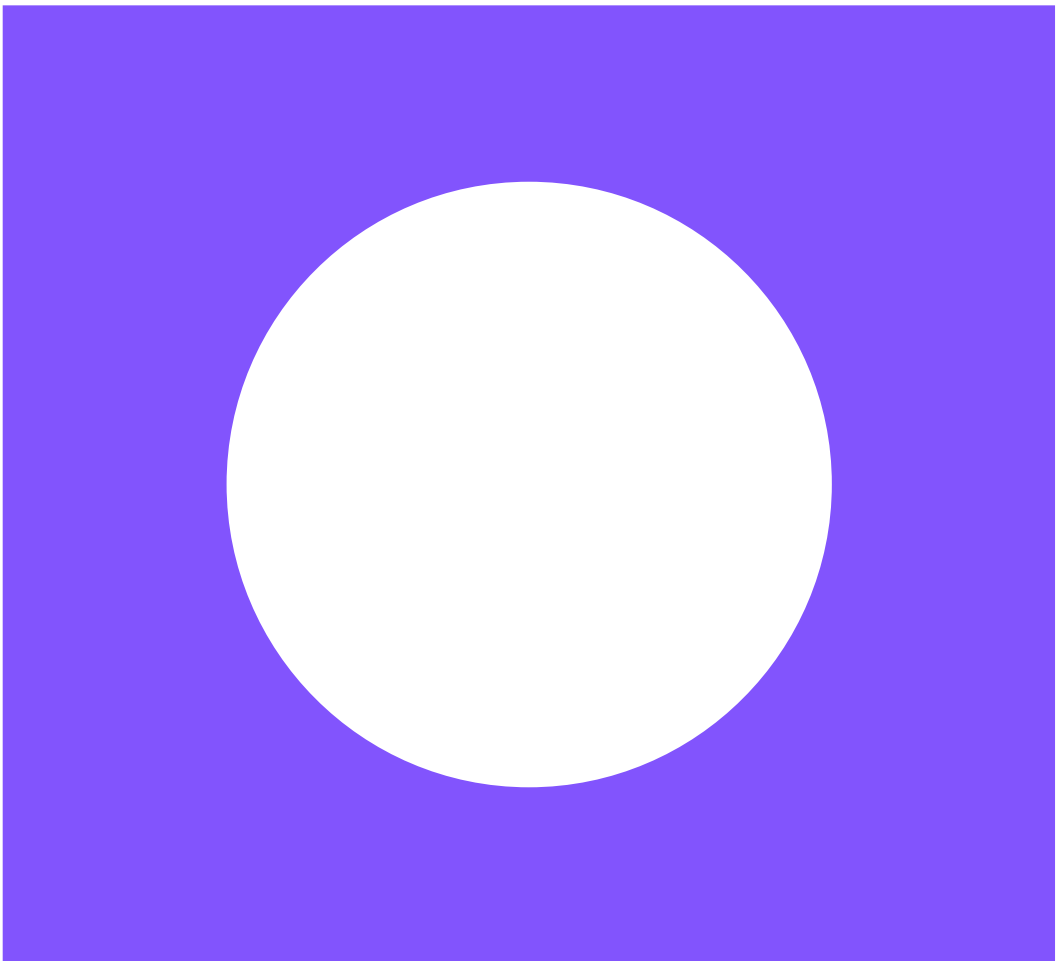
MOTT MACDONALD



Ovacık Wind Power Plant (WPP) Project

Supplementary Biodiversity Surveys Final Report

May 2025

This page left intentionally blank for pagination.

Mott MacDonald
1071 Usta Ankara Is ve
Yasam Merkezi
Kizilirmak District
1443 Cd. No. 25 / A-1
06530 Cankaya
Ankara
Turkey

T +90 (0)216 766 3118
mottmac.com

Ovacık Wind Power Plant (WPP) Project

Supplementary Biodiversity Surveys Final Report

May 2025

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	February 2025	Esra Demirhan Anıl Öser Berkay Şahin Cihan Ünal Değirmenci	Gizem Arıkan Gürler	Hande Hatipoğlu	Draft Final Biodiversity Baseline Report for 2024
B	May 2025	Esra Demirhan Anıl Öser	Gizem Arıkan Gürler	Hande Hatipoğlu	Final Biodiversity Baseline Report for 2024

