulmaceae					
Ulmus minor subsp. minor	Ova Karaağacı	Field Elm	NE	-	-
Urticaceae					
Parietaria judaica	Yapışkan otu	Sticky-weed	NE	-	-
Valerianaceae					
Valerianella vesicaria	Kedi otu		NE	-	-

* Red Data Book of Turkish Plants

NE: Not Evaluated

Relative Abundance: 1 – Very Rare
2 – Rare
3 – Abundant
4 – Very abundant

4.9 Fauna

In order to determine the terrestrial fauna species within the Project site and its vicinity, a site survey was conducted within the scope of the PDR. Fauna inventory was prepared by AECOM using the results of the site survey, literature studies and referencing fauna studies. Results, including fauna inventory and conservation status of fauna species are presented in this section.

In the scope of the terrestrial fauna study, amphibians, reptiles, birds and mammals identified within the Project site and its vicinity and their habitats are assessed. Additionally, the species which are identified in the areas that are ecologically connected to the Project site and its vicinity are also included in this study. The main reason for that inclusion is the mobility of the animals so that they are able to enter to the Project site.

In the course of the literature survey "Vertebrates of Turkey, Amphibians "(*Türkiye Omurgalıları, Amfibiler*)" by Prof. Dr. Ali Demirsoy (1996), "Vertebrates of Turkey, Reptiles "(*Türkiye Omurgalıları, Sürüngenler*)" by Prof. Dr. Ali Demirsoy (1996), and "Vertebrates of Turkey, Mammals "(*Türkiye Omurgalıları, Memeliler*)" published by Prof. Dr. Ali Demirsoy (1996) was utilized.

The national and international conservation status of the fauna species identified at the Project site was assessed during the literature research of this study. For this purpose, 2009.1 version of European Red List (ERL) prepared by the International Union for Conservation of Nature (IUCN), the Bern Convention criteria, the 2009-2010 Decisions of Central Hunting Commission (CHC) of Ministry of Environment and Forestry (MoEF) have been used. In addition, the "Red Data Book for Turkish Birds" prepared by Kiziroğlu (2008) has been used as a national scale reference for the birds observed within the Project site. Finally, it has also been assessed that if there are any endemic species identified in the area.

4.9.1 Amphibians and Reptiles

As a result of this study, four (4) amphibian and twenty (20) reptile species are identified as most likely to exist in the proposed Project site and its vicinity. Table 4-8 provides a complete list of species and their conservation status according to IUCN and Bern Convention.

All amphibian species that are likely to exist in the Project site and its close vicinity are classified as LC (least concern) according to IUCN Red List. *Bufo viridis* (European Green Toad) and *Triturus karelinii* (Southern Crested Newt) are included in Annex II of Bern Convention which list strictly protected fauna species. Other amphibians are included in Annex III of Bern Convention which list protected fauna species.

As seen in Table 4-9, twenty (20) reptile species are identified as most likely to exist in the proposed Project site and its vicinity. Among these species, *Elaphe quatuorlineata* (Four-lined Rat Snake) and *Vipera xanthina* (Armenian Viper) are the species classified as NT (Near threatened) and *Testudo graeca* (Common Tortoise) is classified as VU (vulnerable) category according to IUCN Red List. However, *Elaphe quatuorlineata* (Four-lined Rat Snake) and *Testudo graeca* (Common Tortoise) are abundant and widely seen in Turkey. Ten (10) of these species are included in Annex II of Bern Convention (strictly protected fauna) and other ten (10) are included in Annex III of Bern Convention (protected fauna).

Table 4-8 Amphibians

Scientific Name	Common Name	Turkish Name	IUCN 2009 (ERL)	BERN	Endemism
ANURA					
Pelobates syriacus	*Eastern Spadefoot*	Toprak kurbağası	LC	App.-II	-
Bufo viridis	European Green Toad	Gece Kurbağası	LC	App.-II	-
Rana ridibunda	Eurasian Marsh Frog	Ova Kurbağası	LC	App.-III	-

Scientific Name	Common Name	Turkish Name	IUCN 2009 (ERL)	BERN	Endemism
URODELA					
Triturus karelinii	Southern Crested Newt	Pürtüklü semender	LC	App.-II	-

Table 4-9 Reptiles

Scientific Name*	Common Name	Turkish Name	IUCN 2009	BERN	Endemism
SQUAMATA					
Ablepharus kitaibelii	European Copper Skink	İnce Kertenkele	LC	App.-II	-
Lacerta trilineata	Balkan Green Lizard	Büyük Yeşil Kertenkele	LC	App.-II	-
Lacerta viridis	Green Lizard	Yeşil Kertenkele	LC	App.-II	-
Mabuya aurata	Golden Grass Mabuya	Tıknaz Kertenkele	LC	App.-III	-
Coluber caspius	Large Whip Snake	Hazer Yılanı	LC	App.-III	-
Ophisaurus apodus	Glass Lizard	Oluklu Kertenkele	NE	App.-II	-
Ophisops elegans	Snake-eyed Lizard	Tarla Kertenkelesi	NE	App.-II	-
Coluber najadum	Dahl's Whip Snake	İnce Yılan	LC	App.-II	-
Coluber nummifer	Asian Racer	Sikkeli Yılan	NE	App.-III	-
Eirenis modestus	Asia Minor Dwarf Racer	Uysal Yılan	LC	App.-III	-
Elaphe quatuorlineata	Four-lined Rat Snake	Sarı Yılan	NT	App.-II	-
Elaphe situla	Leopard Snake	Ev Yılanı	LC	App.-II	-
Eryx jaculus	Turkish Sand Boa	Mahmuzlu Yılan	NE	App.-III	-
Malpolon monspessulanus	Montpellier Snake	Çukurbaşlı Yılan	LC	App.-III	-
Telescopus fallax	Europeantiger Snake	Kedi Gözlü Yılan	LC	App.-II	-
Typhlops vermicularis	Eurasian Worm Snake	Kör Yılan	NE	App.-III	-
Vipera ammodytes	Sand Viper	Boynuzlu Engerek	LC	App.-II	-
Vipera xanthina	Armenian Viper	Şeritli Engerek	NT	App.-II	-
Hemidactylus turcicus	Mediterranean Gecko	Geniş Parmaklı Keler, Türk Keleri	LC	App.-III	-
TESTUDINATA					
Testudo graeca	Common Tortoise	Yaygın Tosbağa	VU	App.-II	-

*All species are protected by the MoEF according to 2009-2010 Decisions of Central Hunting Commission.

As a result of this study, no endemic or endangered amphibian and reptile species were determined in the Project area according to the IUCN Red List of Threatened Species and Bern Convention.

4.9.2 Mammals

As a result of this study, 49 species are identified as most likely to exist in the proposed Project site and its vicinity. Table 4-10 provides a complete list of species and their conservation status according to IUCN, Bern Convention and CHC.

Fifteen (15) of these species are included in Annex II of Bern Convention (strictly protected fauna) and 13 species are included in Annex III of Bern Convention (protected fauna). Among these species, *Rhinolophus euryale* (Mediterranean Horseshoe Bat), *Miniopterus schreibersii* (Schreiber's Long-fingered Bat) and *Oryctolagus cuniculus* (European Rabbit) are the species classified as NT (Near threatened) and Rhinolophus mehelyi (Mehely's Horseshoe Bat) is classified as VU (vulnerable) category according to IUCN Red List. However, these species are abundant and widely seen in Turkey according to the book "Vertebrates of Turkey, Mammals".

Table 4-10 Mammals

Scientific Name	Common Name	Turkish Name	IUCN 2009	BERN	CHC 2009-2010*	Endemism
Erinaceus concolor	Eastern European Hedgehog	Kirpi	LC	-	App.-I	-
Sorex minutus	Eurasian Pygmy Shrew	Cücefare	LC	App.-III	-	-
Neomys anomalus	Mediterranean Water Shrew	Bataklık Sivrifaresi	LC	App.-III	-	-
Suncus etruscus	Pygmy White-toothed Shrew	Etrüsk sivrifaresi	LC	App.-III	-	-
Crocidura leucodon	Bicoloured White-toothed Shrew	Sivriburunlu Tarlafaresi	LC	App.-III	-	-
Crocidura suaveolens	Lesser White-toothed Shrew	Bahçe Sivrifaresi	LC	App.-III	-	-
Talpa levantis levantis	Levant Mole	Körköstebek	LC	-	-	-
Rhinolophus ferrumequinum	Greater Horseshoe Bat	Büyük Nalburunluyarasa	LC	App.-II	App.-I	-
Rhinolophus hipposideros	Lesser Horseshoe Bat	Küçük Nalburunluyarasa	LC	App.-II	App.-I	-
Rhinolophus euryale	Mediterranean Horseshoe Bat	Akdeniz Nalburunlu Yarasası	NT	App.-II	App.-I	-
Rhinolophus blasii	Blasius's Horseshoe Bat	Nalburunluyarasa	LC	App.-II	App.-I	-
Rhinolophus mehelyi	Mehely's Horseshoe Bat	Nalburunluyarasa	VU	App.-II	App.-I	-
Myotis myotis	Greater Mouse-eared Bat	Devyarasa	LC	App.-II	App.-I	-
Myotis blythii	Lesser Mouse-eared Bat	Farekulaklı küçükyarasa	LC	App.-II	App.-I	-
Myotis mystacinus	Whiskered Bat	Bıyıklı siyah yarasa	LC	App.-II	App.-I	
Nyctalus noctula	Noctule	Akşamcıyarasa	LC	App.-II	App.-I	-
Pipistrellus pipistrellus	Common Pipistrelle	Cüceyarasa	LC	App.-III	-	-
Pipistrellus nathusii	Nathusius' Pipistrelle	Pürtüklüderili Yarasa	LC	App.-II	App.-I	-
Pipistrellus(=Hypsugo) savii	Savi's Pipistrelle	Savi'nin Cüce Yarasası	LC	App.-II	App.-I	-
Miniopterus schreibersii	Schreiber's Long-fingered Bat	Uzunkanatlı Yarasa	NT	App.-II	App.-I	-
Lepus europaeus	European Hare	Yabani Tavşan	LC	App.-III	App.-III	-
Oryctolagus cuniculus	European Rabbit	Adatavşanı	NT	-	App.-III	-
Sciurus anomalus	Caucasian Squirrel	Kafkassincabı	LC	App.-II	App.-I	-
Spermophilus xanthophrymnus	Anatolian ground squirrel	Tarla Sincabı	NE	-	App.-I	
Cricetulus migratorius	Grey Dwarf Hamster	Cüce Avurtlak	LC	-	App.-I	-

Scientific Name	Common Name	Turkish Name	IUCN 2009	BERN	CHC 2009-2010*	Endemism
Microtus guentheri	Günther's Vole	Tarla Faresi	LC	-	-	-
Arvicola terrestris	Eurasian Water Vole	Susıçanı	LC	-	-	-
Meriones tristrami	Tristram's Jird	Türkiye Çölsıçanı	LC	-	-	-
Spalax leucodon	Lesser Blind Mole Rat	Körfare	DD	-	-	-
Spalax leucodon anatolicus	*	Körfare	NE	-	-	-
Dryomys nitedula	Forest Dormouse	Ağaç Yediuyuru	LC	App.-III	App.-I	-
Glis (=Myoxus) glis	Edible Dormouse	Yediuyur	LC	App.-III	App.-I	-
Rattus rattus	Black Rat	Evsıçanı	LC	-	-	-
Rattus norvegicus	Brown Rat	Göçmenfare	LC	-	-	-
Apodemus mystacinus	Eastern Broad-toothed Field Mouse	Kayalık orman faresi	LC	-	-	-
Apodemus sylvaticus	Long-tailed Field Mouse	Orman faresi	LC	-	-	-
Apodemus flavicollis	Yellow-necked Field Mouse	Sarıboyunlu Ormanfaresi	LC	-	-	-
Mus musculus	House Mouse	Evfaresi	LC	-	-	-
Hystrix indica	Indian Crested Porcupine	Oklukirpi	LC	-	App.-I	-
Canis lupus	Grey Wolf	Kurt	LC	-	App.-I	-
Canis aureus	Common Jackal	Çakal	LC	-	App.-III	-
Vulpes vulpes	Red Fox	Kızıl tilki	LC	-	App.-III	-
Mustela nivalis	Least Weasel	Gelincik	LC	App.-III	App.-III	-
Mustela putorius	European Polecat	Kokulu gelincik	LC	-	App.-III	-
Martes martes	European Pine Marten	Ağaç Sansarı	LC	App.-III	App.-III	-
Meles meles	Eurasian Badger	Porsuk	LC	App.-III	App.-II	-

* CHC: Central Hunting Commission

App. I: species protected by the MoEF

App. II: species protected by the CHC

App. III: species allowed to be hunted for a time period

Source: Demirsoy, A., 1997, Türkiye Omurgalıları (*Vertebrates of Turkey*), Memeliler (*Mammals*)

4.9.3 Birds

Bird Species in the Project Area

Bird species in the Project area and its close vicinity are identified in the PDR. Bird inventory was prepared by AECOM using the data provided in the PDR, literature studies and referencing fauna studies.

As a result of the literature search, field survey data in the close vicinity to Project site was obtained from "Kuşbank (Birdbank)" database. Kuşbank database is a service supported by Nature Society of Turkey (Doğa Derneği), Birdlife International, Erciyes University and Royal Society for the Protection of Birds (RSPB). This system is the part of global family of "Worldbirds" which is a network that provides a platform for the collection, storage and retrieval of bird observations worldwide by BirdLife International, the RSPB and National Audubon Society.

Kuşbank database allow users to download observation data from specific locations in Turkey. In this study, observation locations located within a circular area with a radius of 20 km from the center of the Project site have been selected. These observation locations and observation dates are

presented in Table 4-11. Furthermore, the map including the selected observation locations is presented in Figure 4-26.

Table 4-11 Observation Locations and Dates

Name of the Observation Location	Observation Date
Skamender Valley *(OL-1)*	April 4, 2009 and April 12, 2009
Skamender Valley Skamender River *(OL-2)*	March 25, 2009
Karamenderes River *(OL-3)*	September 27, 2009
Kestanbol Basin *(OL-4)*	April 15, 2009
Fishery (located near the Dalyan Village) *(OL-5)*	June 11, 2009

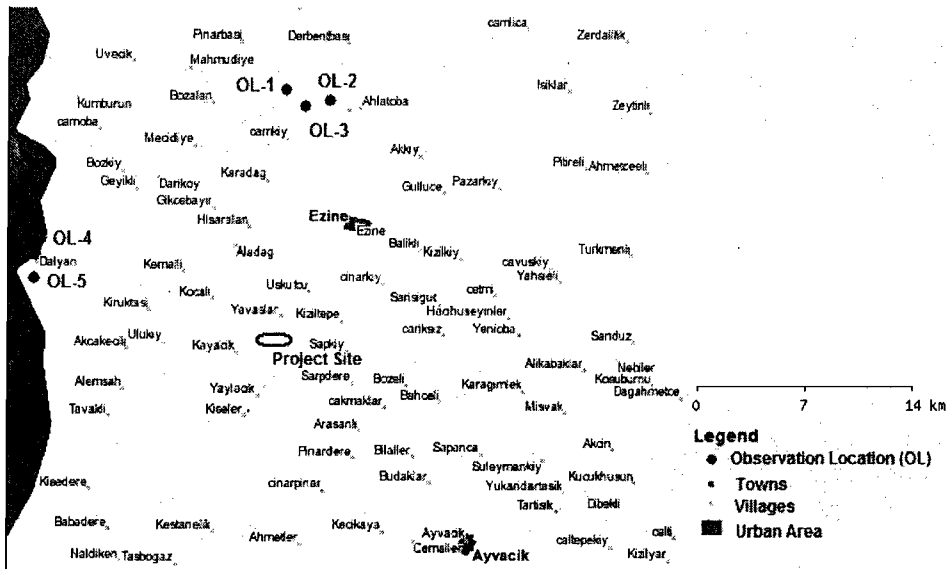


Figure 4-26 Closest Observation Locations to the Project Site in the Kuşbank Database
(Source: www.worldbirds.org)

It should be noted that observation points, OL1, OL2, OL3, OL4 and OL5 have suitable ecosystem for bird living such as water resource and trees for housing. Therefore, plenty of bird species including water and terrestrial species were observed at these sites.

Observation data for each observation point was downloaded from Kuşbank database and listed. As a result, it was observed that the largest population of birds with a great diversity was recorded at the OL-1 which is located at a valley called Skamender Valley (Araplar Boğazı) on Karamenderes River. Bird species recorded at all observation points were taken as the bird inventory and bird species that are most likely to exist in the Project site and its closed vicinity are provided in Table 4-12. For each bird species, family name, common names, Turkish names and conservation status information in accordance with IUCN, Bern Convention and Turkish Central Hunting Commission Decisions and information on their habitats are provided in Table 4-12. Information on birds' habitats was mostly gathered from the Official Website of IUCN.

As seen from Table 4-12, 80 bird species was observed at the observation points in total. Most of these species (53 bird species) are included in Annex II of Bern Convention. In addition, *Charadrius dubius* (Little Ringed Plover) is classified as NT (near threatened) category and *Aquila heliaca* (Imperial Eagle) is classified as VU (vulnerable) category according to IUCN Red List. Besides, among these species, sixteen (16) bird species show preference for water bodies (wetlands, marine, rivers, lakes etc.) as their habitats and the remaining species prefer to live in terrestrial habitats. As indicated in previous sections project area shows terrestrial characteristics. Thus, it is not expected that the bird species preferring water bodies as their habitats live in the close vicinity of the Project site.

Alternative Project locations are discussed in detail in Section 8 of the report. As indicated in that section, project area lies in the best location for wind potential according to Wind Atlas of Turkey (SMI, 2009). In order to minimize bird collision risk, wind turbines will be painted and lighting will be installed as appropriate. Detailed mitigation measures to prevent bird collision risk are provided in following sections.

Migratory Birds

Bird migration is a seasonal journey undertaken by many species of birds. These regular journeys result from change in food availability, habitat or weather. Many bird populations migrate long distances along a flyway between their breeding and wintering habitats.

The most common pattern involves flying in the fall from Northern Hemisphere to wintering grounds in warmer regions to the south, and returning to the north in the spring to breed in the temperate or Arctic summer.

Since there are many wetlands in Turkey, the Eurasian migrants flying to the south use these wetlands as a nesting area. While majority of the migratory birds flying through the Balkans prefers Bosphorus and Dardanelles, the birds flying through the Caucasus migrate along the mountain valleys in Eastern Black Sea. These birds finally concentrate around Belen Pass in Hatay Province (Okan C., 2004).

Bird migration routes in Turkey are presented in Figure 4-27. As seen in the figure, bird migration routes do not passes through the Project site.

Table 4-12 Birds

Scientific Name	Common Name	Turkish Name	IUCN 2009	BERN	CHC 2009-2010	Habitat
ANSERIFORMES						
Tadorna ferruginea	Ruddy Shelduck	Angıt	LC	App.- II	App.- I	Water
CHARADIIFORMES						
Actitis hypoleucos	Common Sandpiper	Dere Düdükçünü	LC	App.-III	App.-I	Water
Charadrius alexandrinus	Kentish Plover	Akça Cılıbıt	LC	App.- II	App.- I	Water
Charadrius dubius	Little Ringed Plover	Küçük Halkalı Cılıbıt	LC	App.- II	App.- I	Water
Larus audouinii	Audouin's Gull	Ada Martısı	NT	App.- II	App.- I	Water
Larus cachinnans	Yellow-legged Gull	Gümüş Martı	LC	App.-III	App.- II	Water
Tringa glareola	Wood Sandpiper	Orman Düdükçünü	LC	App.- II	App.- II	Terrestrial
CICONIIFORMES						
Ardea cinerea	Grey Heron	Gri Balıkçıl	LC	App.-III	App.-II	Water
Casmerodius albus	Great Egret	Büyük Ak Balıkçıl	LC	App.- II	App.- I	Water
Ciconia ciconia	White Stork	Leylek	LC	App.- II	App.- I	Terrestrial
Ciconia nigra	Black Stork	Kara Leylek	LC	App.-II	App.- I	Water
Egretta garzetta	Little Egret	Küçük Ak Balıkçıl	LC	App.-II	App.- I	Water
Nycticorax nycticorax	Black-crowned Night-heron	Gece Balıkçılı	LC	App.-II	App.- I	Water
COLUMBIFORMES						
Columba livia	Rock Pigeon (Dove)	Kaya Güvercini	LC	App.-III	App.-III	Terrestrial
Streptopelia decaocto	Eurasian Collared-dove	Kumru	LC	App.-III	-	Terrestrial
Streptopelia turtur	European Turtle-dove	Üveyik	LC	App.-III	App.- III	Terrestrial
CORACIIFORMES						
Alcedo atthis	Common Kingfisher	Yalıçapkını	LC	App.-II	App.- I	Water
Merops apiaster	European Bee-eater	Arıkuşu	LC	App.-II	App.- I	Terrestrial

Scientific Name	Common Name	Turkish Name	IUCN 2009	BERN	CHC 2009-2010	Habitat
Upupa epops	Eurasian Hoopoe	İbibik	LC	App.-II	App.- I	Terrestrial
CUCULIFORMES						
Cuculus canorus	Common Cuckoo	Guguk	LC	App.-III	App.- I	Terrestrial
FALCONIFORMES						
Accipiter nisus	Eurasian Sparrowhawk	Atmaca	LC	App.-II	App.- I	Terrestrial
Aquila heliaca	Imperial Eagle	Şah Kartal	VU C2a(ii)	App.-II	App.- I	Terrestrial
Buteo buteo	Common Buzzard	Şahin	LC	App.-II	App.- I	Terrestrial
Buteo rufinus	Long-legged Buzzard	Kızıl Şahin	LC	App.-II	App.- I	Terrestrial
Circaetus gallicus	Short-toed Snake-eagle	Yılan Kartalı	LC	App.-II	App.- I	Terrestrial
Falco subbuteo	Eurasian Hobby	Delice Doğan	LC	App.-II	App.- I	Terrestrial
Falco tinnunculus	Common Kestrel	Kerkenez	LC	App.-II	App.- I	Terrestrial
GRUIFORMES						
Fulica atra	Common Coot	Sakarmeke	LC	App.-III	App.- III	Water
Gallinula chloropus	Common Moorhen	Sutavuğu	LC	App.-III	App.- III	Water
PASSERIFORMES						
Anthus campestris	Tawny Pipit	Kır İncirkuşu	LC	App.- II	App.- I	Terrestrial
Anthus pratensis	Meadow Pipit	Çayır İncirkuşu	LC	App.- III	App.- I	Terrestrial/Water
Carduelis cannabina	Eurasian Linnet	Ketenkuşu	LC	App.-II	App.-I	Terrestrial
Carduelis carduelis	European Goldfinch	Saka	LC	App.- II	App.- I	Terrestrial
Carduelis chloris	European Greenfinch	Florya	LC	App.- II	App.- I	Terrestrial
Carduelis spinus	Eurasian Siskin	Kara Başlı İskete	LC	App.- II	App.- I	Terrestrial
Cettia cetti	Cetti's Warbler	Kamışbülbülü	LC	App.- II	App.- I	Water
Corvus corax	Common Raven	Kuzgun	LC	App.-III	App.- II	Terrestrial
Corvus corone palescens	Hooded Crow	Leş Kargası	LC	App.- III	App.- III	Terrestrial

Scientific Name	Common Name	Turkish Name	IUCN 2009	BERN	CHC 2009-2010	Habitat
Emberiza caesia	Cretzschmar's Bunting	Kızıl Kirazkuşu	LC	App.- II	App.- I	Terrestrial
Emberiza cirlus	Cirl Bunting	Bahçe Çintesi	LC	App.- II	App.- I	Terrestrial
Ficedula albicollis	Collared Flycatcher	Halkalı Sinekkapan	LC	App.- III	App.- I	Terrestrial
Fringilla coelebs	Chaffinch	İspinoz	LC	App.- III	App.- II	Terrestrial
Galerida cristata	Crested Lark	Tepeli Toygar	LC	App.- III	App.- II	Terrestrial
Garrulus glandarius	Eurasian Jay	Alakarga	LC	App.- III	App.- III	Terrestrial
Hirundo daurica	Red-rumped Swallow	Kızıl Kırlangıç	LC	App.- II	App.- I	Terrestrial
Hirundo rustica	Barn Swallow	Kır Kırlangıcı	LC	App.- II	App.- I	Terrestrial
Lanius collurio	Red-backed Shrike	Kızıl Sırtlı Örümcekkuşu	LC	App.- II	App.- I	Terrestrial
Lanius minor	Lesser Grey Shrike	Kara Alınlı Örümcekkuşu	LC	App.- II	App.- I	Terrestrial
Lanius nubicus	Masked Shrike	Maskeli Örümcekkuşu	LC	App.- II	App.- I	Terrestrial
Lanius senator	Woodchat Shrike	Kızıl Başlı Örümcekkuşu	LC	App.- II	App.- I	Terrestrial
Luscinia megarhynchos	Common Nightingale	Bülbül	LC	App.- II	App.-I	Terrestrial
Miliaria calandra	Corn Bunting	Tarla Çintesi	LC	App.- III	App.- II	Terrestrial
Motacilla alba	White (Pied) Wagtail	Ak kuyruksallayan	LC	App.- II	App.- I	Terrestrial
Motacilla cinerea	Grey Wagtail	Dağ Kuyruksallayanı	LC	App.- II	App.- I	Terrestrial
Motacilla citreola	Citrine Wagtail	Sarı Başlı Kuyruksallayan	LC	App.- II	App.- I	Terrestrial
Motacilla flava	Yellow Wagtail	Sarı Kuyruksallayan	LC	App.-II	App.- I	Terrestrial
Muscicapa striata	Spotted Flycatcher	Benekli Sinekkapan	LC	App.- III	App.- I	Terrestrial
Oenanthe hispanica	Black-eared Wheatear	Kara Kulaklı Kuyrukkakan	LC	App.- III	App.- I	Terrestrial
Parus caeruleus	Blue Tit	Mavi Baştankara	LC	App.-II	App.- I	Terrestrial
Parus lugubris	Sombre Tit	Ak Yanaklı Baştankara	LC	App.-II	App.- I	Terrestrial
Parus major	Great Tit	Büyük Baştankara	LC	App.- III	App.- I	Terrestrial
Passer domesticus	House Sparrow	Serçe	LC	App.-III	-	Terrestrial

Scientific Name	Common Name	Turkish Name	IUCN 2009	BERN	CHC 2009-2010	Habitat
Passer hispaniolensis	Spanish Sparrow	Söğüt Serçesi	LC	App.- III	App. - III	Terrestrial
Phoenicurus ochruros	Black Redstart	Kara Kızılkuyruk	LC	App.-II	App.- I	Terrestrial
Phoenicurus phoenicurus	Common Redstart	Kızılkuyruk	LC	App.- II	App.- I	Terrestrial
Phylloscopus collybita	Common Chiffchaff	Çıvgın	LC	App.-III	App.- I	Terrestrial
Phylloscopus sibilatrix	Wood Warbler	Orman Çıvgını	LC	App.- II	App.- I	Terrestrial
Pica pica	Black-billed Magpie	Saksağan	LC	App.-III	App.- III	Terrestrial
Riparia riparia	Sand Martin	Kum Kırlangıcı	LC	App.- II	App.- I	Terrestrial
Saxicola rubetra	Whinchat	Çayır Taşkuşu	LC	App.-III	App.- I	Terrestrial
Serinus serinus	European Serin	Küçük İskete	LC	App.-II	App.- I	Terrestrial
Sitta neumayer	Western Rock-nuthatch	Kaya Sıvacısı	LC	App.-II	App.- I	Terrestrial
Sylvia atricapilla	Blackcap	Kara Başlı Ötleğen	LC	App.-II	App.- I	Terrestrial
Sylvia cantillans	Subalpine Warbler	Bıyıklı Ötleğen	LC	App.-II	App.- I	Terrestrial
Sylvia curruca	Lesser Whitethroat	Küçük Ak Gerdanlı Ötleğen	LC	App.-II	App.- I	Terrestrial
Sylvia hortensis	Orphean Warbler	Ak Gözlü Ötleğen	LC	App.-II	App.- I	Terrestrial
Turdus merula	Eurasian Blackbird	Karatavuk	LC	App.-III	App.- III	Terrestrial
PELECANIFORMES						
Phalacrocorax carbo	Great Cormorant	Karabatak	LC	App.-III	App.- II	Water
Phalacrocorax pygmeus	Pygmy Cormorant	Küçük Karabatak	LC	App.- II	App.- I	Water
PICIFORMES						
Dendrocopos syriacus	Syrian Woodpecker	Alaca Ağaçkakan	LC	App.-II	App.- I	Terrestrial

LC: Least Concern
NT: Near threatened
VU: Vulnerable
CHC: Central Hunting Commission
App. I: species protected by the MoEF
App. II: species protected by the CHC

App. III: species allowed to be hunted for a time period

LEAST CONCERN (LC) A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

NEAR THREATENED (NT) A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.