Document reference: B

Contents

Tables

Figures

Definitions and Abbreviations

Abbreviation	Definition
AoI	Area of Influence
AZE	Alliance for Zero Extinction
BAP	Biodiversity Action Plan
BERN	The Convention on the Conservation of European Wildlife and Natural Habitats
BMP	Biodiversity Management Plan
CHA	Critical Habitat Assessment
CITES	Convention for the International Trade in Endangered Species of Wild Fauna and Flora
CR	Critically Endangered
CRM	Collision Risk Model
DD	Data Deficient
DKMP	General Directorate of Nature Conservation and National Park
EBRD	European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment
EN	Endangered
ESIA	Environmental and Social Impact Assessment
ETL	Energy Transmission Line
EU	European Union
EUNIS	European Nature Information System
GIS	Geographic Information Systems
GN	Guidance Notes
IBA	Important Bird Area
IFC	International Finance Cooperation
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
LC	Least Concern
MoENR	Ministry of Energy and Natural Resources
NP	National Park
NT	Near Threatened
PBF	Priority Biodiversity Features
PCFM	Post-construction Fatality Monitoring
PR	Performance Requirement
PS	Performance Standard
Ramsar	Convention on Wetlands of International Importance Especially as Waterfowl Habitat
SP	Sampling Point for ground static acoustic bat surveys
T	Turbine
TRDB	Turkish Red Data Book
VES	Visual Encounter Survey

VP	Vantage Point
VU	Vulnerable
WPP	Wind Power Plant

Executive summary

Ovacık Wind Power Plant (WPP) Project (“the Project”) with 13 turbines and 54.6 MW_m/54.6 MW_e total installed power, is planned to be established by Enerjisa Üretim. As a result of the Environmental and Social Impact Assessment (ESIA) study conducted by the Consultant, biodiversity data gaps were identified for the Project’s compliance with the applicable national and international standards. Supplementary biodiversity baseline collection was carried out by the Project Company in 2024. The draft final report presents flora, terrestrial fauna, bird and bat survey results and outcomes for the study period.

For the baseline collection of herpetofauna during the spring, and summer, seasons, fieldwork commenced in the early morning at daylight and continued until dusk to account for nocturnal species. With the exception of *Testudo graeca*, which is classified as Vulnerable (VU) by the IUCN and listed in CITES Annex-II, l other herpetofauna species are classified as Least Concern (LC), indicating no significant extinction risk. There are no endemic herpetofauna species among the identified species.

For the baseline collection of terrestrial mammal species during the spring and summer seasons of 2024, a total of 20 fieldwork days were conducted. Among the mammal species identified in the Project Area of Influence, 4 species are listed in Annex II of the Bern Convention, 11 species in Annex III, and 3 species in Annex II of CITES. According to the IUCN Red List, no species in the area is classified as endangered, with 2 species categorized as Vulnerable (VU). The remaining species are classified as Least Concern (LC). All vulnerable species have been recorded as literature.

The flora field study identified *Crocus candidus*, a regional endemic species found in Çanakkale and Balıkesir. Classified as "VU: Vulnerable" by TRDB. The species is present within the Project Area of Influence. However, the turbine locations, access roads, and ETL route do not encompass suitable habitats for the species, meaning that no habitat loss for this species will occur as a result of Project activities.

For the baseline collection of bird species, NatureScot VP surveys at turbines and ETL and breeding bird surveys via transect and point counts were carried out in spring, summer and autumn. Surveys revealed low migratory rates for 2024 survey period, and low overall collision risk estimations based on this year’s results. ETL segment with higher collision hazard was not identified. There are no additional recommendations than the previously identified mitigation and monitoring requirements for the subproject.

For the baseline collection of bat species, NatureScot ground static acoustic surveys were carried out in spring, summer and autumn, in addition to transect surveys covering turbine areas. Surveys revealed moderate levels of bat activity including threatened species M. schreibersii. Additional mitigation and monitoring approaches were recommended.

1 Introduction

1.1 Project Background

Enerjisa Üretim Santralleri Anonim Şirketi has been awarded to invest in the Aydın Connection Region on 30 May 2019 within the scope of “Renewable Energy Resource Areas (YEKA) Regulation” and “Allocation of Wind Energy Based Renewable Energy Resource Areas (YEKA) and Total Connection Capacities”[1]. Upon this award, a “YEKA Use Rights Agreement” was signed between Enerjisa Üretim Santralleri Anonim Şirketi and Ministry of Energy and Natural Resources (MoENR) on 09 March 2020. Subsequently, the "YEKA Use Rights Agreement" signed by Enerjisa Üretim Santralleri Anonim Şirketi for the Aydın Connection Region was transferred to Enerjisa Enerji Üretim Anonim Şirketi (“Enerjisa Üretim” or “the Project Company”) with the transfer agreements signed on 03 June 2021.

Ovacık Wind Power Plant (WPP) Project (“the Project”) with 13 turbines and 54.6 MW_m/54.6 MW_e total installed power, is planned to be established by Enerjisa Üretim in Çanakkale Province, Bayramiç District, Gökçeiçi, Kuşçayır and Karıncalık Neighbourhoods. The Project components consist of 13 turbines, a switchyard, Project roads (i.e., access and site roads), a 68.75 tonnes/hour capacity mobile crushing and screening facility[2] (to be used as needed), as well as an energy transmission line (ETL) as a Project associate facility. The Project is part of a nine-project wind energy investment package initiated by Enerjisa Üretim which has a 750 MW total installed power from a total of 180 wind turbines located in Aegean and Marmara Regions of western Türkiye; aiming to evaluate and utilize the wind energy potential of the region and contribute to the national strategy and regional economy.

The Enerjisa YEKA Nine Wind Power Plants (WPPs) projects have undergone Environmental and Social Impact Assessment (ESIA) and Critical Habitat Assessment (CHA) studies, conducted by Mott MacDonald (“Consultant”), also including Biodiversity Management Plan (BMP) development. However, due to limitations identified in the baseline data during the ESIA studies, supplementary biodiversity field surveys were deemed necessary. Consequently, Enerjisa Üretim has commissioned Mott MacDonald Türkiye to develop the site-specific baseline collection methodologies and conduct field studies accordingly. Supplementary baseline studies were conducted for each WPP, as details are provided throughout this report, managed by expert teams using relevant methodologies.

1.2 Scope of Study

As a result of the ESIA study conducted by the Consultant, biodiversity data gaps were identified for the Project’s compliance with the applicable national and international standards as presented in Section 2. Supplementary biodiversity collection methodologies for flora and fauna were subsequently developed by the Consultant and field surveys were scheduled in 2024 to address biodiversity data gaps which would (1) enhance the Project biodiversity baseline to provide reliable and robust results, (2) enable revisions of CHA and BMP, (3) provide clarifications with regards to implementation of mitigation hierarchy and (4) conduct operation phase monitoring for the Project. The supplementary biodiversity surveys cover the period between March and November, which represents three seasons, spring, summer, and autumn.

[1] Published in the Official Gazette Date/No: 07.11.2018/30588

[2] 68.75 tonnes/hour capacity mobile crashing and screening facility is included in the National Environmental Impact Assessment (EIA) Study.

2 Applicable Guidelines and Standards

2.1 National Requirements

The primary framework of the Turkish legislation for environmental legislation is the Environmental Law (Law No: 2872). National laws and regulations regarding protection of the habitats and species are listed in Table 2-1.

Table 2-1 National Legislation on Biodiversity

Legislation (Official Gazette Date/Number - Last Revision Date)	National Strategy Documents
Law on National Parks (11.08.1983/18132 - 09.07.2018) Terrestrial Hunting Law (11.07.2003/25165 - 28.10.2020) Law on Animal Protection (01.07.2004/25509 - 13.12.2010) Regulation on the Protection of Wetlands (04.04.2014/28962 - 23.06.2022) Regulation for Implementing the Convention on International Trade in Endangered Species of Wild Fauna and Flora (27.12.2001/24623 - 20.07.2019) Regulation on Protection of Wildlife and Wildlife Development Areas (08.11.2004/25637) Law on Protection of Cultural and Natural Assets (23.07.1983/18113 - 15.06.2022) Regulation on Collection, Protection and Usage of Plant Genetic Resources (19.07.2012/28358) Law on Fisheries (04.04.1971/ 13799 - 17.02.2021) The Environmental Protection Agency for Special Areas (08.07.2011/ 27988) Environment Law (11.08.1983 / 18132 - 15.06.2022) Forestry Law (08.09.1956 / 9402 - 25.12.2021) Law on Pasture (28.02.1998 / 23272 - 18.01.2019) Law on Coastal Areas Management (17.04.1990 / 20495 - 28.10.2020)	National Plan on on-site Protection of Plant Genetic Diversity (1998) National Environmental Action Plan (1999) National Forestry Program (2004) Climate Change Action Plan (2012) Turkish National Action Plan against Desertification (2015) National Rural Development Strategy (2015) National Biological Diversity Strategy and Action Plan (2019)