VULNERABLE (VU)

A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild.

The criteria C2a(ii) means:

C. Population size estimated to number fewer than 10,000 mature individuals and either:

2. A continuing decline, observed, projected, or inferred, in numbers of mature individuals AND at least one of the following (a-b):

(a) Population structure in the form of one of the following:

(ii) all mature individuals are in one subpopulation.

Important Bird Areas

The European Important Bird Area (IBA) Programme is implemented through national IBA Programmes in 29 countries with the support and co-ordination of the European Division of the BirdLife Secretariat. The IBAs in Turkey have identified by the Society for the Protection of Nature (Doğal Hayatı Koruma Derneği) and BirdLife International and this study was published as a book called "Important Bird Areas in Turkey" in 1997. The book was revised in 2004 by the Nature Society (Doğa Derneği) and Birdlife International with additional support from Royal Society for the Protection of Birds (RSPB).

According to this revised version, the Project site does not lie within any Important Bird Area (IBA). The closest IBAs to the Project site are presented in Figure 4-28. As seen in Figure 4-28, the closest IBAs to the Project site are Kaz Mountains (Kaz Dağları) IBA and Gökçeada IBA which are located approximately 21 and 52 km to the closest turbines (T-1 for Kaz Mountains IBA and T-9 for Gökçeada IBA), respectively.

Kaz Mountains IBA lies within a mountain range along the Biga Peninsula which is located at the Marmara Region of Turkey. A great altitudinal range and distinctive climate has resulted in exceptional vegetation and a wide range of habitats in this IBA. According to the book "Important Bird Areas in Turkey", the area qualifies as an IBA for its breeding populations of *Pernis apivorus* (Honey Buzzard) and *Sitta krueperi* (Krüper's Nuthatch). Gökçeada IBA is located within the eastern part of Gökçeada Island which is the largest island of Turkey in the Aegean Sea. According to the book "Important Bird Areas in Turkey", the area qualifies as an IBA for its wintering populations of *Phoenicopterus rubber* (Greater Flamingo).

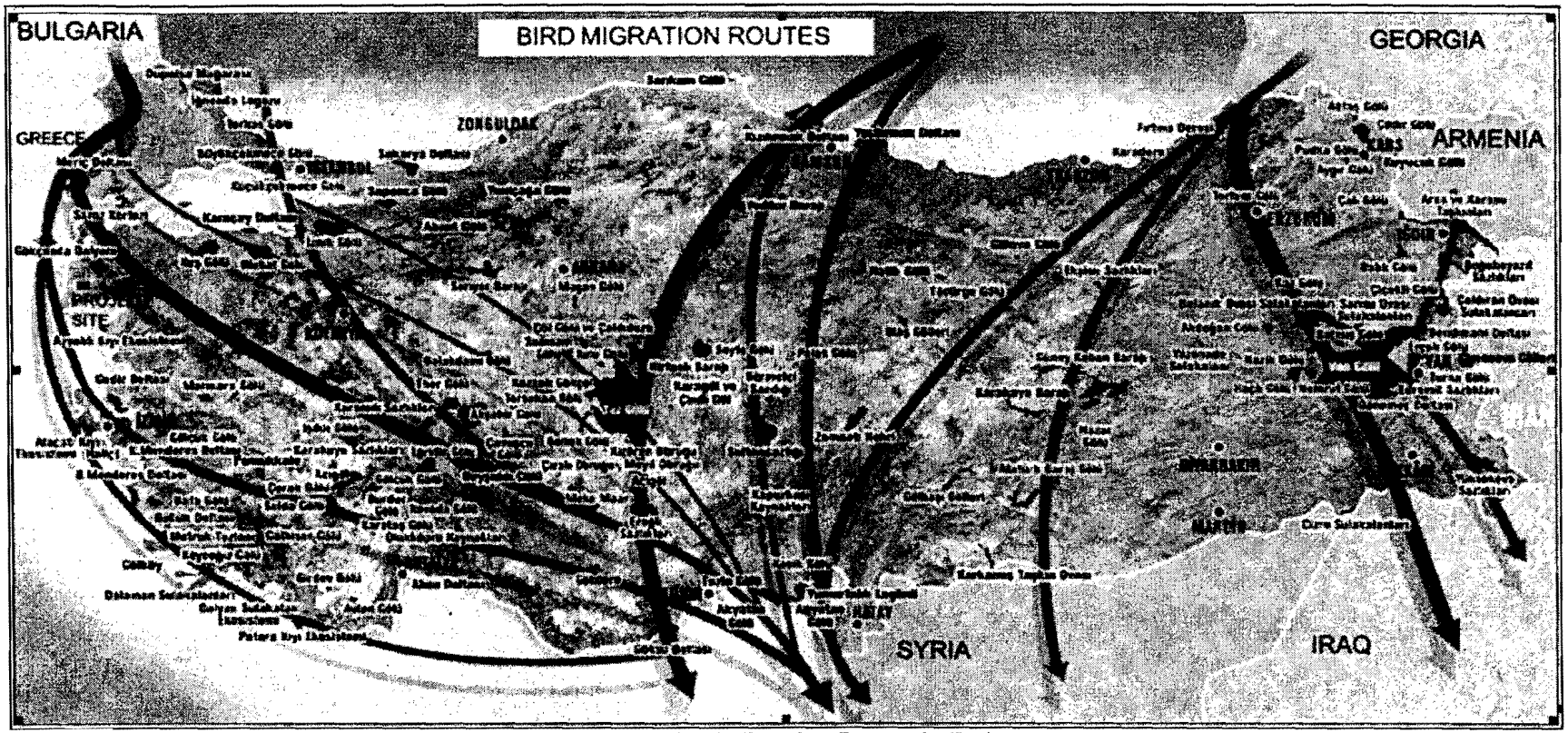


Figure 4-27 Bird Migration Routes in Turkey

(Source. http://www.kusgribi.gov.tr, Ministry of Agriculture and Rural Affairs, General Directorate of Conservation and Control, Department of Animal Health)

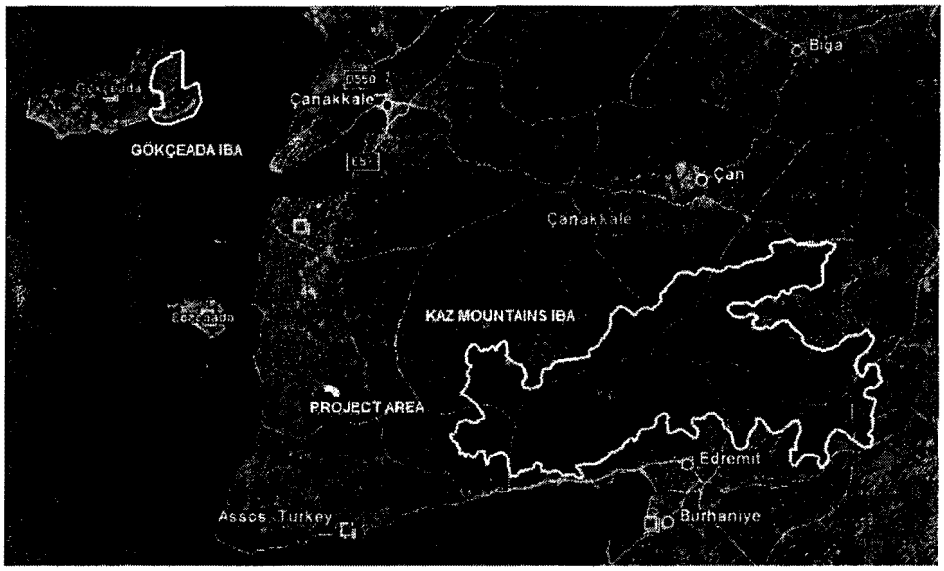


Figure 4-28 Closest Important Bird Areas to the Project Site
(Source: Important Bird Areas in Turkey, 2004 Revision, Doğa Derneği)

Wetlands

Wetlands might be good places for feeding and living of birds. Thus, existence of wetlands in an area might indicate potential for observing migratory birds and/or resident bird habitats. According to the list of wetlands presented in the Official Website of Ministry of Environment and Forestry, General Directorate of Nature Conservation and National Parks, the Project site does not lie within any wetland. The closest wetland to the Project site is Gökçeada Dalyanı which is also an IBA presented in the previous section. It should be noted that this wetland is not one of the wetlands protected by the Ramsar Convention (The Convention on Wetlands of International Importance).

4.10 Naturally Protected Areas

In accordance with the national environmental legislation, there are no national parks, nature reserves, natural monuments, wildlife protection areas and wildlife improvement areas within the Project site and its vicinity. There are key biodiversity areas around the Project site. These are briefly explained in the following sections.

Key Biodiversity Areas

Key Biodiversity Areas (KBAs) are places of international importance for the conservation of biodiversity at the global level. The concept of KBAs has been developed by conservation organizations including BirdLife International, Conservation International, and PlantLife International. The scientific studies in order to determine the KBAs in Turkey are being carried out by Doğa Derneği with the support of the Royal Society for the Protection of Birds and Birdlife International. In 2006,

Doğa Derneği published the book "Key Biodiversity Areas of Turkey" which is also available in the Official Website of Doğa Derneği.

These KBAs also constitute the basis of scientific studies that are carried out within the scope of Natura 2000 network for Turkey's EU accession process. Natura 2000 is an ecological network of protected areas in the territory of the European Union (EU). There are two directives of EU that form the Natura 2000 network. These are the Birds Directive (Council Directive 79/409/EEC on the conservation of wild birds) and the Habitats Directive (Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora). In order to meet the requirements of these directives, Doğa Derneği and the MoEF are carrying out studies in cooperation. The revision of the book "Important Bird Areas in Turkey" and the publication of the book "Key Biodiversity Areas of Turkey" by Doğa Derneği can be considered within this context.

According to the book "Key Biodiversity Areas of Turkey", the closest KBAs to the Project site are Gökçeada KBA, Dardanelles (Çanakkale Boğazı) KBA, Biga Mountains KBA and Kaz Mountains KBA. These areas are presented in Figure 4-29.

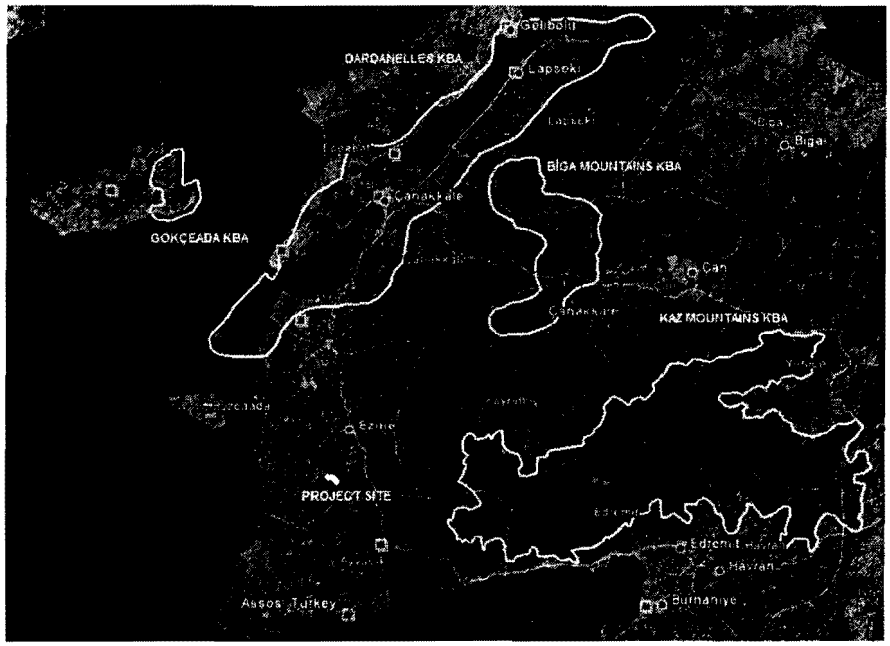


Figure 4-29 Key Biodiversity Areas Close to the Project Site

Gökçeada KBA and Kaz Mountains KBA also correspond to the Gökçeada IBA and Kaz Mountains IBA as mentioned in the previous section. Since the ecological criteria used for determination of the IBAs are same with the criteria used for KBAs, 184 KBAs in Turkey also correspond to IBAs.

Gökçeada KBA is approximately 52 km to the closest turbine, T-1. The area qualifies as a fish trap (*dalyan*) with a shallow and salty water ecosystem and territorial area with maquis vegetation. As mentioned before, the area qualifies as an IBA for its wintering populations of *Phoenicopterus rubber*

(Greater Flamingo). There is no conservation status for this area in accordance with the national environmental legislation.

The distance between Dardanelles KBA and the closest turbine, T-9 is approximately 24 km. Dardanelles KBA lies along the Dardanelles. It has a surface area of 110,294 ha and has a length of 65 km. The area qualifies as a habitat for marine coastal ecosystem, Turkish pine forests and maquis shrublands.

Biga Mountains KBA located at the east of Dardanelles KBA. Biga Mountains is a mountain range consists of 400-450 m high hills located in the middle of Biga Peninsula. The KBA is 38 km from the closest turbine; T6 and has a surface area of 31,081 ha. There are Turkish pine (*Pinus brutia*) forests at the lower attitudes and Turkish oak (*Quercus cerris*) at the higher attitudes in the KBA. There is no conservation status for this area in accordance with the national environmental legislation.

Kaz Mountains KBA lies within a mountain range at the south-east of Project site. The KBA is 21 km from the closest turbine (i.e., T-1) and has a surface area of 160,161 ha. The area qualifies as a KBA because of its biodiversity and rare species inhabitating the region formed as a result of its location and climate. There area Turkish pine (*Pinus brutia*) forests at the lower attitudes and European Black Pine (*Pinus nigra*) at the higher attitudes in the KBA. Beside forest vegetation, there are rich maquis shrublands and olive trees. Among the flora species, a type of abies called Kazdağı Abies (Abies nordmanniana subsp. equi-trojani) is an endemic species to the Kaz Mountains. In addition, the area qualifies as an IBA for its breeding populations of *Pernis apivorus* (Honey Buzzard) and *Sitta krueperi* (Krüper's Nuthatch) as mentioned in the previous section.

Since this KBA has a great biodiversity in flora and fauna species, there is a national park and two nature reserves designated by the Ministry of Environment and Forestry (MoEF). Kazdağı National Park and Kazdağı Abies Nature Reserves are presented in Figure 4-30. The Kazdağı Mountains National Park is located approximately 38.5 km to the closest turbine, T-2, whereas the Kazdağı Abies Nature Reserves are located approximately 52 km to the closest turbine, T-2.

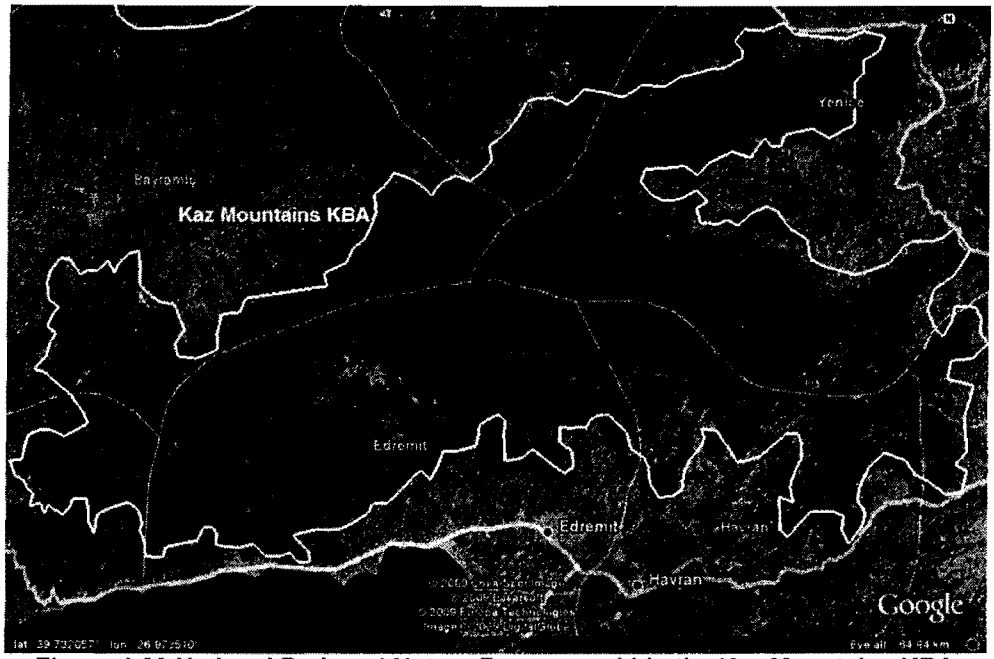


Figure 4-30 National Park and Nature Reserves within the Kaz Mountains KBA

4.11 Archeological Areas

There are two important national parks namely Gelibolu Peninsula National Park and Troy Historical National Park within the boundaries of Çanakkale Province. Troy National Park Area is located on Ezine District and has a total area of 180 km^2 and registered in 1981. Troy Archaeological City and its vicinity were registered as Troy Historical National Park by the Council of Ministers Decision on September 30, 1996 and it has an area of 2 km^2. Troy Archaeological City, the most valuable part of the area, was included in World Heritage List as cultural heritage (Çanakkale Province Environmental Condition Report).The Project site is located approximately 20 km and 27.5 km to the Troy Historical National Park and Troy Archaeological City, respectively.

The Project site is located within the boundaries of Ezine District. There are a number of archeologically protected sites within the boundaries of Ezine District. The data for the important archeologically protected areas in vicinity of the Project site were gathered from 1/5,000 Regulatory Development Plan. This data is visualized as shown in Figure 4-31 to demonstrate the archeologically protected areas in vicinity of the Project site.

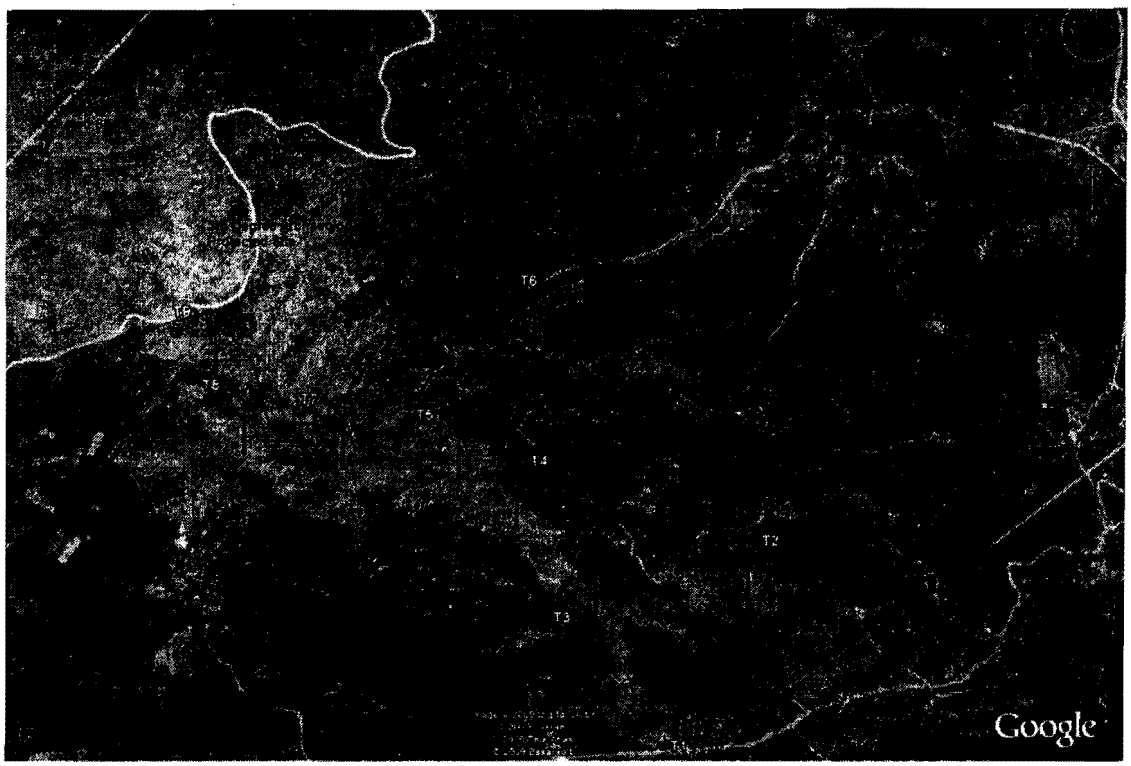


Figure 4-31 Archaeologically Protected Areas in the Vicinity of the Project Area

As seen in Figure 4-31, the closest archaeologically protected sites to the proposed Project site are Nameless 3rd Degree Archaeologically Protected Site and Neandreia Castle 1st Degree Archaeologically Protected Site which are located approximately 70 m and 750 m, respectively to the closest turbines (Turbine 7 (T–7) for Nameless 3rd Degree Archaeologically Protected Site and Turbine 9 (T-9) for Neandreia Castle 1st Degree Archaeologically Protected. The proposed wind farm Project will not have any adverse effect on these archeologically protected areas.

4.12 Socio-Economic Characteristics

4.12.1.1 Settlements and Demographics

Sares Wind Power Plant will be located in Ezine District of Çanakkale Province. Çanakkale Province has a surface area of 9,737 km^2 and total population of 474,791 according to the results of the Address Based Population Census conducted by the Turkish Statistical Institute (TUIK) in the year of 2008. Ezine District is located approximately 40 km to the south of Çanakkale Province Center. Ezine has a surface area of 474 km^2. According to the 2008 census results, the total population and population density of the district is 32,833 and 54, respectively. In addition, majority of population in Ezine District lives in the rural area. The rural population of the district is 21,992 whereas urban population of the district is 13,309. There are 47 villages in the Ezine District.

The nearest settlements to the Project site and their populations according to the 2008 census data based on address information are given in Table 4-13.

Table 4-13 Populations of the Nearest Settlements

Settlements	Total Population
Sapköy Village	137
Kayacık Village	266
Kızıltepe Village	192
Yaylacık Village	218

(Source: Turkish Statistical Institute, 2008)

4.12.1.2 Livelihoods and Economics

Main source of income in Çanakkale Province is agricultural activities. 56% of the population in Çanakkale Province deal with the agriculture and the main agricultural products in this region are wheat, peach, apple, grape, olive and sun flower. In addition, 9% and 4% of the total population occupied in industrial activities and construction works. Furthermore, 31% of the population works in different sectors.

The other economic activity in the region is animal husbandry. Animal products in the provincial can be listed as meat, egg, honey and sea products.

Only a small portion of the population is occupied in industrial facilities. In Çanakkale Province, ceramic and cement production has an important role in the economy. In addition, the most important food products manufactured at the region are frozen food, fruits and vegetables and sea products. Mostly, frozen and dried foods, products, dairy products, legumes, cement, mining ore and ceramic are exported from Çanakkale Province (Official Website of Çanakkale Governorate, 2008).

5.0 ENVIRONMENTAL IMPACTS

5.1 Noise

5.1.1 Construction

Construction inevitably creates some degree of noise emissions at locations in close vicinity of the construction activities. However, construction noise is temporary and transient in nature. The noise levels generated by construction works would have the potential to impact on noise sensitive receptors. Noise levels during construction at a receptor depends on several factors such as number and type of equipment and machinery used, the distance between noise sensitive receptor and the construction site and level of attenuation likely due to ground absorption, air absorption and barrier effects.

Type and Number of Construction Machines

Type and number of equipment and machines that will be used during construction activities and their equivalent noise levels are listed in Table 5-1.

Table 5-1 Sound Power Levels of the Equipment and Machines

Machine	Number	Lw(dB)
Concrete Mixer	2	115
Loader	2	115
Dozer	1	115
Backhoe Loader	1	105
Crane	2	105
Dumper Truck	5	105
Generator	1	97
Welder	5	97

Total Noise Level at the Source

The noise levels are calculated assuming that all machines/equipment will operate at the same time at one location in order to demonstrate the worst case situation.

Total equivalent noise level generated by all noise sources is calculated with the formula (RAMEN, Annex-I) given below:

$$L_{eq} = 10 \times \log\left[\begin{pmatrix} 2x10^{115/10} + 2x10^{115/10} + 1x10^{115/10} + 1x10^{105/10} + 2x10^{105/10} \\ + 5x10^{105/10} + 1x10^{97/10} + 5x10^{97/10} \end{pmatrix}\right] = 103.99 dBA$$

where;

n: Number of noise source;

L_i: Sound power level of each source (dBA);

L_{eq}: Total equivalent noise level.

The total equivalent noise level at the construction activity location is calculated as 103.99 dBA.

Total Noise Level at the Receptors

In order to assess noise impacts of construction activities at the noise sensitive receptor (NSR) described in Section 4.4, the closest turbine location to the NSR is chosen as the construction activity location. This closest turbine to NSR is Turbine 9 (T9) with a distance of 1597 m.