2.2 International Requirements

International agreements, conventions, and protocols regarding protection of the habitats and species are listed below:

- The Convention for the Protection of the Mediterranean Sea Against Pollution (Barcelona Convention) (1981)
- The Convention on the Conservation of European Wildlife and Natural Habitats (BERN) (1984)
- United Nations Framework Convention on Climate Change (1994)
- The Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR) (1994)
- The UN Convention on Biological Diversity (1997) and Cartagena Protocol on Biosafety (2004)
- Kyoto Protocol (2009)
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1996)
- Paris Agreement (2016)

2.3 Project Standards

The Project Company intends to develop the Project in alignment with the applicable international and national standards, and the policy and requirements of the Lenders (i.e., EP IV, IFC and EBRD standards).

The international lender standards concerning biodiversity for the Project are represented by the IFC Performance Standards (PS6) and related Guidance Note (6), EBRD Performance Requirements (PR6) and Guidance Note (6) as well as Equator Principles IV (EP IV).

The impact assessment and critical habitat assessment are carried out in accordance with the following international requirements:

- IFC Performance Standards on Environmental and Social Sustainability,
- EBRD's Environmental and Social Policy and Performance Requirements
- International Union for Conservation of Nature (IUCN) Red List of Threatened Species
- The Birds Directive (2009/147/EC)
- The Habitats Directive (92/43/EEC10)
- Post-construction Bird and Bat Fatality Monitoring for Onshore Wind Energy Facilities in Emerging Market Countries - Good Practice Handbook (2023)

The IFC PS6 objectives can be listed as:

- To protect and conserve biodiversity,
- To maintain the benefits from ecosystem services,
- To promote the sustainable management of living natural resources through the adoption of practices that integrates conservation needs and development priorities.

Similarly, the EBRD PR6 objectives are as defined below:

- Protect and conserve biodiversity using a precautionary approach,
- Adopt the mitigation hierarchy in the design and implementation of projects with the aim of achieving no net loss, and where appropriate, a net gain of biodiversity,
- Maintain ecosystem services, and
- Promote good international practice in the sustainable management and use of living natural resources.

3 Methodology

3.1 Flora

3.1.1 Flora Methodology

In order to reveal the flora inventory in the study area, the studies were carried out in three steps. These are 1-Desktop studies (Basic Preparation), 2-Field studies, 3-Survey (interview) studies. The flora studies have been specifically concentrated on the ETL and Access Road areas, with research and seed collection efforts directed towards the target plant species found within these designated areas.

Desktop Studies:

- Station selection and literature review were conducted utilizing geographic information systems (GIS).
- As part of the GIS studies, stations for point and transect observations were initially established using satellite images as a preliminary step.
- Previous flora studies near the study area were examined within the scope of literature survey. The Project's well-studied National EIA for flora includes a flora study covering turbine locations.
- For the flora assessment, satellite maps were initially analysed as part of the field study preparations. Subsequently, fieldwork was conducted to survey the terrain and habitats within the designated area.
- Information on the distribution of species was obtained from literature sources and this information was used as a base for further analysis. For flora species, the literature sources given in Section 6.1 were reviewed.
- The synonyms of the species were also taken into consideration in the literature review.
- Within the scope of literature survey, nationally protected and internationally recognized areas were investigated, such as Biga Mountains KBA and Çanakkale Strait KBA.

Field Studies:

- Field studies were conducted in areas that were not surveyed previously, specifically in areas where target species could potentially be observed. The flora studies, as a supplementary component, have been primarily concentrated on the ETL and access road areas, while turbine locations may be considered but are not the primary focus of the study.
- The first phase of fieldwork was carried out primarily to verify the quality of the stations identified in the desktop studies. If deemed necessary in the preliminary field work, adjustments were made to the stations. Natural and semi-natural habitats in the Project area and its immediate surroundings were taken into consideration in determining the stations.
- Surveys were carried out in 2024 during the vegetation period, with the objective of thoroughly assessing and documenting the various plant species present within the study area. The studies utilized the region's 1:25,000 scale topographic map, satellite images, GPS device, camera, a notebook, and various materials for collecting plant samples in the field, including transparent bags, a hoe, pruning shears, a plant press, and seed envelopes.
- The field studies were primarily conducted along 500-meter transect lines, representing different habitats within the Project’s footprint and area of influence.