Air absorption is assumed as 0 in order to simulate worst case situation, and thus, the following formula (RAMEN, Annex-I) is used to calculate the noise levels of construction works at the noise sensitive receptor;

$$L_p = L_{eq} + 10 \times \log\left(\frac{Q}{4.\pi.r^2}\right)$$

where;

Lp: Noise power level at the receptor (dBA);
Q: ground absorption coefficient (assumed as 2);
r: distance between the source and the receptor.

The noise levels at different distances are calculated using the above formula and the results are given in Table 5-2 below.

Table 5-2 Noise Levels at NSR and Different Distances

Distance (m)	Lp (dBA)
0	103.99
100	56.0
150	52.5
200	50.0
300	46.5
400	44.0
500	42.0
750	38.5
1000	36.0
1500	32.5
1597 (NSR)	**31.9**
2000	30.0
2500	28.0

In addition to tabular noise level results at different distances, a graphical view of decreasing noise levels with increasing distances is shown in Figure 5-1.

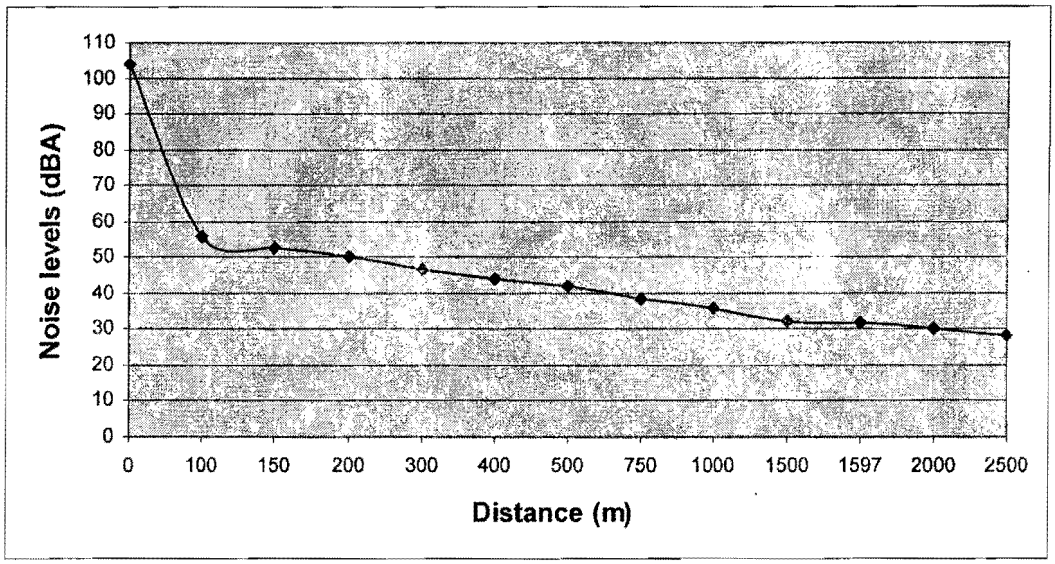


Figure 5-1 Noise Distribution during Construction

As can be seen from Table 5-2, noise level generated from construction activities at NSR is calculated as 31.9 dBA.

In accordance with the Article 23(1)-b of the Regulation on Assessment and Management of Environmental Noise (RAMEN), the construction activities within residential areas and in the close vicinity cannot be carried out during evenings and nighttime except daytime period (07:00-19:00). RAMEN also states construction site noise level limits which are given in Table 2-2 of Section 2.1.5. According to this table, the Project site is classified as "Other Resources" and the noise level limit in this class of areas is set to 70 dBA. Turkish RAMEN noise limits are complied with at the nearest sensitive receptor during construction phase of the Project.

In addition to the regulatory compliance demonstrated above, construction noise is temporary and transient in nature and can be controlled through good site working practices, limiting construction hours and adopting noise control measures where necessary. Thus, noise impact associated with the construction activities is not expected to be a significant issue for the proposed Project.

5.1.2 Operation

Operating wind turbines generate noise varying with wind speed. The sources of sounds emitted from wind turbines consist of 1) mechanical sounds and 2) aerodynamic sounds.

Mechanical sound originates from the rotation of mechanical and electrical equipment. Sources of mechanical sounds include gearbox, generator, yaw drives, cooling fans and auxiliary equipment. Mechanical sounds can be transmitted directly to air (air-borne) or transmitted along structural components before noise is radiated into the air (structure-borne).

Aerodynamic sound originates from the flow of air around the blades. Continuous improvements in mechanical design of large wind turbines have resulted in significant reductions in mechanical

sounds. Presently, noise emissions from modern wind turbines mostly come from broadband aerodynamic sounds.

Since the operating wind turbines generate noise, there is a potential impact at the neighboring residential homes. Thus, a noise impact assessment is carried out for this Project.

Noise assessment study basically consists of the following major steps:

1. Selection of methodology;
2. Noise survey to determine existing ambient background noise levels;
3. Noise levels predicted or measured for the turbines;
4. Applying a sound propagation model;
5. Specifying noise criteria;
6. Comparison of estimated sound pressure levels with noise criteria.

5.1.2.1 Methodology

General guidance and regulatory policy concerning noise associated with new developments in Turkey is provided by the Turkish Regulation on Assessment and Management of Environmental Noise (RAMEN). IFC/WB EHS guidelines for wind energy also provides noise limits that should not be exceeded during the operation of the proposed wind farm. However, it is apparent that existing noise standards do not fully address the issues associated with the unique characteristics of wind farm developments and there is a need for an agreed methodology for defining acceptable noise limits for wind farm developments. The Turkish Ministry of Environment or IFC/WB does not provide any noise assessment methodology for the wind farm development.

In the U.K. a methodology was developed for the Department of Trade and Industry (DTI) by the Working Group on Noise from Wind Turbines (WGNWT) and known as ETSU-R-97, The Assessment and Rating of Noise from Wind Farms (1996). ETSU-R-97 provides a robust basis for determining the noise criteria for wind farms and has become a well-respected and accepted standard for such developments within the UK. This methodology has therefore been adopted for this Project.

5.1.2.2 Noise Background Survey

As described in the previous section in detail, concurrently noise and wind speed/direction was measured at the nearest NSR. During the survey, $L_{A90\text{-}10min}$ data was collected. Generally, $L_{90,10min}$ is taken as for both the background noise and the wind farm noise in noise assessment studies (ETSU-R-97, 1997; Rogers, et al, 2006; EPA 2008). L_{A90} is the A-weighted sound levels that are exceeded 90% of the time. The use of the $L_{A90\text{-}10min}$ data avoids corruption of data from relatively loud, transitory noise events from other sources. Thus, in this assessment, $L_{A90\text{-}10min}$ is used for the calculation of the

background noise levels and also for the wind farm. It should be noted that $L_{A90\text{-}10min}$ is likely to be about 2 dBA less than the L_{Aeq} measured over the same time (ETSU-R-97, 1997).

10-minute averaged concurrent wind and background noise level measurements were carried out. The measured L_{A90} noise levels are then plotted against simultaneously measured wind speed data for daytime and nighttime hours. A "best fit" curve is fitted to the data to establish the background noise level as a function of wind speed as shown in Figure 5-2 below.

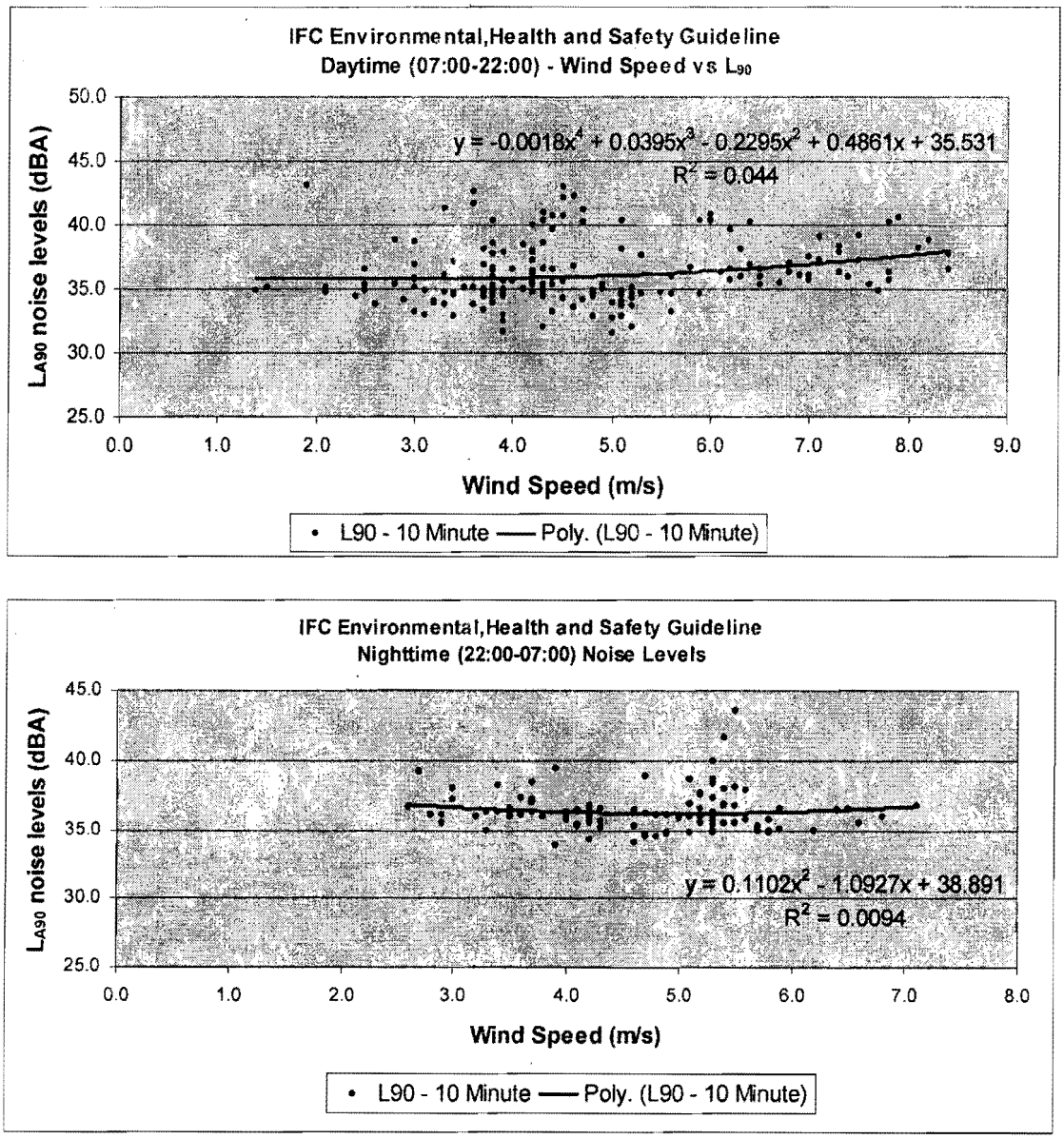


Figure 5-2 Daytime and Nighttime Wind Speed vs L_{A90} Background Noise Level Plots

5.1.2.3 Turbine Noise Characteristics

GE 2.5 XL 50 Hz model turbines will be used in the Project. The noise levels generated by the model GE 2.5 XL is obtained from the turbine manufacturer. The noise data includes octave band spectra and broadband levels as the variation of sound output with wind speed over a range of 3 to 10 m/s (referenced to a 10 m height). Octave band spectrum and broadband noise levels at each wind speed are given in Tables 5-3 and 5-4, respectively.

Table 5-3 Octave Band Spectra of GE 2.5 XL at 10m/s Wind Speed

Octave Band Frequency (Hz)	63	125	250	500	1000	2000	4000	8000
L_{wa}(dBA)	72.3	95.0	100.3	98.3	93.7	97	95.5	72.1

Table 5-4 Broadband Noise Levels at each Wind Speed from 3 to 10 m/s

Wind Speed (m/s)	3	4	5	6	7	8	9	10
Noise Emission, L_{wa} (dBA)	96.0	96.0	99.3	103.4	105.0	105.0	105.0	105.0

5.1.2.4 Noise Propagation Model

The potential noise impact of the wind turbines on sensitive receptors is determined by noise modeling. Commercially available WindPro version 2.6 noise propagation model, which is based on ISO 9613-2, is used in this Project. The model is capable of utilizing different propagation modules, for a variety of wind speed, and it incorporates terrain data into calculations. The model also includes absorbances due to atmosphere and nearby surfaces. Ambient noise levels at the nearest sensitive receptor (NSR) are modeled under worst case conditions.

The model contained within ISO 9613-2 Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General method of Calculation (1996) has been used to calculate the noise emission levels at the nearest sensitive receptor. The ISO 9613-2 algorithm, which is one of the available models presented in WindPro software, has been chosen as being the most robust prediction method based on the findings of a joint European Commission (EC) research project into wind farm noise propagation over large distances.

Although it is not possible to specify exact error bands on noise predictions, the ISO 9613-2 model was found to be the best available, both in flat and hilly, complex terrain. ISO 9613-2, like all the other models, tends to over-estimate the noise at the nearest sensitive receptor, rather than under-estimate it. The study performed as part of the EC research ("Development of a Wind Farm Noise Prediction Model", JOR3-CT95-0051) concluded that the ISO 9613-2 method tended to predict noise levels that would generally occur under downwind propagation conditions. The probability of non-exceedence of the levels predicted by the ISO 9613-2 algorithm was about 85%. The same research also

demonstrated that under upwind propagation conditions, between a given receiver and the wind farm, the noise level at that receiver will be as much as 10dB(A) to 15dB(A) lower.

Model Inputs

ISO 9613-2 model uses the following equation in calculating the noise levels at the receptor locations.

$$L(DW) = LWA,ref + K + Dc - (Adiv + Aatm + Agr + Abar + Amisc) - Cmet$$

where,

$L(DW)$: Calculated noise level at the receptor, dBA
LWA,ref : Noise emission of Wind Turbine, dBA
K : Pure tone, dBA
Dc : Directivity correction, dB
$Adiv$: Attenuation due to the geometrical divergence, dB
$Aatm$: Attenuation due to atmospheric absorption, dB
Agr : Attenuation due to ground effect, dB
$Abar$: Attenuation due to a barrier, dB
$Amisc$: Attenuation due to miscellaneous other effects, dB
$Cmet$: Meteorological correction, dB

All the input values except LWA,ref are calculated according to coordinates of the wind turbines and noise sensitive receptor. Turbine noise emission levels given in Table 5-5 are used as LWA,ref values but deducted 2 dB as a fair approximation of the L_{A90} levels. Other inputs and assumptions used for the noise propagation model are as follows;

- Wind turbine and noise sensitive receptor coordinates,
- 1-m elevation contour data of the project site is used to determine ground effect,
- Meteorological coefficient value is assumed as 0 dB to represent worst case conditions,
- Pure tone value is assumed as 0 dB according to information obtained from turbine manufacturer,
- Air absorption value is assumed 1.9 dB/km, default value of ISO 9613-2.

Model Output

Predicted turbine noise levels at the NSR, in terms of L_{A90}, over the wind speed range from 3 m/s to 10 m/s are estimated with the model and shown in Table 5-5 below.

Table 5-5 Predicted Wind Farm Noise Emission Levels at the NSR

	Wind Speed (m/s)							
	3	4	5	6	7	8	9	10
Noise Emission Levels at the NSR (dBA)	19.1	20.1	21.1	22.0	23.0	24.0	25.0	26.0

Noise contour map obtained from the results of noise modeling is given in Figure 5-3.

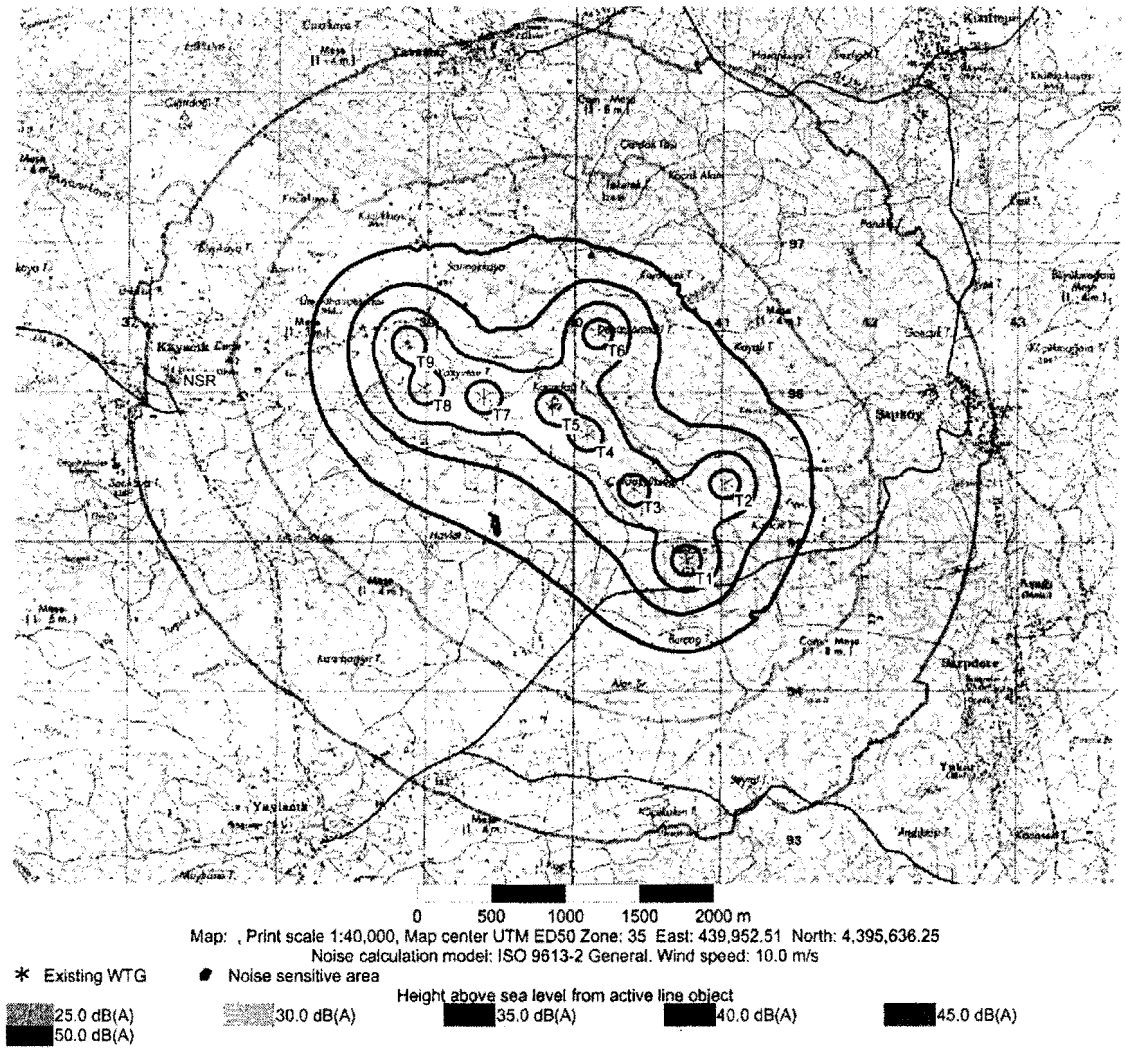


Figure 5-3 Noise Contour Map

5.1.2.5 Noise Criteria

In this assessment, five noise criteria are used:

1. A constant regulatory noise limit set for the daytime (07:00-19:00); eveningtime (19:00-23:00) and nighttime (23:00-07:00) by the Turkish noise regulation (RAMEN). These noise limits are 60 dBA, 55 dBA and 50 dBA, for the daytime, eveningtime and nighttime, respectively. Since L_{A90} is the most appropriate descriptor to represent background noise levels and the background noise levels are determined as $L_{A90\text{-}10min}$ during the noise survey in this study, the Turkish noise criterion is set to 58 dBA, 53 dBA and 48 dBA for the daytime, eveningtime and nighttime, respectively, by simply subtracting 2 dBA from the L_{Aeq} values. The regulatory noise criterion is an absolute value that does not vary with the background wind speed.

2. The IFC/WB noise guideline limit is given as L_{Aeq} and is set for 55 dBA for daytime (07:00-22:00) and 45 dBA for nighttime (22:00-07:00). For this assessment, the limits are set to 53 dBA for daytime and 43 dBA for nighttime to be compared with the $L_{A90\text{-}10min}$ background values. The IFC/WB noise criterion is an absolute value that does not vary with the background wind speed. It should be also noted that the nighttime absolute lower limit of 43 dBA is also based on World Health Organization guidelines for the protection of sleep indoors with windows open.

If the above stated criteria are not met, then the following criteria are used:

3. The IFC/WB noise guideline states that if the noise impact is above the IFC/WB limits then it requires that proposed activities should not result in a maximum increase in background levels of 3 dBA at the nearest receptor.

4. The RAMEN states that if the noise impact is above the RAMEN limits then it requires that proposed activities should not result in a maximum increase in background levels of 5 dBA at the nearest receptor.

5. The ETSU-R-97 noise criterion is based on a level 5 dBA above the best fit curve over the 3-10 m/s wind speed range (actually the ETSU-R-97 criterion is similar to the IFC/WB criterion given above). If the ETSU-R-97 criterion curve is found to be below the IFC/WB nighttime absolute value of 43 dBA (since this value is the lowest of all absolute limits given by RAMEN and IFC/EB), it is basically fixed at 43 dBA.

Thus, the noise criteria set either at the prevailing measured background level plus 3 dBA and 5 dBA or the absolute lower limits, whichever is the greater.

5.1.2.6 Comparison of Noise Impact with Noise Criteria

Noise impact values result from turbine operation at the NSR for daytime and nighttime periods are calculated as a function of wind speed from 3 m/s to 10 m/s and given in Table 5-6 with the background noise levels and the difference between background noise levels and cumulative noise levels.

Background noise levels for each wind speed from 3 m/s to 10 m/s for daytime and nighttime periods are calculated by using the equation of regression curve given in Figure 5-2.

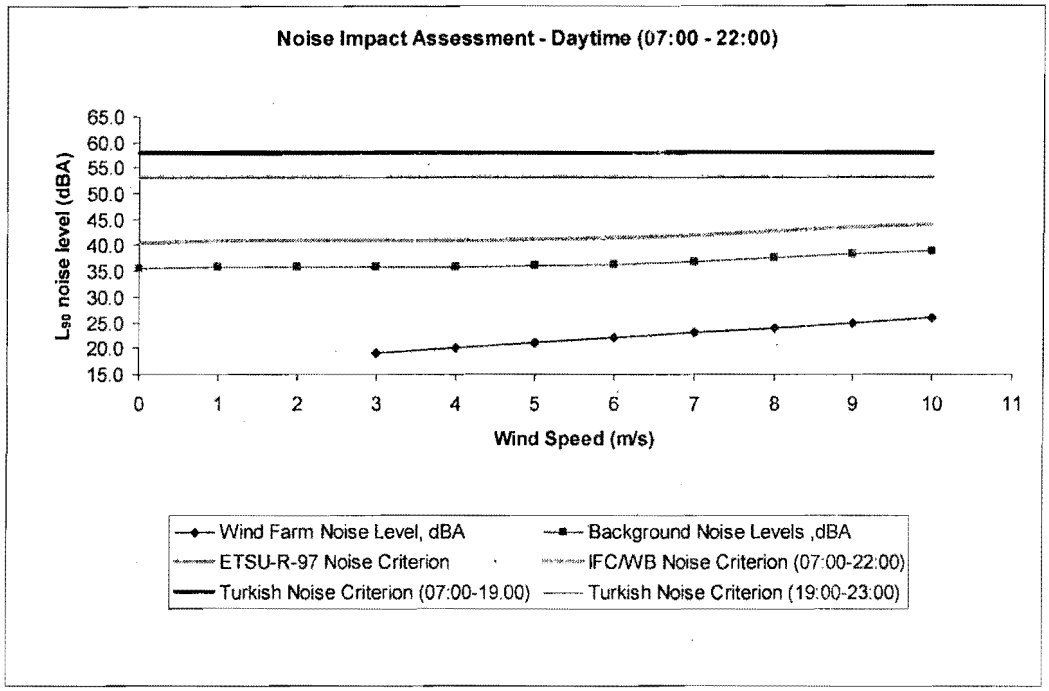
Table 5-6 Daytime and Nighttime Cumulative Noise Levels

		Wind Speed (m/s)							
		3	4	5	6	7	8	9	10
Turbine Noise Emission Levels, dBA		19.1	20.1	21.1	22.0	23.0	24.0	25.0	26.0
Daytime Period (07:00 – 22:00)	Background Noise Levels, dBA	35.8	35.9	36.0	36.4	36.9	37.6	38.3	38.9
Nighttime Period (22:00 – 07:00)	Background Noise Levels, dBA	36.6	36.3	36.2	36.3	36.6	37.2	38.0	39.0

In addition to the tabulated view of noise impact values of the proposed Project, graphical representation of noise impact values at the NSR and the noise criteria for both daytime and nighttime periods are given in Figure 5-4.

As can be seen from Table 5-6 and Figure 5-4, the predicted noise levels at the NSR are well below the absolute noise criteria of RAMEN and IFC/WB for daytime and nighttime. Moreover, the differences between predicted noise levels and background noise levels in daytime and nighttime periods are below 5 dB at all wind speeds indicating compliance with the ETSU-R-97 noise criteria.

This noise assessment study has demonstrated that the operational noise of the proposed wind farm Project will not exceed the Turkish noise regulation and IFC/WB and daytime and nighttime noise limits. Thus, the noise impacts associated with the proposed wind farm Project will be negligible.



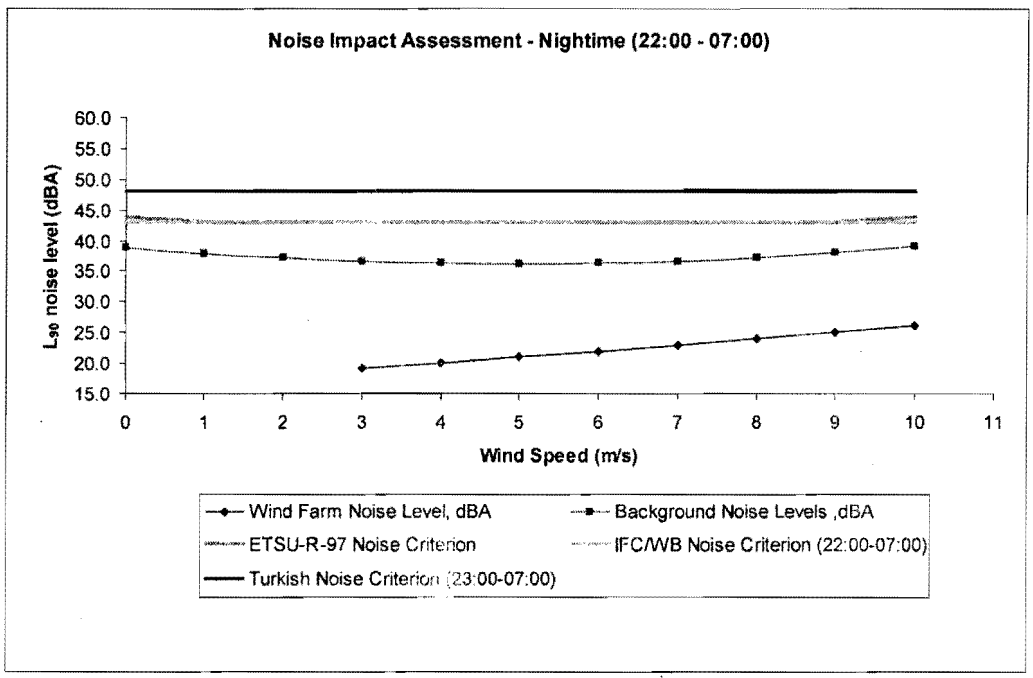


Figure 5-4 Daytime and Nighttime Wind Farm Noise Levels Compared to Noise Criteria

5.1.3 Decommissioning

Noise levels during decommissioning are expected to be similar to the noise levels during construction. Decommissioning noise will be temporary and transient in nature and like the

construction activities, it can be controlled through good site working practices, limiting decommissioning hours and adopting noise control measures where and when necessary. Thus, noise impacts associated with the decommissioning activities are not expected to be a significant issue for the proposed Project.

5.2 Air Emissions

5.2.1 Construction

Main emission sources during the construction period are excavation activities, heavy construction vehicles, material loading and unloading and heating systems of the camping area in case the camping area is established. The construction period will be approximately a year.

Exhaust Emissions

During civil works, the earth moving vehicles, heavy vehicles used for the transportation of excavation materials and generators will burn diesel fuel and fuel consumption will be about 15 lt per vehicle in an hour. It is assumed that four construction vehicles will be in operation at the same time. Hence, the hourly total diesel consumption at the construction site will be 60 liters.

USEPA AP-42 Emission Factors are used for the calculation of emissions generated by the diesel fired vehicles. Since the emissions, generated due to operation of these vehicles, will include sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), particulate matter (PM_{10}) and total organic carbon/volatile organic carbon (TOC/VOC), hourly mass flow of these pollutants were calculated individually.

Calorific value of diesel = 137,000 BTU/gal x gal/4.54609 l = 30,135.8 BTU/l.

Emissions from construction vehicles are as follow;

Carbon monoxide : 0.95 lb/(10^6BTU) x 30,135.8 BTU/l x 60 l/hr x 0,4536 kg/1 lb = 0.78 kg/hr

Sulfur oxides : 0.29 lb/(10^6BTU) x 30,135.8 BTU/l x 60 l/hr x 0,4536 kg/1 lb = 0.24 kg/hr

Total Organic Carbon : 0.35 lb/(10^6BTU) x 30,135.8 BTU/l x 60 l/hr x 0,4536 kg/1 lb = 0.29 kg/hr

Nitrogen oxides : 4.41 lb/(10^6BTU) x 30,135.8 BTU/l x 60 l/hr x 0,4536 kg/1 lb = 3.62 kg/hr

Dust(PM_{10}) : 0.31 lb/(10^6BTU) x 30,135.8 BTU/l x 60 l/hr x 0,4536 kg/1 lb = 0.25 kg/hr

Taking into account the dispersion effect of the wind in the Project area and short duration of the construction, it can be concluded that the proposed Project will not affect the local air quality during the construction.

Dust Emissions Due to Excavation

Dust will be mainly arise from earth moving for excavation and back filling activities during wind turbine construction, switchyard, access roads and transmission line construction.

Approximate construction area and digging durations are presented in Table 5-7. It is assumed that construction works will be performed 26 days a month and 8 hours a day.

Table 5-7 Construction Area

Construction Site	Construction Area (m^2)	Excavation Duration (month)
Wind Turbines	3,969	4
Switchyard and Administration Building	16,190	3
Access Roads and Cabling Trenches	47,300	3

The formula used for the calculation of the maximum hourly dust emission amount is as follows:

Dust Emission Amount = (E x construction area) / construction period

Emission factor (E) is 10.34 g/m^2/day according to USEPA Air Pollutants Emission Factors (AP-42). Dust emissions that will be generated during the excavation operations is given in the following:

Wind Turbines

= 10.34 g/m^2/ days x 3,969 m^2 /(4 months x 26 days/month x 8 hour) = 0.049 kg/hr

Switchyard and Administration Building

= 10.34 g/m^2/ days x 16,190 m^2 /(3 months x 26 days/month x 8 hour) = 0.27 kg/hr

Access Roads and Cabling Trenches

= 10.34 g/m^2/ days x 47,300 m^2 /(4 months x 26 days/month x 8 hour) = 0.59 kg/hr

In order to prevent dust generation, roads will be sprinkled with water regularly, loading and unloading of material that could generate dust will be done without throwing into the air; loads on the hauling vehicles will be covered with tarpaulin type material while in transport. Materials deposited on stockpiles on site will be closely monitored for any emission of dust and if required they will be damped down, covered or treated with a dust suppressant.

All heavy commercial vehicles leaving the site will be washed to prevent the transmission of soil from the site to the public roads. Vehicles will be encouraged to reduce their speed while moving around the site during dry weather to minimize disturbance.

All such mitigation measures will further reduce the amount of dust generated and therefore it is not expected that dust generated during construction activities will create any adverse effects on the local air quality. The proposed Project will comply with the Air Quality Assessment and Management Regulation. Thus, no negative long-term air quality impacts are likely to occur.

5.2.2 Operation

Wind power generation is a non-combustion process that relies on the direct conversion of mechanical energy into electrical energy. Thus, during operation, fossil fuels will not be used for power generation and air emissions will not be generated. There will be no emission resulting from heating since catalytic heater or electric power will be used for heating purposes. There will be an emergency generator, however, the emissions associated with the temporary operation of the emergency generator, if occurs, is not expected to impact the local air quality. Therefore, the proposed Project will not have any adverse impact on local air quality during operation.

5.2.3 Decommissioning

It is expected that emissions resulting from the decommissioning activities will be minor and similar with the construction phase. Main emission source will be dust due to earth moving activities. However, quantity of the dust to be generated during the decommissioning of the Project will be less than the dust emissions generated during the construction phase of the proposed Project since there will be little earth moving required. Necessary precautions will be taken in order to minimize the generation and spread of dust.

5.3 Water Supply and Wastewater

5.3.1 Construction

Preferably, the water required for the construction works, dust suppression and wheel will be carried out by tanker trucks. In case the potable water demand of personnel is supplied from the groundwater resources, necessary permit will be secured from the State Hydraulic Works. This amount of water is insignificant compared to the local water resources and will not impact adversely the local surface or groundwater resources. In addition, drinking water will be supplied by bottled water.

Only domestic wastewater will be generated throughout the construction period of the Project. It is assumed that a single person requires about 150 l/day water and this water will return as wastewater completely. Then the total wastewater generation during construction period will be as follows:

Total number of persons engaged	: 50
Water required	: 150 l/person/day = 0.15 m^3/person/day
Total water requirement	: 0.15 m^3/person/day x 50 persons = 7.5 m^3/day.

During construction, a leak-proof septic basin will be built for the disposal of domestic wastewater since the Project area is located in the rural area and there is no municipal sewer system in the vicinity of the Project area. Wastewater generated during the construction phase will be collected in the septic tank and disposed in accordance with Water Pollution Control Regulation. The domestic wastewater generated during the construction phase will not create any adverse impact on the local environment. The Project will comply with the Turkish Water Pollution Control Regulation and the IFC Guidelines.

5.3.2 Operation

During operation period the Project will not need process water. Thus, the Project will not have any adverse impact on the local water resources. Potable water demand of personnel could be supplied from the water network of the Municipality or groundwater resources. In case the groundwater is used, necessary permit will be secured from the State Hydraulic Works. Drinking water demand of workers will be supplied with bottled water. Seven (7) employees, who will work at the site, will generate an average of 1.5 m^3/day of domestic wastewater (0.150 m^3/person/day x 7 persons = 1.05 m^3/day). Wastewater will be collected in the septic tank and disposed periodically by local municipality. The proposed Project will comply with the Turkish Water Pollution Control Regulation and the IFC Guidelines and will not have any negative impact on the local environment.

5.3.3 Decommissioning

During decommissioning phase, potential impacts of water supply and wastewater are likely to be similar in scale to those associated with construction and an adverse impact is not expected.

5.4 Hazardous Waste

5.4.1 Construction

Small amounts of hazardous wastes such as oily rags, spent solvents, empty paints cans, chemical containers, waste oil and waste batteries and accumulators will be generated during the construction phase. Liquid hazardous wastes within the construction site will be collected in the leak-proof and safe containers and stored in an area with a concrete surface and a proper secondary containment to prevent potential spills and leakages reaching to the soil and groundwater. These containers will be properly labeled and this label will also indicate the amount of stored waste as well as the storage time of the hazardous waste. Waste oil will not be mixed with the other types of hazardous wastes and stored in red colored leak-proof containers with a label of "Waste oil" on it. These containers will be placed on impermeable ground and a proper secondary containment will be also provided for these waste oil containers. Transportation of the wastes will be done by the persons and entities that are licensed for this work and by the vehicles appropriate for the properties of the transported waste. The hazardous wastes will be sent to a licensed disposal facility. All health and safety precautions regarding for staff responsible for activities such as transport and temporary storage of wastes will be taken in the facility.

Waste battery and accumulators generated within the construction site will be collected separately from household wastes and will be delivered to the collection points to be established by enterprises engaged in the distribution and sales of battery products, or by municipalities within six months after they are generated.

The proposed Project will not create any adverse impact on the local environment due to the handling, storage, transport and disposal of the hazardous waste generated during the construction and will comply with the requirements of the Turkish Regulations and the IFC Guidelines.

5.4.2 Operation

Transformers not including carcinogenic materials will be used during the operation period of the Project. Waste oil will be generated due to periodical maintenance of the turbines. Waste oils will be stored red colored tanks/ containers with a label of "Waste Oil" on it and these containers will be placed at the areas with secondary containment. These wastes will be removed to a licensed disposal facility by licensed transporters. It should be noted that regular maintenance of the turbines will minimize the potential for fluid leaks. In addition, non-hazardous fluids will be used as much as possible and practicable.

In addition to the waste oils, waste battery and accumulators will be generated during operation. These wastes will be collected separately from household wastes and will be delivered to the collection points to be established by enterprises engaged in the distribution and sales of battery products, or by municipalities within six months after they are generated.

The hazardous wastes will be handled, stored, transported and disposed of according to the Turkish Hazardous Wastes Control Regulation, Waste Oils Control Regulation and Waste Batteries and Accumulators Control Regulation, and the IFC guidelines. Thus, an adverse impact on the local environment is not expected.

5.4.3 Decommissioning

During decommissioning, transformer oil and lubricating oil will be collected and stored on site as required by the Waste Oil Control Regulation prior sending them to a licensed company with licensed vehicles. Any hazardous waste generated during decommissioning will be stored on site temporarily until they are sent to the licensed treatment and disposal facilities. None of the hazardous waste will be left on site permanently.

5.5 Non-Hazardous Solid Waste

5.5.1 Construction

During the construction period, the following non-hazardous solid waste is expected to be generated:

- Recyclable solid wastes generated by workers (e.g. paper, glass, plastics, etc.);
- Organic solid wastes generated due to catering services provided for the employees;
- Construction wastes;
- Empty drums, cans, containers, etc. (according to the Turkish regulations, if they are used to contain hazardous chemicals, then the containers are considered as hazardous waste); and
- Scrap metal, packing material and card boxes, wood and timber scraps.

According to Turkish Statistical Institute Regional Statistics (2006), waste generation rate per person in Çanakkale Province is 1.57 kg/day/person. Thus, for 50 employees, daily total solid waste generation is estimated to be 78.5 kg/day.

Recyclable wastes like cement bags, metal scraps, packing boxes and wooden crates, etc. will be segregated from other wastes and stored temporarily on site for eventual recycling process. Any other solid wastes that are non-recyclable and non-hazardous will be collected within closed bags and these wastes will be transported to the disposal area of local municipality. All solid non-hazardous wastes will be treated according to the Solid Waste Control Regulation, Packaging Wastes Control Regulation and the IFC guidelines.

Excavated soil will be re-used for the filling of the turbine foundation and site leveling purposes. Hence, no excavated soil will be transported and stored outside the Project site.

5.5.2 Operation

During operation phase of the power plant, the only domestic solid wastes will be generated from people working at the plant. Based on 1.57 kg/person/day average output, the daily total output is expected to be 1.57 kg/person/day x 7 = 10.99 kg/day.

Such solid wastes will include food leftovers, plastics, glass, etc. The paper, plastic and glass content in the wastes will be segregated from other wastes for recycling.

Similar to construction phase, non-recyclable and non-hazardous solid wastes will be collected within closed bags and these wastes will be transported to the disposal area of local municipality. The Project will comply with the Turkish Solid Waste Control Regulation and the IFC Guidelines when handling, storing and disposing of non-hazardous solid waste.

Adverse environmental impacts associated with solid waste is not expected during the operations.

5.5.3 Decommissioning

During the decommissioning, similar to construction and operation period, non-hazardous waste will be segregated and non-recyclables waste will be taken to the local municipal disposal area. The recyclables waste will sent to the licensed and authorized recycling companies. Adverse environmental impact is not expected during decommissioning.

5.6 Medical Wastes

It is not planned to construct infirmary at the Project site within the scope of the Project. The closest health care center will be used for health care purposes. Hence, no medical waste will be generated at the Project site during the construction and operation phase.

5.7 Soil and Groundwater

5.7.1 Construction

Construction activities may pose the potential for release of petroleum based products, such as lubricants, hydraulic fluids, or fuels during their storage, transfer, or use in equipment. All chemical storage containers, including diesel fuel, and hazardous liquid waste drums/containers will be placed so as to minimize the risk of soil and groundwater contamination and water pollution. Such chemicals and fuel will be stored in concrete areas with proper secondary containments and drip trays during construction. When necessary, spill kits, absorbent pads or materials and absorbent sands will be provided near the chemical storage areas at all times.

There is also a potential for spills/leakage of oil associated with the construction machinery and vehicles. Construction machinery will be checked regularly. Any maintenance required will occur over hardstanding or on a suitable impermeable ground cover. Refuelling will be limited to a designated area. Spill kits, absorbent pads and absorbent sands will be available on site at all times. Parking of staff vehicles will only be permitted in designated areas.

Any spills will be cleaned up as soon as possible with any contaminated sands bagged up and disposed of correctly.

With such proper precautions to prevent potential releases to reach environment, an adverse impact to soil or groundwater is not expected during the construction.

5.7.2 Operation

It is not expected to store large volumes of chemicals and oil during the routine operations. Only some minor and temporary storage of transformer and lubricating oil will take place during the routine maintenance. All storage tanks and drums, including those containing oil will be placed in concrete areas with proper secondary containments.

Most of the oil is contained in the gearbox and any leakage would be contained within the nacelle and tower structures. The turbines will be designed with fluid catch basins and containment systems to prevent accidental releases from leaving the nacelle. The door to the tower is situated above ground level. Any accidental gear oil or other fluid leaks form the wind turbines will be contained inside the towers as they are sealed around the base and will be cleaned up as soon as possible. The wind turbines will be equipped with sensors to automatically detect loss in fluid pressure and/or increases in temperature in the lubricating oils used, enabling the turbines to be shut down automatically in the event of a fluid leak.

Transformers will be sealed units with negligible leakages. The transformer oils will not contain polychlorinated biphenyls (PCB).

With these precautions to prevent potential releases from reaching the environment, an adverse impact to soil or groundwater is not expected during the operations phase.

5.8 Biological Resources

The proposed Project is not expected to create significant impacts on the local biological resources and wildlife on or in close proximity to the Project site. Indirect but not significant habitat loss as a result of increased human presence, noise or the movement of the operating turbines is anticipated.

5.8.1 Protected Areas

There are no national parks, natural parks, natural monuments, nature protection areas, wildlife protection areas, wildlife improvement areas, tourism regions, tourist sites and tourism centers within the Project site and its close vicinity as declared in accordance with the Turkish national legislation.

There will be impact on the existing vegetation during site preparation and excavation activities. However, vegetation loss will be limited and moreover, topsoil will be removed and stored on site for future landscaping purposes. Since the Project area is dominantly covered by the maquis shrubs and a part of the are is bare soil, minor tree cuttings will occur during construction activities. As a result the impact on vegetation is expected to be not significant during the construction.

5.8.2 Bird Collision Risk

The most important potential impact of the Project is the risk of collision of birds and bats with the wind turbines. Some resident birds might fly over the Project site during their daily usual flights. As explained earlier in Section 4.9, the Project site is not located on a major migration route, thus migratory birds are not of concern for potential collision risk.

Studies of bird behavior around wind turbines have shown that when the turbines are visible, birds will change direction to avoid flying directly into turbines. In addition, water birds such as geese and swans tend to avoid the vicinity of turbines, keeping from 250 m to 500 m away from them (NWCC, 2002).

There are a number of studies available in the literature about avian collisions with wind turbines. It is reported that fatality rates of birds vary among sites and likely depend on several factors including the amount of bird, vegetation, and other physical and biological characteristics of the specific wind plant and surrounding area (NWCC, 2004).

It is reported in a study published by National Wind Coordinating Committee (NWCC) that the avian mortality result from the collisions with human-made structures, including vehicles, buildings and windows, power lines, communication towers, and wind turbines (NWCC, 2001). The study indicates the following estimated annual avian collision mortality in the United States:

- Vehicles: 60 million - 80 million
- Buildings and Windows: 98 million - 980 million
- Power lines: tens of thousands - 174 million
- Communication Towers: 4 million - 50 million

- Wind Generation Facilities: 10,000 - 40,000

As seen from the list above, the lowest rates of avian mortality in the United States are estimated to result from the collisions with the wind turbines. It is reported that data collected to date indicate an average of 2.19 avian fatalities per turbine per year for all species combined and 0.033 raptor fatalities per turbine per year in the U.S. Based on the projections of 15,000 operational wind turbines in the U.S. by the end of 2001, the total annual mortality was estimated at approximately 33,000 bird fatalities per year for all species combined. The majority of these fatalities are projected to occur in California where approximately 11,500 operational turbines exist, and most are older smaller turbines (100- to 250-kW machines) (NWCC, 2001).

Consequently, based on the estimates in the report, wind turbine-related avian collision fatalities probably represent from 0.01% to 0.02% (i.e., 1 out of every 5,000 to 10,000 avian fatalities) of the annual avian collision fatalities in the United States (NWCC, 2001). Large number of fatalities is reported at large wind farms, such as Altamont wind farms located in California which has over 5,000 turbines. Bird facilities are significantly lower if the wind farm has less number of turbines.

Although the chance is low, there still exists a risk of avian collision with the wind turbines and hence necessary precautions must be taken to minimize this avian collision risk. The mitigation measures to minimize avian collision risk associated with the proposed Project are explained in the following section.

Mitigation Measures

Since the Project will include only 9 turbines, it is anticipated that the risk of avian mortality due to collision with the turbines will be relatively lower than large wind farms.

In order to reduce potential avian collisions during the operation following measures will be taken:

- Site selection: The site selection was made so that the Project site lies in an area where there are no important bird areas, wetlands or high bird activity. The Project site is not on migration routes of migratory birds. Thus, the risk of collision is expected to be low.
- Micrositing: Sufficient distance, ranging from 200 m to 1,320 m, is placed between two turbines; thus birds should be able to fly around or above turbines.
- Appropriate storm water management measures will be implemented to avoid creating small ponds which can attract birds and bats for feeding or nesting near the wind farm.
- Turbine blades will be painted by reflecting color and appropriate lighting of the wind turbines will be provided. As indicated in the above, according the studies regarding bird behavior around wind turbines, when the turbines are visible, birds will change direction to avoid flying directly into turbines. Hence, collision risk will be reduced.

5.9 Cultural and Historical Resources

As indicated in Section 4.11, there are no archaeological and historical resources within the proposed Project site. The closest archaeologically protected sites to the Project sites are can be listed as;

- Nameless 3rd Degree Archaeologically Protected Site located approximately 70 m Turbine 7 (T–7); and
- Neandreia Castle 1st Degree Archaeologically Protected Site located approximately 750 m to the Turbine 9 (T-9).

Although there are no archeological and historical resources within the Project site, there is always a chance of discovering archeological artifacts or remains during construction related excavations in Turkey. During construction, if any archeological remains are discovered, as the national law requires, the Project will cease excavation at this location and inform the local Department of Culture and Tourism immediately. After inspection by the experts from the local Department of Culture and Tourism, a decision will be given to continue or reposition the excavation. With these precautions, the local cultural and historical resources will not be adversely impacted due to the construction activities.

5.10 Visual Impacts

Visual or aesthetic resources refer to those natural and cultural features of an environmental setting that are of visual interest to people. The Project site is not located in a protected area or a tourist/resort area; it is located on a several hill tops and not considered as an aesthetically significant place. Thus, a visual impact is not considered as significant. However, the visual impact associated with the proposed wind farm will be permanent for those residing at the closest settlements.

The potential visual impact of the proposed wind farm will primarily result from changes to the visual character of the area within the view catchment. The nature of these changes will depend on the level of the visual contrast between turbine structures and the existing landscape within which they would be viewed. The degree of contrast between the turbines and the surrounding landscape will result from one or more of the visual characteristics such as; color, shape or scale, texture and reflectivity. Since the Project site has a hilly topography and the closest settlements are located at lower elevations, the turbines will be viewed against the sky.

In order to demonstrate the visual impact, views of the Project site from three different locations have been prepared. Three dimensional models were used in order to represent wind turbines, towers and blades and these models were located on satellite image of the Project site. The dimensions of the models were same as the project dimensions; 85 m hub height and 100 m rotor diameter.

- The first view, which is given in Figure 5-5, is looking to the Project site from south of Kayacık Village at the entrance of the village in east direction, about 1.65 km away from Turbine 8 (T8) at 336 m altitude.

- The second view in Figure 5-6 shows the Project site from Yaylacık Village in south-southwest. The view is looking in northeast direction, about 3 km away from Turbine 4 (T4) at 364 m altitude.
- The third view, given in Figure 5-7 shows the Project site from Şapköy Village located in east of the Project site. The view is looking in west direction 1.75 km away from the Turbine 2 (T2) location at 200 m altitude.
- The last view, shown in Figure 5-8 is looking to the wind farm from Yavaşlar Village in north looking in south direction, about 1.8 km away from Turbine 6 (T6) at the altitude of 282 m.

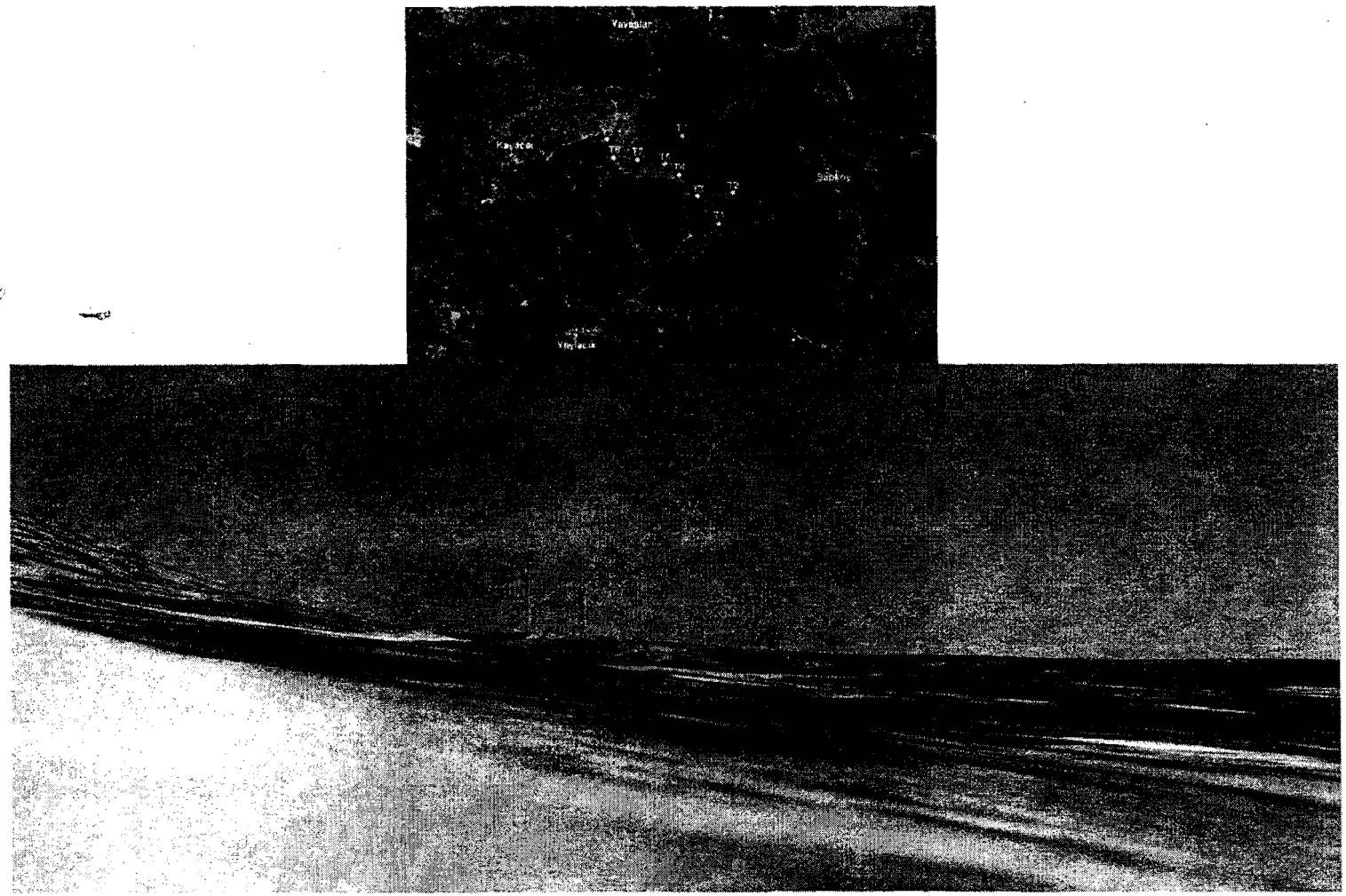


Figure 5-5 View of the Project Site from South of Kayacık Village

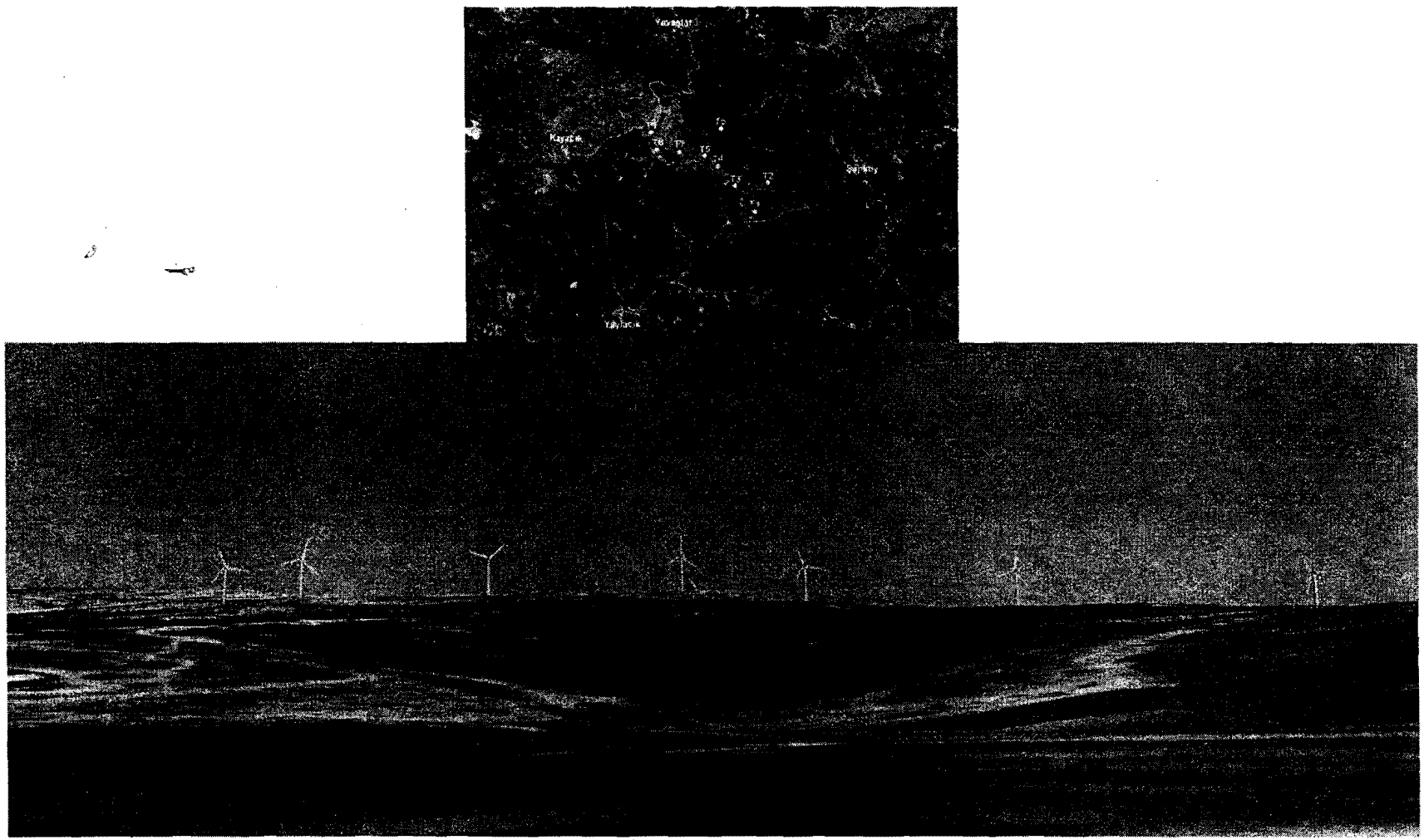


Figure 5-6 View of the Project Site from Northeast of Yaylacık Village

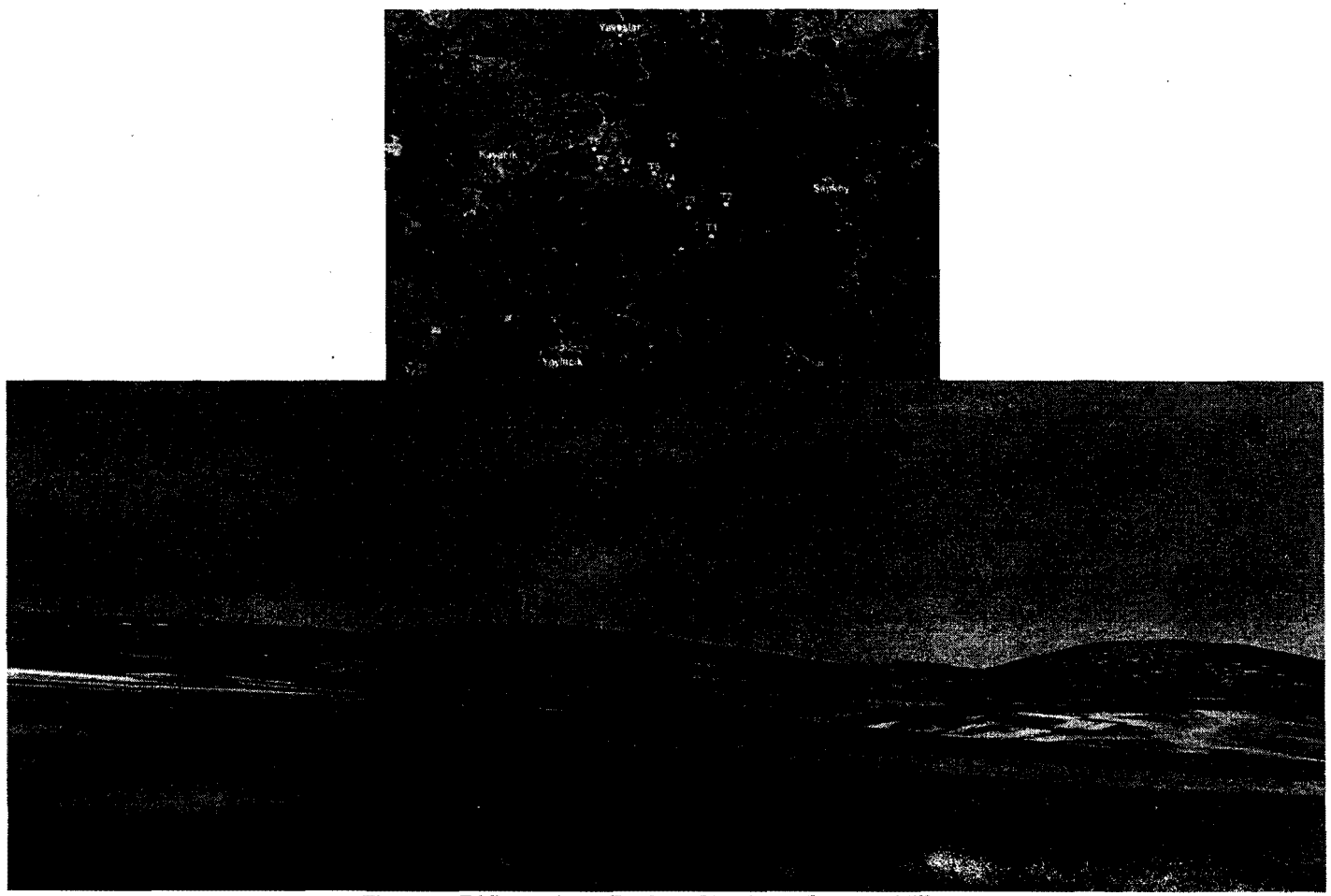


Figure 5-7 View of the Project Site from Şapköy Village

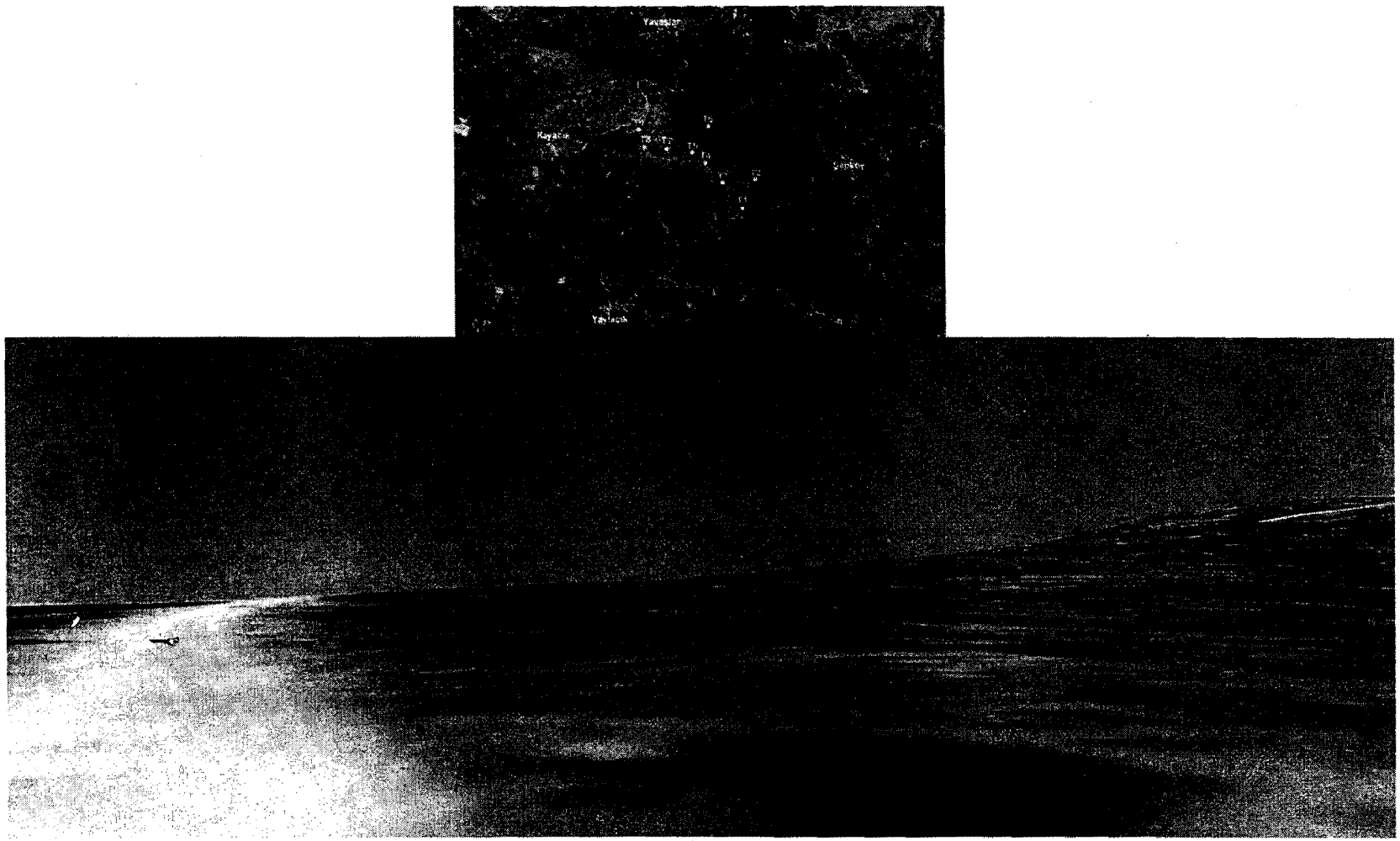


Figure 5-8 View of the Project Site from East of Yavaşlar Village

As can be seen from Figure 5-5, Turbine 9 (T9), Turbine 8 (T8), Turbine 7 (T7), Turbine 5 (T5), Turbine 4 (T4) and Turbine 3 (T3) will be seen from the View Point 1 which is located at the entrance of Kayacık Village. T6, T2 and T1 are located far away from the View Point 1 at the east of the Project site. None of the turbines will be in the view shed of residents located in Kayacık Village since the hill named "Dede Tepe" prevents the turbines to be seen from Kayacık Village.

The residents of Yaylacık Village located in south of the Project site will see all of the turbines as shown in Figure 5-6. All turbine towers except Turbine 6 (T6) will be completely visible to the village. The rotating blades and nacelle of T2 will be in the view shed of the Yaylacık Village.

All turbines except Turbine 8 (T8) and Turbine 9 (T9) will be visible to the residents of Şapköy Village located in east of the Project site. T8 and T9 are the farthest turbines to the Şapköy Village and the hilly topography at the east of the Project site prevents the turbines to be seen from the village. Turbine 5 (T5) will be completely seen from the village where as the other turbines will be partially visible with their blades and nacelles.

In the last view from the Yavaşlar Village in the north of the Project site, only four of nine turbines will be visible which are Turbine 4, Turbine 5, Turbine 6 and Turbine 7. These turbines will be partially seen from the residents of Yaylacık Village. There are two hills between the Yavaşlar Village and the Project site whose names are "Sarıcakkaya Tepesi" and "Tekerek Tepesi". Since these hills prevents the turbines to be seen from the village, T4, T5, T6 and T7 which are the closest turbines to the village will be visible.

Visual impact is a subjective issue, a significant number of people in Turkey associate wind farms with clean energy and view the towers as symbols of modern and civilized living. There is no known public opposition on wind farms in terms of potential visual effects. Moreover, after the conversations with local people, it was understood that they do not have any disturbance or negative attitude about the visual impact of wind towers. Thus, it is expected that public and NGOs will view this development favorably and visual impacts will not considered as significant.

5.11 Shadow Flicker and Blade Glint

Wind turbines, like all other tall structures will cast a shadow on the neighboring area when the sun is visible. The major difference between a tall structure and a wind turbine regarding their shadow casting potential is the rotating blades of the wind turbine. As the rotor blades rotate, shadows pass over the same point causing an effect termed as shadow flicker. Shadow flicker occurs when the sun passes behind the wind turbine and thus casts a shadow. This phenomenon is regarded as an environmental impact and can create a disturbance/nuisance if the wind farm is not situated and/or planned accordingly.

A modeling study was performed in order to estimate the shadow casting areas by WindPRO software and to create a shadow model for each of the wind turbines. Two shadow receptors which

are closest permanent residences are determined. The map showing location of shadow receptors is given in Figure 5-9. As can be seen in Figure 5-9, the Shadow Receptor 1, which is the same residence selected as noise sensitive receptor, is located in east of Kayacık Village in west of the Project site. The Shadow Receptor 2 is located in the west of Şapköy Village which is situated in the east of the Project site.

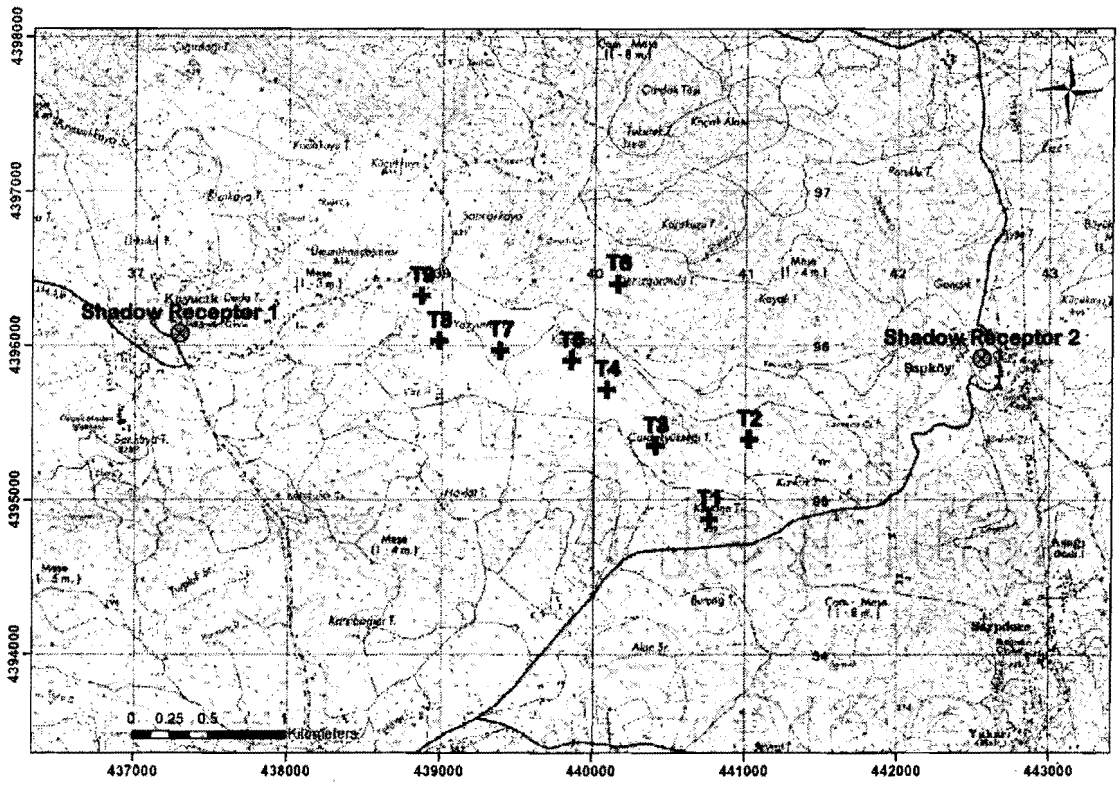


Figure 5-9 Locations of Shadow Receptors

The coordinates of the shadow receptors (UTM Projection, ED 50 datum) are given in Table 5-8 below.

Table 5-8 Shadow Receptor Coordinates

	East	North	Z
Shadow Receptor 1	437,298	4,396,077.98	340.4
Shadow Receptor 2	442,549.51	4,395,915.10	184.0

Model Inputs

Shadow module of WindPRO software requires several parameters for the calculation of the shadow model. These parameters are terrain data, blade specifications (shape, length, thickness

etc.), sun shine probabilities for each month, annual operational times of turbines for each of 16 wind sectors, maximum distance of influence, and minimum sun height over horizon for influence.

Terrain data used in the model is 10 m contour data which provides accurate elevation values for both turbines and shadow receptors. Blade specifications values are obtained from known values of similar size blades given in database of WindPRO software. In addition, a hub height of 85 m and rotor diameter of 101 m are entered into model. Monthly sun shine probability values are acquired from long term meteorology data (1975-2006) of Çanakkale Meteorological Station. Annual operational times of turbines for each of 16 wind sectors are obtained from data from MAST towers situated in the Project site. Monthly sun shine probability values and annual operational times for each of 16 wind sectors are given in Table 5-9 and Table 5-10, respectively.

Table 5-9 Monthly Sun Shine Probabilities

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Probability	0.22	0.19	0.21	0.19	0.28	0.33	0.28	0.20	0.29	0.36	0.35	0.24

Table 5-10 Annual Operation Times for 16 Wind Sectors

	N	NNE	NE	ENE	E	ESE	SE	SSE
Hour (hr)	141.7	402.3	2,413.2	1,782.2	90.8	74.0	130.3	544.2
	S	SSW	SW	WSW	W	WNW	NW	NNW
Hour (hr)	655.3	521.3	392.0	330.2	272.2	132.2	82.3	92.5

Regarding the maximum distance for influence of shadow flickering, various attempts and experiments have showed that the shadow impact is irrelevant at the areas which are seven times rotor diameter distance away from the wind turbine (windpower.org). Although the influence distance is 700 m according to this assumption, to be on the safe site, the distance of 1,575 m which is the maximum distance in the WindPro software shadow model is used as the maximum distance of influence for shadow flickering. The minimum sun height over horizon is used as 3° in the model.

Model Results

Shadow modeling calculates the shadow flickering impact in two different scenarios; worst case and realistic case. The worst case scenario assumes that the sun is shining for all day from dusk to dawn with no cloud cover and the heading of the turbines is following the movement of the sun during the shining hours. The realistic case scenario is based on the inserted data into the model such as; annual operation hours of turbines in 16 wind sectors and monthly sunshine probabilities.

Shadow modeling calculates the shadow flickering for each minute of a day throughout a year. The results of WindPRO software include several reports and graphical demonstrations. These reports are given in Appendix B.

Shadow modeling results show that shadow hours per year at the shadow receptor for both worst and realistic cases are 0 which means that there will be no shadow flickering impact at the closest settlements. The reasons of no shadow flickering impact are the distance between the shadow receptors and the turbines are greater than 1575 m and the hill situated between the Project area and closest settlements. The map showing the shadow contours (hour/year) for realistic case is given in Figure 5-10.

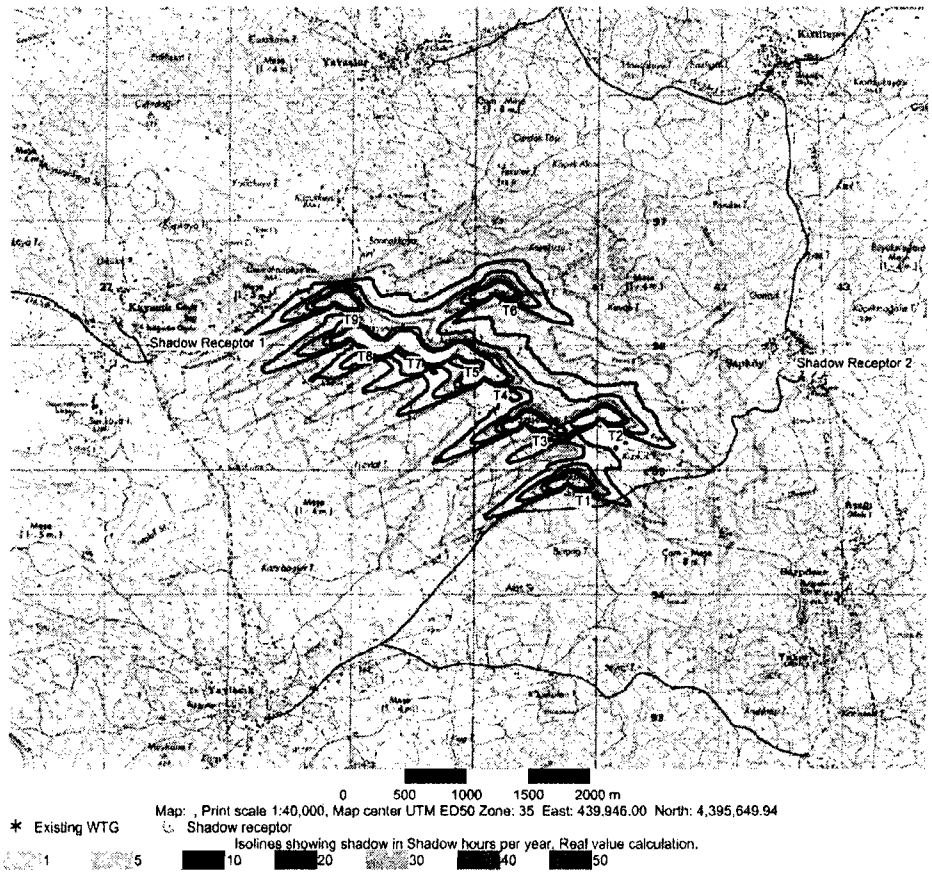


Figure 5-10 Realistic Case Shadow Contour Map

As can be seen from the shadow contour map, the hill named "Dede Tepe" prevents the shadows to reach to the shadow receptor 1 and Kayacık Village. Regarding the shadow receptor 2 and Şapköy Village, the distance between the shadow receptor 2 and the closest turbine T2 is greater than the maximum influence distance of 1575 m.

There is no limit stated in both Turkish legislations and IFC/World Bank guidelines regarding to shadow flickering. The modeling result show that 0 hr/year shadow flickering will occur at the shadow receptors for both worst case and realistic case scenarios and it can be stated that the proposed wind power plant will not cause shadow flickering on the closest settlements. In addition, blade glint is not expected to be important since the blades will be made of and painted non reflective materials.

6.0 SOCIO-ECONOMIC IMPACTS

The Project area is located on a state-owned land. The area is registered as forest and pasture land. There is no structure on the Project site and project site is not used for any other economic means. There will be no involuntary resettlement or expropriation of privately owned lands. Therefore, the Project will not have significant socio-economic impacts in the area. However, minor potential impacts onto local socio-economy may arise during construction, operation and decommissioning phases of the Project. Probable socio-economic impacts and mitigation measures are described in the following sections.

6.1 Construction Phase

- Employment;

Impact: There might be employment opportunities during construction phase of the project.

Mitigation: A recruitment approach to hire construction workers from region and especially from project-affected communities will provide a positive socio-economic impact.

- Land Expropriation, Land Use and Resettlement;

As it was thoroughly discussed in Section 4.0 of the ESA report, the Project area is located on a state-owned land. GARET has leased the required land for 49 years from the Ministry of Finance in accordance with the national energy law and regulations. Currently there is no active use of this land for any economic income purpose (such as for agriculture). Since there are no privately owned lands or houses located on the proposed Project site, there will be no economic or physical resettlement or displacement associated with the proposed Project. Therefore, the Project does not have any impact on land use and resettlement.

- Community relations;

Impact: There might be tension/dispute between local resident and workers during construction period.

Mitigation: This impact can be minimized by managing any disputes between the Contractors and local residents, showing respect to local people and customs, implementing an alcohol and drug policy for the construction workers, having zero tolerance of illegal activities by construction personnel, providing cultural awareness training to construction workers.

- Safety risk for local community;

Impact: There might be temporary increase in traffic flow in the region during construction.

Mitigation: In order to minimize the impact, local residents will be informed about the traffic flow.

Impact: Open trenches during construction of the Project might pose a safety risk to the local community.

Mitigation: There will be no access to open trench area for non-authorized personnel. The security guards will prevent access to non-authorized personnel to the construction area.

- Disruption to local infrastructure;

Impact: There might be disruption to roads during the construction of the Project.

Mitigation: All of the construction works are planned and managed properly to eliminate and minimize health and safety risks. Transportation and construction works will be done properly to minimize damage to local infrastructure.

6.2 Operation Phase

- Employment;

Impact: There might be employment opportunities during operation phase of the Project.

Mitigation: A recruitment approach to hire safety guards from region and especially from Project-affected communities will provide a positive socio-economic impact to the Project.

- Safety risk for local community;

Impact: Access of non-authorized people to high voltage parts and equipments might result in health and safety risks.

Mitigation: There will be safe guards during operation of the plant that will prevent access to high voltage parts and equipments. All of project personnel will be trained for health and safety issues.

6.3 Decommissioning phase

The socio-economic impacts of the Project during decommissioning phase are similar to that of during construction phase. However, there might be some additional impacts due to change in the demography of the Project area at the time of decommissioning. Negative impacts should be minimized by taking necessary mitigations and compensations should be given when required. Positive impacts such as employment opportunity should be maximized by applying necessary policies and mitigations.

7.0 OCCUPATIONAL and COMMUNITY HEALTH AND SAFETY

7.1 Working at Heights

Working at height is a major occupational health and safety issue while assembly of wind tower components and general maintenance activities during operations. Prior to the construction works, a Health and Safety Plan (HASP) including issues relevant to working heights will be prepared and implemented. As the details will be included in the HASP, the safety harness will be used to secure persons during ascent to and descent from the nacelle of the wind turbine generator system and when carrying out work in areas where there is a falling hazard. In addition, employees will be trained in climbing techniques and fall protection measures and fall protection equipment will be inspected, maintained and replaced regularly. Furthermore, tower installation and maintenance works will not be carried out during poor weather conditions.

All the precautions related with working at heights will be taken throughout the construction and operational phases of the Project in accordance with the Turkish Health and Safety laws and regulations and IFC Guidelines. With the proper implementation of the HASP and taking the necessary precautions given in the regulations, potential accidents associated with working height would be eliminated.

7.2 Air Craft and Marine Navigation Safety

In accordance with the 2920 numbered Civil Aviation Law, it is forbidden to construct buildings and structures that will prevent air traffic, aviation security, and telecommunication and endanger the navigation and court security around the airports and related facility or equipments. In addition, according to the Regulation on Construction, Operation and Certification of Airports published in the Official Gazette No. 24755 dated May 14, 2002, Ministry of Transport and Communication was authorized to remove buildings and structures that will endanger the aviation safety. In addition, Ministry of Transport and Communication could ask putting visible signs and radio and electrical signs on the defined obstacles and areas.

International Standards and Recommended Practices (Annex 14) published by the International Civil Aviation Organization (ICAO) recommends that the obstacles or fixed objects listed below should be marked or lightened according to the defined methods;

- A fixed obstacles that extend above a take off climb surface within 3,000 m of the inner edge of the take-off climb surface;
- A fixed object, other than a obstacles adjacent to the take-off climb surface;
- A fixed obstacles that extends above an approach or transition surface within 3,000 of the inner edge of the approach surface;
- A fixed obstacle above a horizontal surface; and
- A fixed object that extends above an obstacle protection surface.

Proposed Project area is located approximately 48 km south-west to the Çanakkale Airport. Hence, in accordance with the recommendations published by ICAO, there is no need to mark or lighten the wind turbines. However, in case visible signs and radio and electric signs are requested by the Ministry of Transport and Communication, the wind turbines should be marked. Within the Project, the edges of the turbine blades will be painted by a reflecting color and lightening system will be installed. In the scope of the Project, 2920 numbered Civil Aviation Law and related international laws will be complied with.

7.3 Blade/ Ice Throw

As indicated in Section 3.1, the coldest months are January and February when the average minimum temperature is 3.2°C. Since, in general the Mediterranean Climate is dominant in the region; blade/ice throw will not be a potential risk to threat public safety. However, the turbines will be maintained regularly in case of a blade/ice throw risk.

7.4 Electromagnetic Interference

Wind turbines could lead electromagnetic interference with aviation radar and telecommunication systems. There is no aviation radar in the close vicinity of the proposed Project site. In addition, wind blades are made of synthetic light material which will reduce the impacts of electromagnetic interference caused by wind turbines. The proposed Project is not expected to interfere with the telecommunication systems.

7.5 Public Access

The proposed Project will not cause any risk in terms of public access. All the necessary precautions will be taken in order to prevent un-authorized access to the Project site. There will be security personnel during the operation period. Hence, entrance of unauthorized people to the wind turbine area will be prevented.

8.0 ANALYSIS OF ALTERNATIVES

8.1 Technology Alternatives

Power plants can produce electricity using a renewable resource, such as water, wind or solar, or a nonrenewable resource such as coal, oil/gas or nuclear energy. Coal fired or gas fired thermal power plants are generally built as close as possible to their fuel resources or close to their transportation mutes.

The coal fired or oil/gas fired thermal power plants have high air emission rates although their stack air emissions are significantly reduced by modern treatment technologies. In thermal power plants, various types of hazardous wastes are generated due to their processes. Thermal power plants generally require a considerable amount of water for their cooling systems, which creates another environmental problem to overcome.

Hydropower plants are constructed at the main tributaries of rivers. These projects occupy significantly large surface areas due to the water reservoir created behind the dams. Thus, impacts on biological resources, wildlife and natural habitat are generally considered significant during the construction and operation of hydro power plants.

Wind power is a renewable power source as it only uses the movement energy of the air currents for power production. Here are some advantages of wind power:

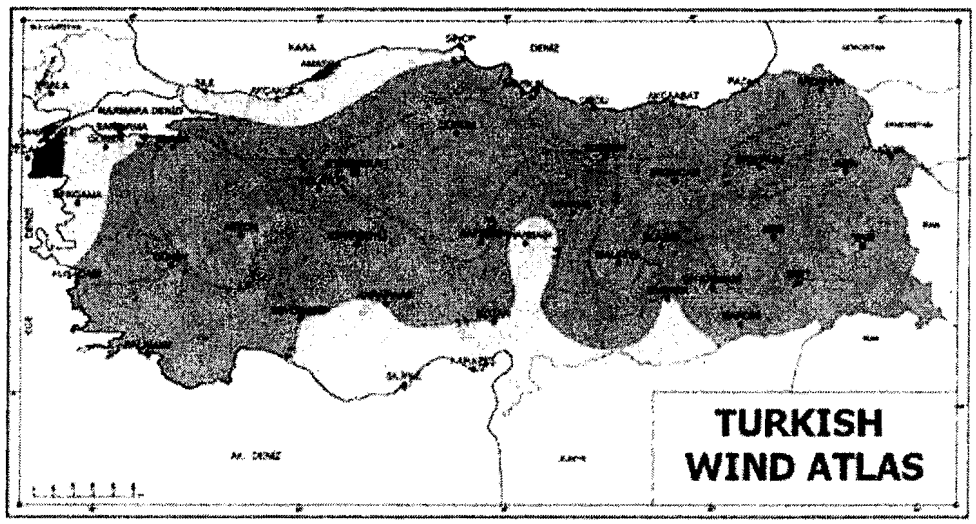
- Wind facilities produce electricity without requiring the extraction, processing, transportation, or combustion of fossil fuels.
- Wind power production is an environmentally friendly power generation source, as it does not produce any air emissions or hazardous wastes.
- Unlike fossil-fueled power plants, wind farms emit no greenhouse gases.
- Wind project operation does not consume surface or groundwater, or discharge wastewater containing heat or chemicals.
- Wind turbines take up less space than the average power station. Windmills only have to occupy a few square meters for the base. This allows the land around the turbine to be used for many purposes, for example agriculture.
- Wind turbines are a great resource to generate energy in remote locations, such as mountain communities and remote countryside. Wind turbines can be a range of different sizes in order to support varying population levels.
- The wind power generation industry has a proven record of safety. Accidents related to wind power are reported to occur only during construction and maintenance.

In addition to the advantages of wind power, wind power generation has been recommended that due to the limited fossil fuel resources, a gradual shift from fossil fuels to renewable resources should be considered seriously in Turkey (Ediger and Kentel, 1999).

As stated in previous paragraphs there are various technical alternatives of producing electricity from different energy resources. However, in order to combat with the global warming problem, sustainable and renewable energy resources must be used as much as possible. The Project aims at utilizing wind energy, which is a renewable energy, potential of Turkey via Wind Turbine technology to generate electricity. Hence, the Project will not only provide benefit to Turkey by producing electricity but also to global atmosphere by reducing CO_2 emissions.

8.2 Alternative Sites

The General Directorate of Electrical Power Resources Survey and Development Administration (EPRSDA) evaluated the natural wind energy potential for most parts of Turkey using monthly wind speed and direction data from the State Meteorological General Directorate. As a result of these studies, Turkish Wind Energy Potential Atlas presented in Figure 8.1 had been prepared in order to evaluate the wind energy potential (REPA, 2007). The figure has been created by WAsP model based on the collected wind data at several locations around Turkey. As seen from the figure, Çanakkale Province and Biga Peninsula lies within one of the highest wind energy potential regions in Turkey. The Project Site is selected in this region in order to utilize high wind energy potential in this region. Additionally, on site collection of wind data on the Project site for one year also demonstrated this high wind energy potential in the project area.



Wind resources at 50 m above ground level for open plains (roughness class 1)

v (m/s)	> 7.5	6.5 – 7.5	5.5 – 6.5	4.5 – 5.5	< 4.5
P (W/m²)	> 500	300 - 500	200 - 300	100 - 200	< 100

Figure 8-1Wind Atlas for Turkey

(Source: Turkish Wind Atlas, State Meteorological Organization, 2002)

9.0 ACTION PLAN AND MANAGEMENT SYSTEM

Project Action Plan (AP) provides clearly identifiable mechanisms to ensure that all mitigation measures recommended in the ESA are implemented.

Table 9-1 comprises the AP including environmental and social issues for the Sares Wind Power Plant. In preparing the AP consideration has been given as appropriate to the IFC's Policy and Performance Standards on Social and Environmental Sustainability. AP and the environmental and management plan is based on the mitigation that is considered necessary to reduce or avoid the potential significant impacts of construction, operation, and decommissioning on environmental and human receptors. GARET, its subcontractors, and its workers should comply with the recommended construction and operational practices and mitigation measures described in the table to ensure that their activities are conducted in a manner that meets the environmental protection requirements of the AP. This would include training for workers so they are familiar with the practices required by the AP. The proposed AP can be regularly updated as the works progress through the different phases and as environmental and social issues associated with the project change in significance.

In addition to the ESA and AP, other documents such as the construction Health, Safety and Environment (HSE) Plan and the Operations Environmental Management System (EMS) should be prepared at a later date and should include further details on the manner in which the aims of the AP will be implemented.

The costs associated with the proposed mitigation for the Project should be minimal and are inherent to good engineering practice. There are not considered to be any site specific mitigation measures that could represent a significant expense. Monitoring costs would be minimal and would principally be associated with the purchase of monitoring equipment and the employment of the relevant environmental staff or consultants.

To ensure that the monitoring and mitigation measures outlined in the AP are successfully implemented consideration of the appointment of an environmental and safety Engineer during the construction and operational phases should be considered.

The Engineer would need to be designated by the project developer who would be responsible for the implementation of the AP. The Engineer would be responsible for reporting on any oil spills etc, and for ensuring AP and permitting requirements are met, as well as ascertaining adequate reporting of events. The compliance or non-compliance as results from inspections would need to be documented by the Engineer, who would be in consultation with the Ministry of Environment and Forestry and relevant governmental agencies as required.

Employees/contractors engaged in the works would be expected to comply with the AP by their direct managers, who would be familiar with the AP and would liaise with the responsible Engineer.

In the event of an environmental incident, the point of contact would be the responsible Engineer. The responsible Engineer would use the incidents register and should report all incidents to GARET within 48 hours. Any serious incidents should be reported as soon as practically possible.

ENVIRONMENTAL ISSUE/IMPACT	IMPACT SIGNIFICANCE	MITIGATION MEASURE	RESPONSIBILITY	MONITORING	MONITORING / INSPECTION FREQUENCY	COST
WATER AND SOIL QUALITY - Construction Phase						
Groundwater, Surface water and Soil Contamination	Moderate	Any wastewater discharge to the environment will be prohibited.	Contractor	Visual inspection	Continuously	Part of best working practice
	Moderate	All chemical storage containers, including diesel fuel, and hazardous liquid waste drums/containers will be placed in concrete areas with proper secondary containments during construction. When necessary, absorbent pads or materials will be provided near the storage areas.	Contractor	Visual inspection	Weekly	Part of best working practice
	Low to Moderate	Sanitary wastewater from the workers camp will be stored in sealed septic tanks.	Contractor	Visual inspection to ensure the effectiveness of the mitigation measure	Weekly	Part of best working practice
	Low to Moderate	The septic tanks will be leak proof and will be checked periodically.	Contractor	Visual inspection to ensure the effectiveness of the mitigation measure	Weekly	Part of best working practice
	Low to Moderate	Wastewater generated during the construction phase will be transported and disposed periodically by local Municipality.	Contractor	Visual inspection to ensure the effectiveness of the mitigation measure	During the activity	Part of best working practice
Groundwater, Surface water and Soil Contamination	Low to Moderate	An oil spill contingency plan will be prepared and implemented.	Contractor	-	-	Part of best working practice
	Low to Moderate	Spoil from construction activities will be monitored and controlled; waste materials which are unsuitable for reuse on-site will be disposed at an appropriately licensed sanitary landfill site.	Contractor	Visual inspection of construction grounds for potential stains	Weekly	Part of best working practice

ENVIRONMENTAL ISSUE/IMPACT	IMPACT SIGNIFICANCE	MITIGATION MEASURE	RESPONSIBILITY	MONITORING	MONITORING / INSPECTION FREQUENCY	COST
WATER AND SOIL QUALITY - Operation Phase						
Groundwater, and Soil Contamination	Moderate to High	All chemical storage tanks and drums, including those containing fuel and oil as well as waste oil drums and containers will be placed in concrete areas with proper secondary containments. If necessary, absorbent materials will be purchased and placed near the chemical storage tanks.	Operator	Visual inspection to ensure the effectiveness of the mitigation measure	Daily	Part of best working practice
	Moderate to High	Any leakage oil will be collected in the bottom part of the nacelle enclosure. The wind turbine generator system will also be equipped with a series of smaller oil collection systems for individual system components.	Operator	Visual inspection to ensure the effectiveness of the mitigation measure	Daily	Inherit in Design
	Moderate to High	Any residues and leftover oil following maintenance work will be collected in leak-proof containers and removed to a recycling facility by licensed transporters.	Operator	Visual inspection to ensure the effectiveness of the mitigation measure	During the activity	Part of best working practice
	Moderate to High	Regular maintenance of the turbines will minimize the potential for fluid leaks.	Operator	Visual inspection to ensure the effectiveness of the mitigation measure	Daily	Part of best working practice
	Moderate to High	Transformers will be provided with pits to retain 110% of the coolant capacity of the transformers.	Operator	Visual inspection	When required	Inherit in Design
Groundwater and Soil Contamination	Moderate to High	The cooling oil for the transformers will not contain PCBs or any other carcinogenic type oils.	Operator	Visual inspection	When required	Inherit in Design
	Moderate to High	Waste oils will be temporarily stored, handled and disposed in separate tanks/containers according to the categories referred in the Waste Oil Control Regulation.	Operator	Visual inspection	When required	Part of best working practice

ENVIRONMENTAL ISSUE/IMPACT	IMPACT SIGNIFICANCE	MITIGATION MEASURE	RESPONSIBILITY	MONITORING	MONITORING / INSPECTION FREQUENCY	COST
	Moderate to High	Waste oils will be collected inside the tanks/containers placed on an impermeable surface. Different tanks/containers will be used for waste oils of different categories. Waste oil temporary storage tanks/containers will be red and bear "Waste Oil" sign.	Operator	Visual inspection	When required	Part of best working practice
	Moderate to High	Emergency Response Plan and Oil Spill Contingency Plan will be prepared and implemented	Operator	-	-	Part of best working practice
Waste Oil Disposal	Moderate to High	Waste oils will be transported by licensed transporters to the licensed processing and disposal facilities and National Transportation Form will be filled in the case of transporting the waste oil out of the facility and waste oil declaration form will be submitted to relevant authorities annually.	Operator	Visual inspection	When required	Part of best working practice
Wastewater Disposal	Low	Wastewater generated during the operation phase will be transported and disposed by local Municipality.	Operator	Visual inspection	Monthly	Minimal
NOISE - Construction Phase						
Noise Control	Moderate	All construction vehicles will be maintained so that their noise emissions do not cause nuisance to workers or local people.	Contractor	Inspection with a Sound Meter	Daily or during the activity	Part of best working practice
	Moderate	Exhaust mufflers will be employed on engine-powered construction equipment and vehicles	Contractor	Inspection with a Sound Meter	Daily or during the activity	Part of best working practice
	Moderate to High	The use of vehicles during construction will be optimized as much as possible to reduce number of vehicles and thus reduce the potential for traffic noise.	Contractor	Daily inspection with a Sound Meter	Daily	Part of best working practice

ENVIRONMENTAL ISSUE/IMPACT	IMPACT SIGNIFICANCE	MITIGATION MEASURE	RESPONSIBILITY	MONITORING	MONITORING / INSPECTION FREQUENCY	COST
Noise Control	Moderate	All vehicles will be driven responsibly and below 30 km/h within the construction site	Contractor	Daily inspection with a Sound Meter	Daily or during the activity	Part of best working practice
	Moderate to High	The site personnel will be provided with proper personnel protective equipments in order not to expose to high noise levels that can be generated at the site.	Contractor	Visual inspection to ensure the effectiveness of the mitigation measure	Daily	Part of best working practice
	Moderate	Site personnel will be trained in the proper use and maintenance of tools and equipment, and the positioning of machinery on site to reduce noise emissions to neighboring communities.	Operator	Inspection to ensure the effectiveness of the mitigation measure	Weekly	Part of best working practice
	Moderate	The construction activities within residential areas and in the close vicinity cannot be carried out other than daytime frame (07:00-19:00)	Contractor	Visual inspection	Daily	Part of best working practice
	Moderate	Noise monitoring will be conducted regularly to assure compliance	Contractor	Noise Monitoring around the construction boundaries during daytime and nighttime	Monthly	Part of best working practice
NOISE - Operation Phase						
Noise Control	Moderate to High	Noise mitigation measures will be incorporated into the design of the turbines, including: • The turbines with reduced noise operation system will be chosen in order to minimize noise emissions • The turbines are properly positioned in terms of possible noise emissions.	Contractor	Noise monitoring around the nearest sensitive receptors in Kayacık Villages.	Monthly during the first year and then yearly afterwards.	Inherit in Design

ENVIRONMENTAL ISSUE/IMPACT	IMPACT SIGNIFICANCE	MITIGATION MEASURE	RESPONSIBILITY	MONITORING	MONITORING / INSPECTION FREQUENCY	COST
VISUAL IMPACT – Construction Phase						
Waste Management	Moderate	All debris and wastes will be collected, stored, and transported in an orderly manner to prevent any adverse visual impact on the surrounding area.	Contractor	Visual inspection	Daily	Part of best working practice
Visual Management	Moderate	Construction camp site will be compact, kept clean and well maintained. Building material at the camp will be well maintained and newly painted to match with the local environment.	Contractor	Visual inspection	Daily	Part of best working practice
	Moderate	Project equipment storage area will be maintained properly to prevent adverse visual impact.	Contractor	Visual inspection	Daily	Part of best working practice
	Moderate	Construction camp site and equipment lay down area will be reinstated to original after the construction.	Contractor	Visual inspection	Daily	Part of best working practice
VISUAL IMPACT – Operation Phase						
Visual Management	Moderate to High	The turbines will be maintained in uniform size (e.g. direction of rotation, type of turbine and tower, and height).	Contractor	-	-	Inherit in Design
	Moderate to High	Anti-collision lighting and marking systems will be used on the blades in order to provide aviation safety.	Contractor	-	-	Inherit in Design
	Moderate to High	Proper landscaping will be provided around the control and operations area.	Contractor	-	-	Inherit in Design
	Moderate to High	Lettering, company insignia, advertising, or graphics on the turbines will be avoided.	Operator	-	-	Part of best working practice

ENVIRONMENTAL ISSUE/IMPACT	IMPACT SIGNIFICANCE	MITIGATION MEASURE	RESPONSIBILITY	MONITORING	MONITORING / INSPECTION FREQUENCY	COST
	Moderate to High	Turbines will be painted a uniform color, typically matching the sky (light gray or pale blue).	Contractor	-	-	Inherit in Design
AIR QUALITY - Construction Phase						
Dust	Moderate	Where possible, the contractor will select equipment designed to minimize dust emissions	Contractor	Visual inspections	Daily	Part of best working practice
	Moderate to high	Activities that produce significant dust emissions will be monitored during periods of high winds and dust control measures implemented as appropriate.	Contractor	Visual inspections	Daily and when high winds	Part of best working practice
	Moderate	Stockpiles of soil and similar materials will be carefully managed to minimize the risk of windblown dust, e.g. water spray dampening soils and spoil and during delivery and dumping of sand and gravel during periods of dry weather.	Contractor	Visual inspections	Daily	Part of best working practice
	Moderate	Loading and unloading of material that could generate dust will be done without throwing into the air.	Contractor	Visual inspections	Daily	Part of best working practice
Dust	Moderate	Where possible, drop heights for material transfer activities, e.g. unloading of friable materials, will be minimized and carefully managed.	Contractor	Visual inspections	Daily	Part of best working practice
	Moderate	On-site and access roads will be well maintained through mechanical means (sweeping or vacuuming) or spraying with water.	Contractor	Visual inspections	Daily	Part of best working practice
	Moderate	Vehicle speeds on un-surfaced roads will be limited to 30 km/h;	Contractor	Visual inspections	Daily	Part of best working practice

ENVIRONMENTAL ISSUE/IMPACT	IMPACT SIGNIFICANCE	MITIGATION MEASURE	RESPONSIBILITY	MONITORING	MONITORING / INSPECTION FREQUENCY	COST
	Moderate	Lorries used for the transportation of friable construction materials and spoil off-site will be covered/sheeted.	Contractor	Visual inspections	Daily	Part of best working practice
Gaseous Pollutants	Moderate	Best control technology will be adopted to reduce emissions from fuel storage, combustion emissions from engines and any other temporary equipment.	Contractor	-	-	Part of best working practice
	Low to moderate	Engines will not be left running unnecessarily. Engines will be switched off when not in use.	Contractor	Visual inspections	Daily	Part of best working practice
	Low to moderate	Regular maintenance of vehicles will be undertaken to ensure that vehicles are safe and that emissions are minimized.	Contractor	Visual inspections	Daily	Part of best working practice
	Moderate	All vehicles will be maintained so that their exhaust emissions do not cause nuisance to workers or local people.	Contractor	Visual inspections	Daily	Part of best working practice
HAZARDOUS WASTE - Construction Phase						
Hazardous Waste Management	Moderate to High	Hazardous wastes will be segregated from non-hazardous wastes and its management will focus on the prevention of harm to health, safety, and the environment.	Contractor	Visual inspections	Continuously	Part of best working practice
	Moderate to High	Hazardous wastes will be stored in containers that are non-damaged, leak-proof, safe and appropriate for the international standards, on concrete place within the land of the facility.	Contractor	Visual inspections	Continuously	Part of best working practice
	Moderate to High	The hazardous waste containers will be checked routinely in order to determine whether they are damaged	Contractor	Visual inspections	Continuously	Part of best working practice

ENVIRONMENTAL ISSUE/IMPACT	IMPACT SIGNIFICANCE	MITIGATION MEASURE	RESPONSIBILITY	MONITORING	MONITORING / INSPECTION FREQUENCY	COST
	Moderate to High	Hazardous waste containers will be kept closed and wastes will be stored in a way that they will not go in chemical reactions.	Contractor	Visual inspections	Continuously	Part of best working practice
Hazardous Waste Management	Moderate to High	The hazardous liquid wastes will be collected in metal or plastic drums and stored in an area with a concrete surface and a proper secondary containment to prevent potential spills and leakages reaching to soil or groundwater.	Contractor	Visual inspections	Continuously	Part of best working practice
	Moderate to High	Transportation of the wastes will be done by the persons and entities that are licensed for this work and by the vehicles appropriate for the properties of the transported waste. The hazardous wastes will be sent to a licensed disposal facility.	Contractor	Visual inspections	When required	Part of best working practice
	Low to Moderate	Waste battery and accumulators will be collected separately from household wastes and will be delivered to the collection points to be established by enterprises engaged in the distribution and sales of battery products, or by municipalities within six months after they are generated.	Contractor	Visual inspections	Continuously	Part of best working practice
HAZARDOUS WASTE - Operation Phase						
Hazardous Waste Management	Moderate to High	Waste oils will be stored red colored tanks/ containers with a label of "Waste Oil" on it and these containers will be placed at the areas with secondary containment. These wastes will be removed to a licensed disposal facility by licensed transporters.	Operator	Visual inspections	When required	Part of best working practice
	Low to Moderate	Waste battery and accumulators will be collected separately from household wastes and will be delivered to the collection points to be established by enterprises engaged in the distribution and sales of battery products, or by municipalities within six months after they are generated.	Operator	Visual inspections	Continuously	Part of best working practice

ENVIRONMENTAL ISSUE/IMPACT	IMPACT SIGNIFICANCE	MITIGATION MEASURE	RESPONSIBILITY	MONITORING	MONITORING / INSPECTION FREQUENCY	COST
	Low to Moderate	"Hazardous waste" label will be placed on to the containers and this label will indicate the amount of stored waste as well as the storage time of the hazardous waste. Hazardous solid wastes generated during construction will be collected and stored in a concrete area with proper labeling.	Operator	Visual inspections	Continuously	Part of best working practice
	Low to Moderate	Any hazardous waste will be collected in leak-proof containers and removed to a licensed disposal facility by licensed transporters. The hazardous wastes will be handled, stored, transported and disposed of according to the Turkish Hazardous Wastes Control Regulation, Waste Oils Control Regulation and Waste Batteries and Accumulators Control Regulation, and the IFC guidelines.	Operator	Visual inspection	Continuously	Part of best working practice
NON-HAZARDOUS WASTE - CONSTRUCTION & OPERATION						
Non-Hazardous Waste Management	Low to Moderate	The wastes will be characterized according to composition, source, types of wastes produced, generation rates, or according to local regulatory requirements.	Operator	Visual inspections	Continuously	Part of best working practice
	Low to Moderate	Feasible waste prevention, reduction, reuse, recovery and recycling measures will be taken, waste materials will be treated and disposed of and all measures will be taken to avoid potential impacts to human health and the environment.	Operator	Visual inspections	Continuously	Part of best working practice
	Low to Moderate	Solid wastes that could be recycled, like cement bags, metal scraps, packing boxes and wooden crates, etc. will be separated and stored temporarily on site for eventual recycling process.	Contractor	Visual inspections	Weekly	Part of best working practice

ENVIRONMENTAL ISSUE/IMPACT	IMPACT SIGNIFICANCE	MITIGATION MEASURE	RESPONSIBILITY	MONITORING	MONITORING / INSPECTION FREQUENCY	COST
	Low to Moderate	Solid wastes that are non-recyclable and non-hazardous will be collected and properly disposed in a waste disposal site by local Municipality.	Operator	Visual inspections	Continuously	Part of best working practice
	Low to Moderate	The paper, plastic and glass content in the wastes will be separated for recycling.	Operator	Visual inspections	Continuously	Part of best working practice
Non-Hazardous Waste Management	Low to Moderate	The non-recyclable solid wastes will be sorted and accumulated inside appropriate, leak proof, non-contaminating drums for eventual disposal at the site designated by the local Municipality.	Operator	Visual inspections	Weekly	Part of best working practice
	Low to Moderate	The domestic waste will be collected in special trash bins onsite and made available for the local municipality collection trucks.	Operator	Visual inspections	Daily	Part of best working practice
	Low to Moderate	The excavation, construction and demolition wastes will be reused where possible. In case they can not be used they will be disposed to the places approved by the Municipality or relevant authorities according to the Excavation, Construction and Demolition Waste Control Regulation.	Contractor	Visual inspections	When required	Part of best working practice
BIOLOGICAL RESOURCES AND HABITAT ALTERATION - Construction Phase						
Flora	Moderate to High	Topsoil will be removed and stored on site for future landscaping purposes.	Contractor	Visual inspections	When required	Part of best working practice
Fauna	Moderate to High	Hunting of animals and collecting ground nests for resident birds will be prohibited.	Contractor	Visual inspections	Daily	Part of best working practice

ENVIRONMENTAL ISSUE/IMPACT	IMPACT SIGNIFICANCE	MITIGATION MEASURE	RESPONSIBILITY	MONITORING	MONITORING / INSPECTION FREQUENCY	COST
	Moderate to High	All solid and liquid wastes during construction will be collected and disposed in the nearest disposal sites to decrease the impact on fauna	Contractor	Visual inspections	Daily	Part of best working practice
	Moderate to High	Turbines will be made in a tubular structure, which will deter birds from landing or perching on them.	Contractor	-	-	Part of best working practice
BIOLOGICAL RESOURCES AND HABITAT ALTERATION - Operation Phase						
Flora	Moderate	Vehicle movement will be restricted to the existing roads that connect the proposed Project site with the surrounding areas. Off road driving will be avoided.	Operator	Visual inspections	When required	Part of best working practice
Fauna	Moderate to High	Hunting will be prohibited at and around Project site by the workers	Operator	Visual inspections	When required	Part of best working practice
	Moderate to High	The top of blades will be painted with noticeable colors. Orange color with double stripes recommended.	Operator	-	-	-
	Moderate to High	Appropriate storm water management measures will be implemented to avoid creating small ponds which can attract birds and bats for feeding or nesting near the wind farm.	Operator	Visual inspections	Continuously	Part of best working practice
	Moderate to High	Low intense and blinking lights will be preferred obstruction lights in order to minimize the risk of avian collision.	Operator	-	-	Part of best working practice

ENVIRONMENTAL ISSUE/IMPACT	IMPACT SIGNIFICANCE	MITIGATION MEASURE	RESPONSIBILITY	MONITORING	MONITORING / INSPECTION FREQUENCY	COST
CULTURAL HERITAGE - Construction Phase						
Cultural and Archeological Resources	High	Construction works will be monitored for archaeological remains.	Contractor	Visual inspections	Daily	Part of best working practice
	High	If any archeological remains are discovered, as the national law requires, the Project will cease excavation at this location and the local Department of Culture and Tourism will be informed immediately.	Contractor	Visual inspections	Daily	Part of best working practice
TRAFFIC - Construction Phase						
Traffic Management	Moderate to high	Safety and traffic signs will be clearly placed near and around the Project site on the road to the Project site.	Contractor	Visual inspections	During the activity	Part of best working practice
	Moderate	Scheduling of traffic will be undertaken to avoid the peak hours on the local road network wherever practicable.	Contractor	Visual inspections	During the activity	Part of best working practice
	Moderate to high	Special loads will adhere to prescribed routes to be agreed with the appropriate authorities - these will be scheduled to avoid peak hours on local roads and published well in advance to minimize possible disruption	Contractor	Visual inspections	During the activity	Part of best working practice
	Moderate	Road safety training and adherence to speed limits will be stressed to all drivers.	Contractor	Visual inspections	During the activity	Part of best working practice
	Moderate	Prescribed routes for construction traffic will be agreed with the appropriate authorities, particularly with respect to tanker and truck traffic and special loads.	Contractor	Visual inspections	During the activity	Part of best working practice
	Moderate	Entrance to the site will be clear and properly designed.	Contractor	Visual inspections	During the activity	Part of best working

ENVIRONMENTAL ISSUE/IMPACT	IMPACT SIGNIFICANCE	MITIGATION MEASURE	RESPONSIBILITY	MONITORING	MONITORING / INSPECTION FREQUENCY	COST
						practice
	Moderate	To protect the roads, trucks which will be used for transporting activities should have a gross weight within the axial permissible load	Contractor	Visual inspections	During the activity	Part of best working practice
TRAFFIC - Operation Phase						
Traffic Management	Moderate	Road safety training and adherence to speed limits will be stressed to all drivers	Operator	Visual inspections	Continuously	Part of best working practice
	Moderate	Safety and traffic signs will be clearly placed near and around the Project site on the way to Project site.	Operator	Visual inspections	Continuously	Part of best working practice
	Moderate	To protect the roads, trucks which will be used for transporting activities should have a gross weight within the axial permissible load	Operator	Visual inspections	Continuously	Part of best working practice
ON SITE HEALTH AND SAFETY – Construction and Operation Phases						
Working at Height	High	The safety harness will be used to secure persons during ascent to and descent from the nacelle of the wind turbine generator system and when carrying out work in areas where there is a falling hazard. Together with the safety harness, the traveling safety hook constitutes a safety device for ascent/descent via the ladder inside the tower. All the precautions related with working at heights will be taken throughout the construction and operational phases of the proposed Project in accordance with the IFC Guidelines and the local regulations.	Contractor, Operator	Inspection to ensure the effectiveness of the mitigation measure	Continuously	Part of best working practice

ENVIRONMENTAL ISSUE/IMPACT	IMPACT SIGNIFICANCE	MITIGATION MEASURE	RESPONSIBILITY	MONITORING	MONITORING / INSPECTION FREQUENCY	COST
Emergency Exit	High	The wind turbine generator system is provided with an emergency exit system consisting of an emergency descending device. The emergency exit consists of a hatch located at the back of the nacelle.	Contractor	Inspection to ensure the effectiveness of the mitigation measure	-	Inherit in design
Noise	High	Heavy machinery that used in the construction activities will be provided with good rubber insulation for windows and doors to protect the drivers.	Contractor	Inspection to ensure the effectiveness of the mitigation measure	Daily	Part of best working practice
	High	Ear protection equipment will be used in all areas of a potential source of high noise.	Contractor	Inspection to ensure the effectiveness of the mitigation measured	Daily	Part of best working practice
Hazardous Chemicals and Waste	High	Material Safety Data Sheets for all chemicals used at the plant will be available at site and in easy reach to concerned employees. Employees will be trained on the proper handling of chemicals and be informed of their hazards. Such material data sheet will be included within a safety manual for this operation. Proper and approved Personal Protective Equipment (PPE) will be provided to all employees handling chemicals and will be trained on their use and maintenance.	Operator	Inspection to ensure the effectiveness of the mitigation measure	As necessary	Part of best working practice
Accidents	High	A first aid box will be located in the nacelle of the wind turbine system for the treatment of minor injuries.	Operator	Inspection to ensure the effectiveness of the mitigation measure	As necessary	Part of best working practice
	High	A Safety Manual will be prepared for the construction and operation activities.	Operator	Inspection to ensure the effectiveness of the mitigation measure	As necessary	Part of best working practice

ENVIRONMENTAL ISSUE/IMPACT	IMPACT SIGNIFICANCE	MITIGATION MEASURE	RESPONSIBILITY	MONITORING	MONITORING / INSPECTION FREQUENCY	COST
Fire Hazards	High	Two fire extinguishers will be available in the wind turbine generator system. One fire extinguisher will be mounted on the down tower assembly in the tower base, the other one on the top box in the nacelle. Employees will be trained on the use of fire fighting systems and equipment.	Operator	Inspection to ensure the effectiveness of the mitigation measure	As necessary	Part of best working practice
Fire Hazards	High	The wind turbine will be equipped with lightning protection systems which have the task of diverting the lightning currents arising from lightning strikes and the energy associated with the lightning into the ground in a controlled manner. The turbine will be equipped with receptors, e.g. on the blades, that receive the lightning current and divert it through predefined paths within the turbine to the ground.	Contractor	Inspection to ensure the effectiveness of the mitigation measure	As necessary	Inherit in design
HS Monitoring Program	High	A comprehensive occupational health and safety monitoring program will be prepared prior to start of the Project.	Operator	Inspection to ensure the effectiveness of the mitigation measure	-	Part of best working practice
PUBLIC HEALTH AND SAFETY - Construction and Operation Phases						
Public Health and Safety	Moderate to High	Access of unauthorized personnel to the site will be prevented during construction and operation of the Project. There will be two security guards during operation.	Contractor, Operator	Inspection to ensure the effectiveness of the mitigation measure	As necessary	Inherit in design

ENVIRONMENTAL ISSUE/IMPACT	IMPACT SIGNIFICANCE	MITIGATION MEASURE	RESPONSIBILITY	MONITORING	MONITORING / INSPECTION FREQUENCY	COST
	Moderate to High	Information boards about public safety hazards and emergency contact information will be available in the wind farm.	Operator	Inspection to ensure the effectiveness of the mitigation measure	As necessary	Part of best working practice
	Moderate to High	The transport of equipments, turbines and materials will be undertaken in an appropriate manner.	Contractor, Operator	Inspection to ensure the effectiveness of the mitigation measure	As necessary	Part of best working practice
	Moderate to High	Project vehicles and equipment will be well maintained and project related traffic will be requested to travel no faster than the speed limit.	Contractor, Operator	Inspection to ensure the effectiveness of the mitigation measure	As necessary	Part of best working practice
SOCIAL IMPACT- Construction and Operation Phases						
Employment opportunities	Moderate	A recruitment approach will be developed to hire workers from region and especially from project-affected communities during construction phase.	Project owner	Inspection to ensure the effectiveness of the mitigation measure	-	Part of best working practice
	Moderate	If it is possible, workers will be hired from region and especially from project-affected communities in operation related works.	Project owner	Inspection to ensure the effectiveness of the mitigation measure	-	Part of best working practice
	Moderate to High	For the duration of construction, payments will be made for temporary loss of agricultural production based on their discounted net income.	Project owner	Inspection to ensure the effectiveness of the mitigation measure	-	Part of best working practice
	Moderate to High	In constructing the wind power Project, passageways will be created through affected pasture and grazing lands to allow passage from one side of the pasture to the other, thus avoiding adverse impacts on animal feeding patterns.	Project owner	Inspection to ensure the effectiveness of the mitigation measure	Continuously	Part of best working practice

ENVIRONMENTAL ISSUE/IMPACT	IMPACT SIGNIFICANCE	MITIGATION MEASURE	RESPONSIBILITY	MONITORING	MONITORING / INSPECTION FREQUENCY	COST
Community Relations	Moderate to High	The followings will be carried out for manage and mitigate the tension/dispute between local resident and workers ▪ The local people will be informed regularly on the progress of the project and works, ▪ Any dispute will be managed between the Contractors and local residents An alcohol and drug policy will be developed, ▪ Construction personnel will be prohibited from illegal activities, ▪ Non-authorized personnel will not be allowed into the camps, ▪ Personnel will be trained for the cultural awareness, ▪ Community's right to privacy will be respected.	Project owner	Inspection to ensure the effectiveness of the mitigation measure	During Construction	Part of best working practice
Safety Risk for Local Community	Moderate to High	Local residents will be informed about temporary increases in traffic flows	Project owner	Inspection to ensure the effectiveness of the mitigation measure	During Construction	Part of best working practice
	Moderate to High	Non-authorized personnel will not be allowed to open trench area.	Project owner	Inspection to ensure the effectiveness of the mitigation measure	During Construction	Part of best working practice
Disruption to Local Infrastructure	Moderate to High	Compensation will be paid for loss of roads, buildings, etc	Project owner	Inspection to ensure the effectiveness of the mitigation measure	As necessary	Part of best working practice

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Appendix A

SITE PHOTOLOG

SARES WIND FARM PROJECT

PHOTOGRAPHIC LOG

Client Name: GAMA/GE

Site Location: Ezine, Çanakkale Turkey

Project No. 266.01.01

Photo No.	**Date:**
1	11/11/2009

Direction Photo Taken:
Southeast

Description: T1 Location

Turbine 1 (T1) will be located in eastern part of the project site. The location of the turbine is the hill top seen in the middle of the photograph.

Photo No. 2	Date: 11/11/2009
Direction Photo Taken: East	
Description: T3 Location Turbine 3 (T3) will be located in eastern part of the project site.	

Photo No. 3	Date: 11/11/2009
Direction Photo Taken: East	
Description: T4 Location Turbine 4 (T4) is situated in the eastern part of the project site.	

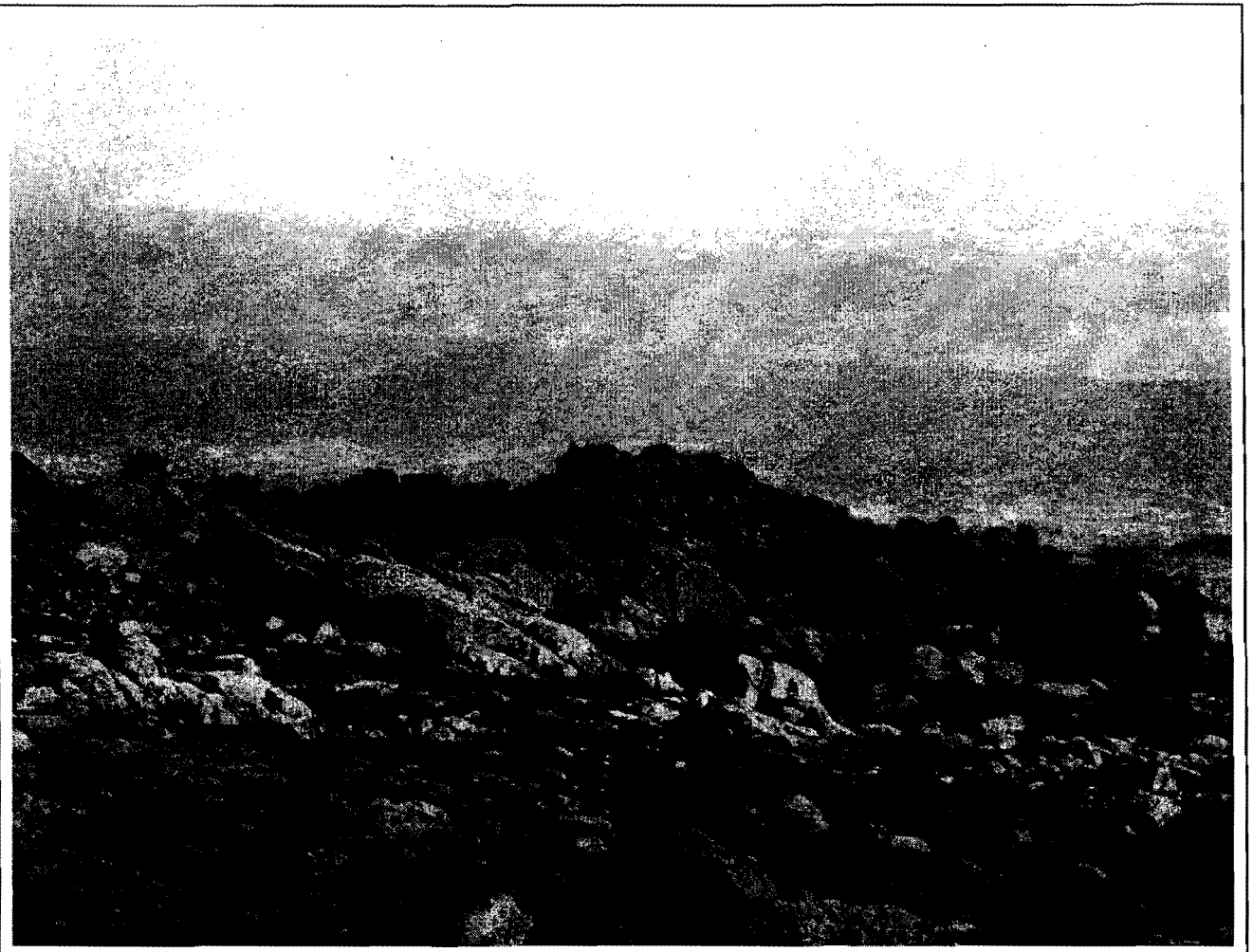


Photo No. 4	Date: 11/11/2009
Direction Photo Taken: East	
Description: T5 Location Turbine 5 (T5) is located in the middle of the project site.	

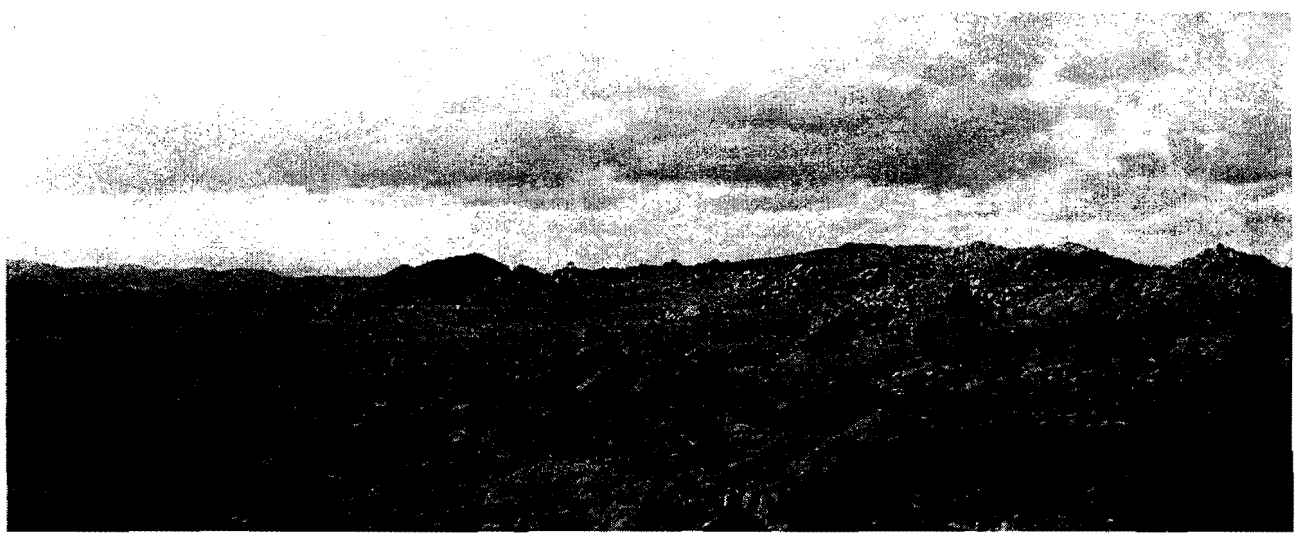
Photo No. 5	Date: 11/11/2009	
Direction Photo Taken: West		
Description: T8 & T9 Location Turbine 8 (T8) and Turbine 9 (T9) are located in the western part of the project site.		

Photo No. 6	Date: 11/11/2009

Direction Photo Taken:
Northeast

Description: T5 Basement

The switchyard will be located in the middle of the project site near Turbine 7 (T7) location.

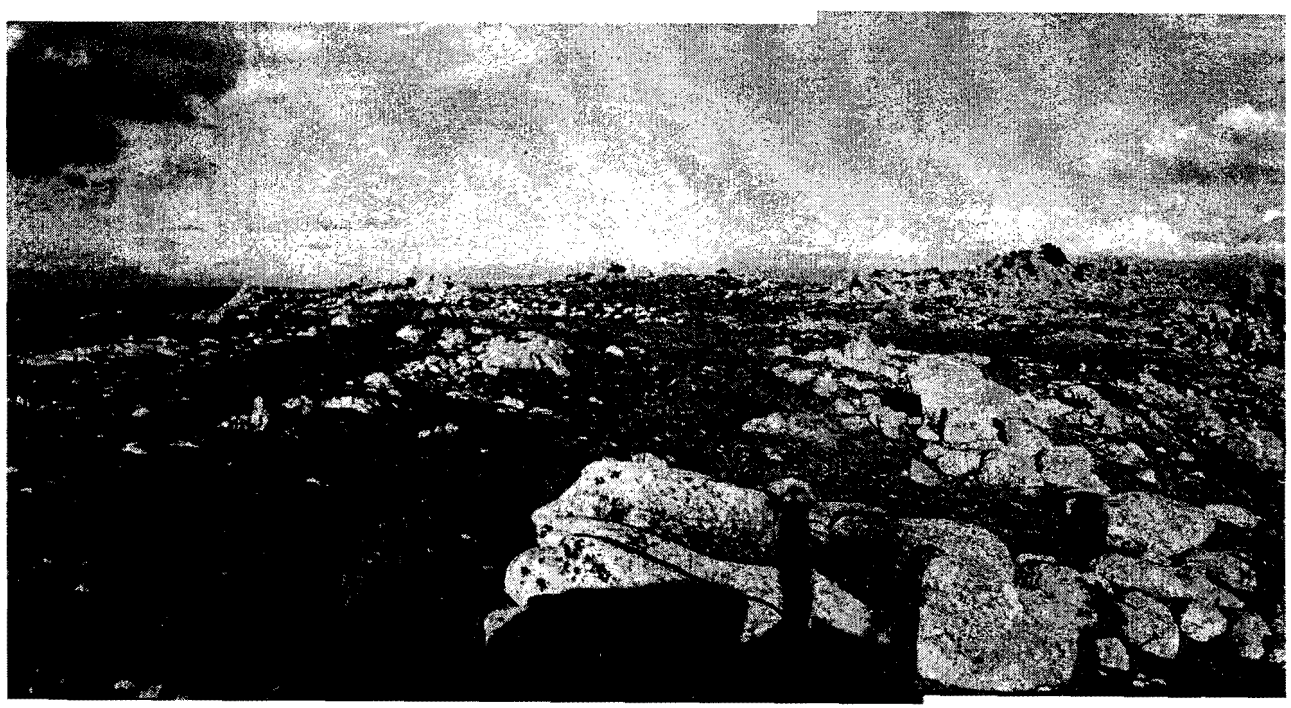


Photo No. 7	Date: 11/11/2009
Direction Photo Taken: East	
Description: T6 Location MAST tower is present in the project site near Turbine 7 (T7) location.	

Photo No. 8	Date: 11/11/2009

Direction Photo Taken:
Southeast

Description: T6 Basement

The view of the project site from the Neandria Castle Archeological Site which is located in the northwest of the project site

Appendix B

SHADOW MODELING RESULTS

Main Result Report

WindPRO version 2.6.1.252 Jan 2009

Project
Sares Wind Farm Project

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Calculated
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SHADOW - Main Result

Calculation: Shadow Model

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sun shine probabilities (part of time from sun rise to sun set with sun shine)

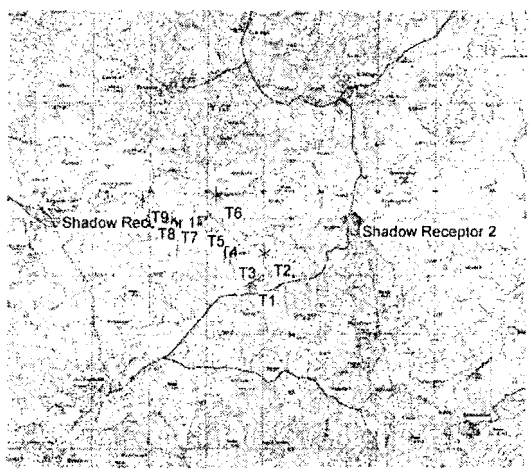
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.11	0.16	0.18	0.20	0.30	0.37	0.38	0.40	0.30	0.20	0.10	0.09

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
142	402	2,413	1,782	91	74	130	544	655	521	392	330

W	WNW	NW	NNW	Sum
272	132	82	93	8,057

To avoid flicker from WTGs not visible a ZVI calculation is performed before the flicker calculation. The ZVI calculation is based on the following assumptions
Height contours used: 10m Contours
Obstacles used in calculation
Eye height: 1.5 m
Grid resolution: 10 m



Scale 1:100,000
✳ Existing WTG ◔ Shadow receptor

WTGs

	UTM ED50 Zone: 35 East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
	UTM ED50 Zone: 35		[m]					[kW]	[m]	[m]	[m]	[RPM]
1	440,767.40	4,394,874.53	380.0	T1	Yes	GE WIND ENERGY	GE 2.5xl-2,500	2,500	100.0	85.0	1,575	14.0
2	441,028.66	4,395,393.79	368.6	T2	Yes	GE WIND ENERGY	GE 2.5xl-2,500	2,500	100.0	85.0	1,575	14.0
3	440,412.00	4,395,350.98	400.0	T3	Yes	GE WIND ENERGY	GE 2.5xl-2,500	2,500	100.0	85.0	1,575	14.0
4	440,093.38	4,395,717.66	420.0	T4	Yes	GE WIND ENERGY	GE 2.5xl-2,500	2,500	100.0	85.0	1,575	14.0
5	439,859.00	4,395,902.98	440.0	T5	Yes	GE WIND ENERGY	GE 2.5xl-2,500	2,500	100.0	85.0	1,575	14.0
6	440,165.00	4,396,397.98	386.8	T6	Yes	GE WIND ENERGY	GE 2.5xl-2,500	2,500	100.0	85.0	1,575	14.0
7	439,393.83	4,395,969.43	420.2	T7	Yes	GE WIND ENERGY	GE 2.5xl-2,500	2,500	100.0	85.0	1,575	14.0
8	438,992.98	4,396,030.61	411.5	T8	Yes	GE WIND ENERGY	GE 2.5xl-2,500	2,500	100.0	85.0	1,575	14.0
9	438,876.35	4,396,323.79	409.2	T9	Yes	GE WIND ENERGY	GE 2.5xl-2,500	2,500	100.0	85.0	1,575	14.0

Shadow receptor-Input

No.	Name	UTM ED50 Zone: 35 East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
				[m]	[m]	[m]	[m]	[°]	[°]	
A	Shadow Receptor 1	437,298.00	4,396,077.98	340.4	1.0	1.0	1.0	-180.0	90.0	"Green house mode"
B	Shadow Receptor 2	442,549.51	4,395,915.10	184.0	1.0	1.0	1.0	-180.0	90.0	"Green house mode"

Project:
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SHADOW - Main Result

Calculation: Shadow Model

Calculation Results

Shadow receptor

No.	Name	Shadow, worst case: Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]	Shadow, expected values: Shadow hours per year [h/year]
A	Shadow Receptor 1	0:00	0	0:00	0:00
B	Shadow Receptor 2	0:00	0	0:00	0:00

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]
1	T1	0:00
2	T2	0:00
3	T3	0:00
4	T4	0:00
5	T5	0:00
6	T6	0:00
7	T7	0:00
8	T8	0:00
9	T9	0:00

Shadow Calendar Graphs

WindPRO version 2.6.1.252 Jan 2009

Project:
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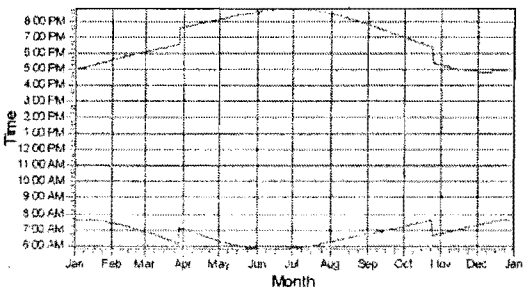
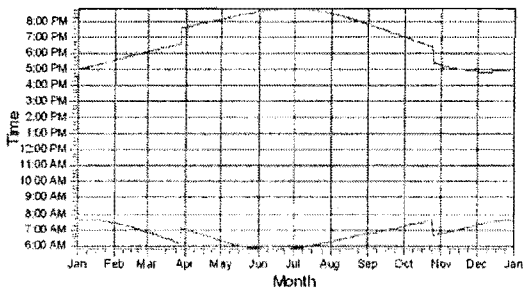
SHADOW - Calendar, graphical

Calculation: Shadow Model

A: Shadow Receptor 1



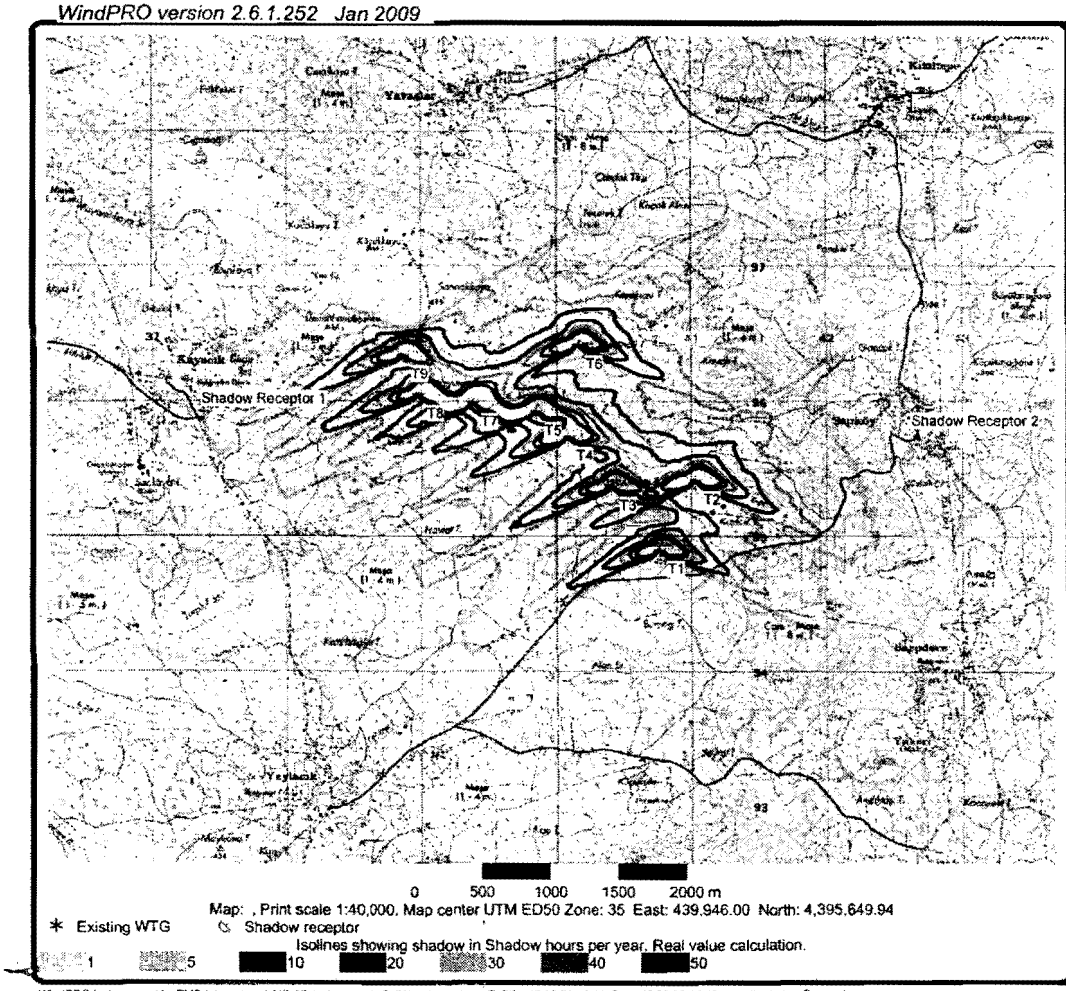
B: Shadow Receptor 2



WTGs

Shadow Contour Map

WindPRO version 2.6.1.252 Jan 2009



Project
Sares Wind Farm Project

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SHADOW -
SARES Wind Farm 1:25k Map
Calculation:
Shadow Model
File:
Sares_25k_map_ed50.tif

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AECOM

WindPRO is developed by EMD International A/S. Niels Jernesvej 10, DK-9220 Aalborg Ø, Tlf +45 96 35 44 44, Fax +45 96 35 44 46, e-mail: windpro@emd.dk

Garet Enerji was established to produce electricity through its windpower plants that will be established in Çanakkale Ezine (Sares - 22,5 MW). Sares WPP construction started in 2009 and is planned to be under operation on March 2011.

Phase	Issue	Mitigating Measure	Responsibility*
Construction	Wind farm siting	(a) Avoid migratory and local bird flight paths and patterns (b) Consider vistas and aesthetic values (c) Avoid adverse tourism effects (d) Avoid forested areas as much as possible	> Turbine&Civil&Electrical Contructors
	Municipal services for worker camps	(a) Water for the camps will be purchased from the Kayacık village. (b) Sewage will be stored temporarily in a septic tank and will be collected weekly by Ezine Municipality (nearest town). (c) Garbage from the camps will be put in garbage drums and it will be collected weekly by Ezine Municipality. (d) Construction camp will be restored to compatible use after work is completed.	> Turbine&Civil&Electrical Contructors
	Infringement on critical habitats or conservation areas	(a) Verify overall plant layout is not within 1 km of any critical areas and does not render them unusable by species of concern (b) Select project site, transmission line route, access road route, construction camp-sites to avoid sensitive areas (other than residential), by at least 100 meters	> Turbine&Civil&Electrical Contructors
	Worker safety	(a) Workers will be subjected to health screening and health and safety training sessions will be provided by Contructors. (b) Necessary safety tools such as helmets, working shoes, ear protection and others will be provided and be required to be used by workers. (c) All operational activities will be in compliance with the relevant Turkish Occupational Health and Safety Regulation	> Turbine&Civil&Electrical Contructors
Operation	Worker safety	(a) Workers will be subjected to health screening and health and safety training sessions will be provided by Garet Enerji Elektrik Üretim A.Ş. (b) Necessary safety tools such as helmets, working shoes, ear protection and others will be provided and be required to be used by workers. (c) All operational activities will be in compliance with the relevant Turkish Occupational Health and Safety Regulation	GARET ENERJİ Elektrik Üretim A.Ş.
	Noise (from turbines)	Turbines and/or associated rotating equipment should be designed to meet international standards	GARET ENERJİ Elektrik Üretim A.Ş.
	Bird deaths	(a) Avoid migratory routes (b) Design towers to be low enough to avoid flight paths (c) Require only cylindrical closed towers (not lattice towers)	

ENVIRONMENTAL MANAGEMENT PLAN-MONITORING

Phase/Issue	**What** *parameter is to be monitored?*	**Where** *is the parameter to be monitored?*	**How** *is the parameter to be monitored/ type of monitoring equipment?*	**When** *is the parameter to be monitored-frequency of measurement or continuous?*	**Responsibility**
Construction					
Wind farm siting	Is the wind farm placed in the path of any bird flight patterns?	At the project site	Visual	Before construction starts	GARET ENERJİ Elektrik Üretim A.Ş.
	Does the wind farm block any vistas or diminish any aesthetic values?	At the wind farm along different lines of sight (east, west, north, south)		Before construction starts	
	Changes in tourism statistics	Local tourist enterprises (shops, hotels, restaurants etc.)		After one year of operation	
	Any forested areas nearby?	General vicinity of windfarm		Before construction starts	
Infringement on critical habitats and conservation areas	Impoundment area influence critical habitats?	Project site (including impounded areas)	Visual/survey	Prior to construction, after preliminary design	GARET ENERJİ Elektrik Üretim A.Ş.
	Project site and off-sites avoid sensitive areas by at least 100 meters?	Project site location, off-site locations		Prior to construction, after preliminary design	
Operation					
Noise (from wind turbines)	Noise at ground level	Within 10 meters of wind machine base or at local population centers	Db meter	Quarterly or if local groups complain	GARET ENERJİ Elektrik Üretim A.Ş.
Bird deaths	Type and species of dead birds found	At the site of each wind mill	Visual	Quarterly, for at least two years (assuming no problem is identified)	GARET ENERJİ Elektrik Üretim A.Ş

SARES LOCAL STAKEHOLDER CONSULTATION MEETING

The aim of the meeting is to inform all stakeholders, especially local stakeholders and apply for their comments about the project. The meeting was held on 15 April 2010, at 20:00, in Coffeehouse of Kayacik Village, Ezine, Canakkale.

A. Invitations

The stakeholders who were invited to the meeting can be summarised as International and Local Non-governmental Organisations, Gold Standard Representatives, Public Institutions and Local People. Please see **Annex-1** for the Invitation List.

The local stakeholders were invited to the meeting via announcements made from the Mukhtars's Office. Also, the Kayacik Village Mukhtar, Mr. Mustafa Aydin invited the villagers via face to face invitations. On the other hand, the individual invitations were made via phone, e-mail and fax. Please see the English version of the invitation text in **Annex-2**. During the invitations, non-technical summary of the project was also shared with the stakeholders. (**Annex 3**)

B. Agenda of the Meeting

Opening of the meeting

After welcoming the participants, all authorised people who were present for the meeting introduced themselves respectively. After that, the goal of the meeting was explained to the people and asked them to sign the attendance list on which they registered their names, jobs and location with signature.

Explanation of the project

To introduce project to the local people and to give details about how this project will impact their lives, a non-technical document is distributed all the participants and two presentations about the project. The information given in presentations was based on the non-technical summary of the project. The presentations mostly focused on how the project might have some environmental effects and how these issues will be mitigated by the investor. In addition to the project specific information, stakeholders were informed about the climate change issue and how the project will help the fight against climate change.

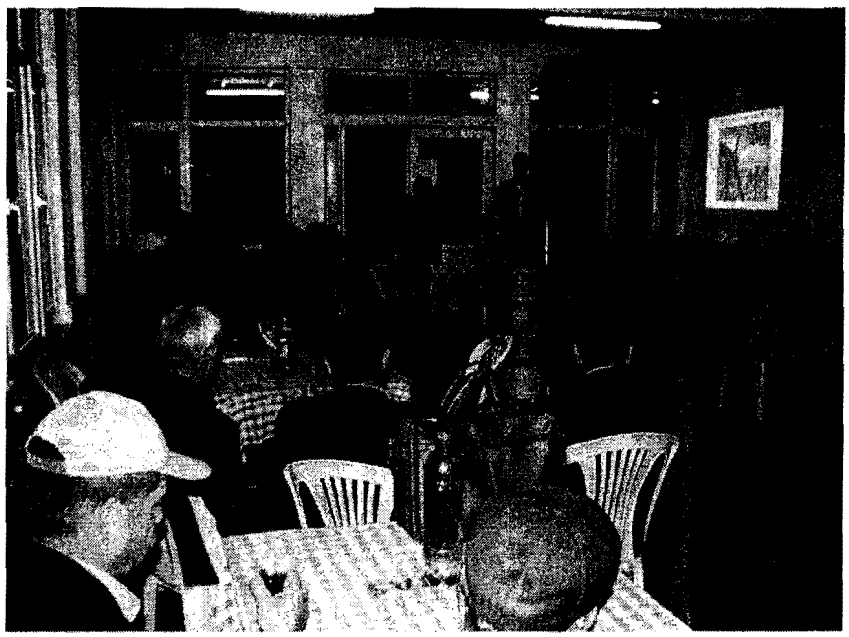
Discussion

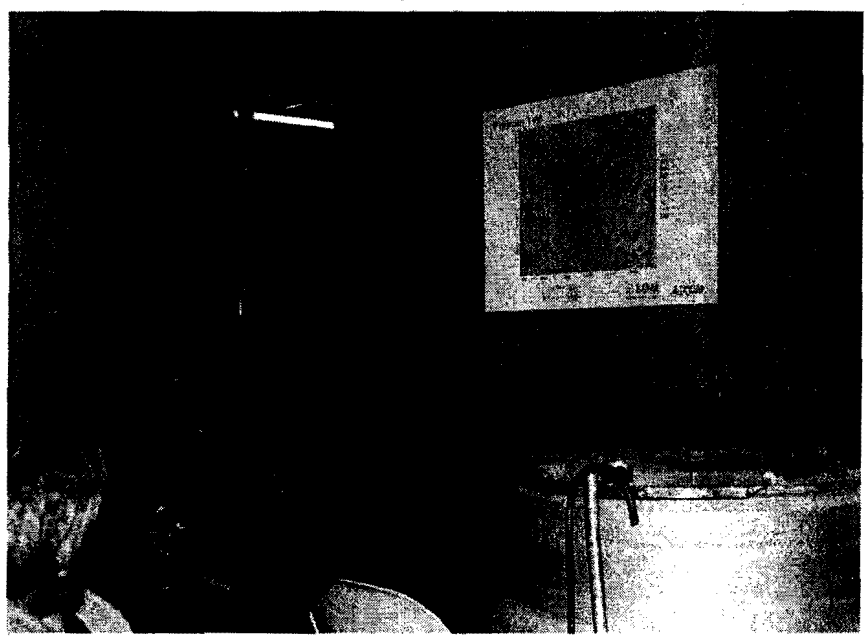
After presentations, it was requested from the participants to ask questions related to the project. Also, to get an understanding about an overall perspective of stakeholders' opinion on the project, a questionnaire with 17 questions was distributed to the participants. The questions are about the region, social and environmental impacts of the project and the presentation.

Closure of the meeting

Local stakeholders were informed that this meeting will not be the last meeting of its kind. There will be other meeting(s), as needed, to give feedback about what have been done for the issues raised in this meeting.

Pictures from the Meeting





Annex-1

Organisation (if relevant)	Name of invitee	Way of invitation
Kayacik Village	Mustafa Aydin (Mukhtar)	Phone
Kayacik Village	Kayacik People	Announcement from Mukhtar's Office
District Governorship of Ezine	Cengiz Karabulut (District Governor)	Fax
Ezine Municipality	Halil Buyukerol (Mayor)	Fax
Canakkale Provincial Department of Environment and Forestry	To whom it may concern	Fax
Ministry of Environment and Forestry	Evren Turkmenoglu	E-mail
TEMA	Demet Cavusligil	E-mail
Nahla Sabet	Gold standard	E-mail
REC	Gulcin Ozsoy	E-mail
WWF	Ceren Ayas	E-mail
Greenpeace	Korol Diker	E-mail
Greenpeace	Sinem Fahli	E-mail
Helio International	To whom it may concern	E-mail
Mercy Corps	To whom it may concern	E-mail

Annex-2

Dear Sir or Madam,

As **Gaia Finansal Danismanlik Hizmetleri Ltd. Sti. (GAIA),** we are providing consultation services to our valuable client **GAMA Enerji A.S. (GAMA)** for development of carbon assets rising from Sares Wind Power Plant (Sares WPP) the company is planning to construct near Kayacik Village in Ezine District of Canakkale, Turkey.

(Please see attached Non-technical Summary document for detailed information about the project.)

In this sense, GAIA is organizing a "Local Stakeholder Consultation Meeting" on behalf of GAMA, on April 15th 2010. The aim of the meeting is to inform all the stakeholders, especially local people and ask for their comments and requests about the project, to develop the project considering the social, economical and environmental effects and support sustainable development in the region.

We will be honoured for your participation of the meeting on **April 15th, 2010 at 20:00 in Kayacik Village Coffeehouse, Kayacik Village, Ezine, Canakkale, Turkey.**

Please inform us about your participation up to April 13th via e-mail, phone or fax numbers below.

Yours faithfully,

Annex-3

SARES WIND POWER PLANT PROJECT

NON-TECHNICAL SUMMARY

Project Location

Sares Wind Power Project (Sares WPP) is located in the northwest of Turkey, in borders of Ezine district of Canakkale. The project is about 9 km from the Ezine District Center and about 49 km from the Canakkale Province Center. The nearest settlements to the project site are Kayacık village and Şapköy village. The closest turbines to Kayacık village and Şapköy villages are 1.66 km and 1.69 km away from the village centers, respectively.

(Please see the project location on Turkey map ant the locations of turbines in Annex-1)

About Sares WPP

The purpose of Sares WPP is to utilize wind energy potential in Turkey and to compensate energy requirement through a sustainable, environmentally and cost effective way.

GARET Enerji Üretim ve Ticaret A.Ş. (GARET) which is a subsidiary of GAMA Enerji A.Ş. proposes to install Sares WPP with 22.5 MW installed capacity in Çanakkale Province of Turkey. Sares WPP will have 9 turbines, each having an output of 2.5 MW. The total electricity production of the project is expected to be some 90.500 MWh/year. Sares WPP will be connected via a 9 km transmission line to the 154 kV Ezine Transformer Station and the generated electricity will be supplied to Turkey's national electricity grid.

GARET obtained the "Electricity Power Generation License" from the Energy Market Regulatory Authority (EMRA) for the proposed project site. A 49-year license (License No. EU/1632/5/1193, dated June 5, 2008) is granted for the project by option of EMRA under the provisions of Law No. 4628 governing the electricity market in the Public of Turkey.

GARET is planning to start the construction of the plant until June 2010. As for the commissioning of the plant, June 2011 is estimated.

Economical, Social and Environmental Assessment

In order assess Sares WPP in environmental aspect, a Project Description Report was prepared and submitted to Çanakkale Provincial Directorate of environment and Forestry (PDoEF). The Çanakkale PDoEF reviewed the Project Description Report and decided that a detailed EIA report was not required for the project. Nevertheless, an Environmental and Social Assessment Report is prepared according to the Equator Principles to identify potential environmental and social impacts of the

project on the local environment and community during construction, operation and decommissioning phases.

Economic, social, environmental effects of the project can be summarized as follow:

Turkey's grid is mainly consists of thermal power plants which uses imported fossil fuels (natural gas, coal etc). The project, above all, will reduce import dependency and diversify the electricity generation mix of the country by generating electricity from a renewable source.

The project, in place of generating electricity with fossil fuels, will generate electricity from wind power and will result in emission reductions in direct proportion to its electricity production. Considering that the expected annual electricity generation is 90.500 MW, the project will result in about 58.000 tCO2 emissions annually.

Sares WPP will also result in extra employment in the region. It is planned to hire 50 employees temporarily during the construction and 7 employees constantly during the operation of the plant. Priority will be given to local labor force both for construction and operation of the plant. Also, the material needs of the plant will be met from the region.

There is no endemic flora in the region which will be affected by the construction of the plant. Anyhow, in order not to affect the flora, off-road vehicles will not be driven outside of the service roads. Also, the vegetable soil which will be excavated during the construction phase will be removed and stored on site for future landscaping purposes.

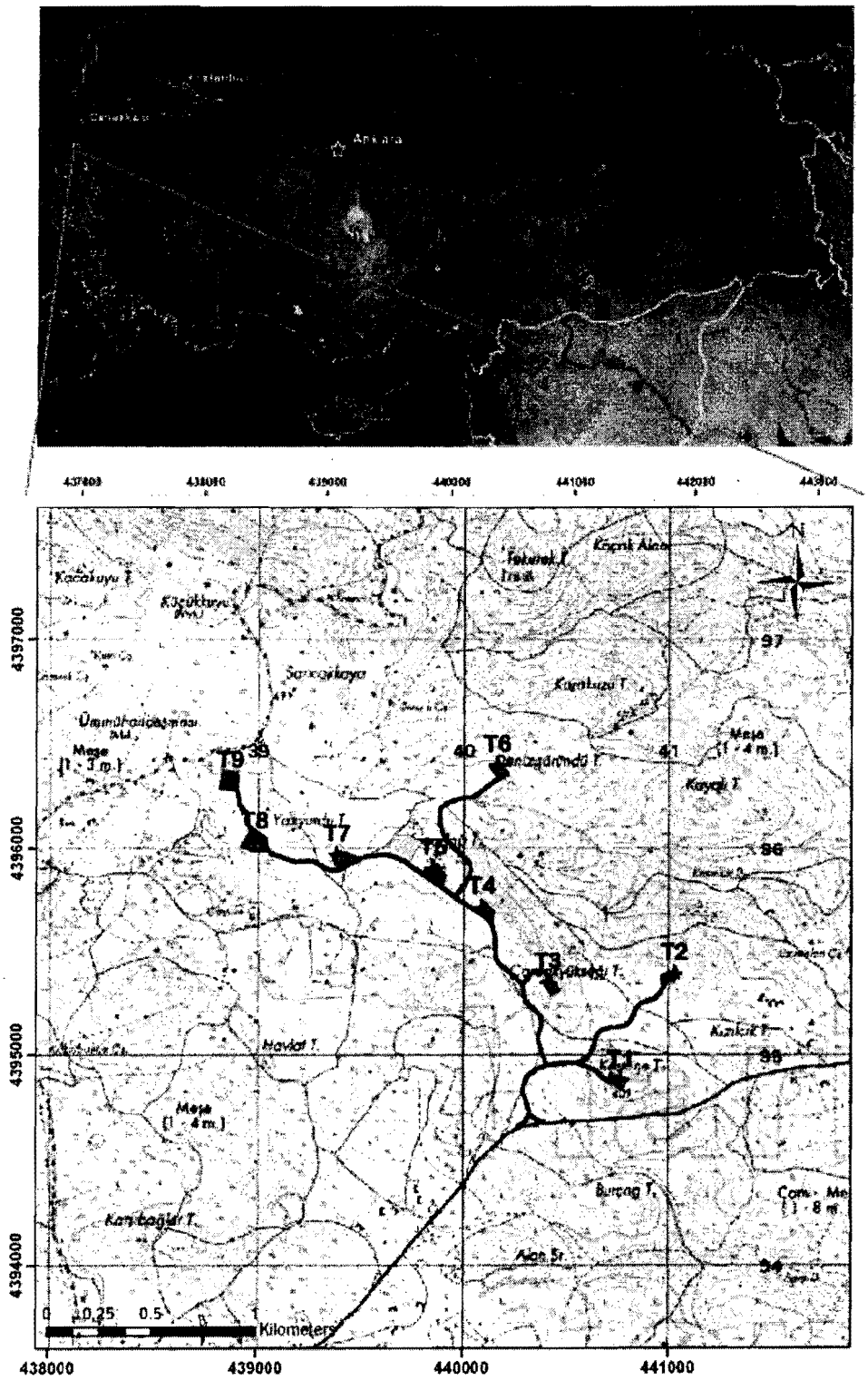
In addition, no endemic fauna exists in the region which will be affected by the construction of the plant. Anyhow, hunting of animals and collecting ground nests for resident birds will be prohibited. In addition, the top of blades will be painted with noticeable colors. What's more, appropriate storm water management measures will be implemented to avoid creating small ponds which can attract birds and bats for feeding or nesting near the wind farm.

In order not to affect the local people and fauna in the region, the construction equipments will not work in the sensitive times and also, the noise level will be under the allowed levels in line with the Regulation on Environmental Noise Control in Turkey.

In addition, the company will pay extra attention not to affect the soil condition of the region. The materials such as sand and pebble will be provided from quarries and the excavated earth will be used for landscaping. The company will be in line with the laws and regulations on disposal of excavation wastes, domestic wastes, packing wastes and sewage water.

During the construction, there will be some dust emissions rising from the excavation works. In order to prevent dust emissions during the excavation and construction, the company will take precautions such as covering the excavated earth during the transportation, watering the roads of the project area and limiting the speeds with 30 km per hour.

Project and Turbine Locations on Turkey Map



Minutes of physical meeting

The attendance to the meeting was moderately high. The meeting was held, unusually, at 8:00 in the evening because the main occupation in the village is animal livestock where most of the stakeholders are out during the day for shepherding. The organizers of the meeting still waited until almost 10 pm for the crowd get together and maintain utmost attendance.

After welcoming the participants, all authorised people who were present for the meeting introduced themselves respectively. In the meeting, one representative from the investor group, two representatives from Carbon Asset Development Consultancy Company hired by the investor group and also two representatives from the Environmental and Social Assessment Company were present as the authorized people. After that, the goal of the meeting was explained to the people and asked them to sign the attendance list on which they registered their names, jobs and location with signature. Yet, for cultural reasons, the attendants mostly do not want to give out their names and identifications. Hence, the photos taken during the meeting prove that the attendance to the meeting is indeed much higher than indicated by the signature list; 11 versus 42.

Two presentations were given to stakeholders. The first presentation from the company responsible with EIA focused on environmental and social aspects of the project. The second presentation from the carbon asset developing company focused on climate change and the climate change benefits of the project.

The presentations were followed by a Q&A session and conducting questionnaires with the attendants face to face. Both the Q&A session and the questionnaires aimed at discussing the sustainable development indicators as identified by the Gold Standard. As seen below, the questions asked during the meeting paved the way for discussing the sustainability of the project.

It is important to note that people do not want to be identified when they ask questions. To experience, trying to identify people with names in such meetings result in people shying away and detaching from the discussions. Therefore, the organizers refrain from collecting the names of the people who ask questions for the sake of a fruitful discussion.

Q1: Our animals expand to a large area for grazing. Will the wind mills prevent grazing of our animals near the project site?

A1: The windmills will be operating individually where the project area will not be closed or fenced. The animals will be free to approach the windmills and use the project land around for grazing.

Q2: Will our animals be affected by the noise from the wind mills?

A2: The expected noise level was modelled and compared to international standard which showed that the living things are not affected adversely from such level. In addition, it is a very windy area and the wind noise deemphasized the noise from the plant at many spots around the plant.

Q3: Will the project help the villages around with employment?

A3: The project company assures that the employment priority will be given to local people as much as possible. Yet, the construction period is not very long. The project company expects to train some of the workers and employ them further during the operation.

Q4: What about the dust and possible waste dispersion from the trucks during the construction as the trucks will use village roads?

A4: The trucks will be fully covered for clean transportation of construction material as well as excavated material. The dust will prevented by clean transportation.

Q5: Will you eventually increase the number of turbines?

A5: The license is for nine turbines and cannot be increased. The subject project site and the license allow us only with 9 turbines. So the answer is no.

Q6: How can we be sure that the project will not be expanded with new turbines because the site is very wind rich?

A6: There may be other project companies with new projects but our license limits the project with 9 turbines. In case there is room for increase, it cannot be realized without public consultations. Hence, the village will know if there is any project expansion.

Q7: How will you handle the excavated material?

A7: It will be stored at the site according to appropriate standards and transported to an area addressed by the local municipality. In case there is any discomfort with the storage conditions, although we use international standards to handle this storage, do not hesitate to contact us.

Q8: Will you assist the village in some infrastructure improvement?

A8: Sure. In case you need to improve your sewerage or potable water system, we would be glad

to help with our equipment as well as technical capacity such as engineering and planning.

Q9: Is there a chance that the project will cause water and soil contamination?

A9: The project does not have anything to do with chemicals or water use. The only issue is the excavation and handling the soil excavated. As said before, the project company complies with national and international standards to prevent any contamination during the construction. Yet, the wind projects are very clean projects where the chance for contamination is very minimal.