- During the field studies, the third-level EUNIS habitat types of the study area along each transect line were also identified.

The below steps were followed in the identification process of plant species:

- During the identification of plant specimens, various sources were used, First of all Flora of Turkey and the East Aegean Islands, as well as the digital version of the Flora of Turkey (Tübives) and other references given in Section 6.1.
- Latin and Turkish names, family information, and taxonomic classification were based on the book “Türkiye Bitkileri Listesi (Damarlı Bitkiler) [List of Plants of Turkey (Vascular Plants)]” published by the Turkish Flora Research Association in 2012.
- Recent publications and newly added taxon records to the Flora of Turkey have also been reviewed, and the study Important Plant Areas of Turkey has been referenced as well.
- References have also been made to The Plant List, Plants of the World Online, and the International Plant Name Index (IPNI), and Bizimbitkiler.org.
- When determining the national IUCN threat categories of the identified species and subspecies, both endemic and non-endemic rare taxa, the primary reference used was the Red Data Book of Turkish Plants. For determining the global IUCN threat categories, the official website of the IUCN Red List was used as the main reference.

3.1.2 Field Schedule

The survey was conducted in April, May and September.

3.1.3 Survey Locations

For the purpose of evaluating floristic diversity within the scope of the Project, the boundaries of the study area were first defined. Field studies were conducted in areas that were not surveyed previously, specifically in areas where target species could potentially be observed. The flora studies, as a supplementary component, have been primarily concentrated on the ETL and access road areas, while turbine locations may be considered but are not the primary focus of the study. The study area was determined by considering all components and aspects of the Project, including land preparation, excavation works, installation and construction, transportation, energy production activities, any solid/liquid waste, dust, air emissions, noise, electromagnetic impacts, and the environmental effects and spread distances of these emissions. (See Table 3-1 and Figure 3-1)

Table 3-1 Flora Survey Location (Point and Transects)

Flora Point			Transect			
Station No	Survey Point	Nearest Project Element	Transect No	Transect Start Location	Transect End Location	Nearest Project Element
1	40° 3'57.50"N - 26°25'15.42"E	Access Road	1	40° 3'59.09"N - 26°25'12.56"E	40° 3'48.41"N - 26°25'16.88"E	Access Road
2	40° 1'58.02"N - 26°25'31.08"E	Access Road	2	40° 1'50.32"N - 26°25'22.97"E	40° 1'51.44"N - 26°25'34.85"E	Access Road
3	40° 1'6.99"N - 26°26'21.75"E	Access Road	3	40° 1'13.70"N - 26°26'20.90"E	40° 1'2.96"N - 26°26'33.00"E	Access Road
4	39°59'45.50"N - 26°28'52.25"E	Access Road	4	39°59'49.37"N - 26°28'45.85"E	39°59'39.87"N - 26°28'46.21"E	Access Road

5	39°58'34.54"N - 26°29'10.11"E	Access Road - Salihler Lake	5	39°59'5.11"N - 26°28'53.75"E	39°58'59.05"N - 26°29'1.76"E	Access Road - Salihler Lake
6	39°56'59.05"N - 26°33'37.38"E	Access Road	6	39°58'36.67"N - 26°29'2.59"E	39°58'28.71"N - 26°29'8.49"E	Access Road - Salihler Lake
7	39°55'38.35"N - 26°35'14.42"E	ETL - Switch Yard - T6	7	39°57'2.56"N - 26°33'29.83"E	39°56'51.53"N - 26°33'44.59"E	Access Road
8	39°56'15.53"N - 26°35'17.44"E	ETL - T9 - T5	8	39°55'28.10"N - 26°35'22.64"E	39°55'41.31"N - 26°35'17.04"E	ETL - Switch Yard - T6
9	39°56'32.60"N - 26°35'0.86"E	T8 - T4 - T1	9	39°56'19.43"N - 26°34'51.12"E	39°56'14.85"N - 26°34'39.27"E	ETL - T3
10	39°57'16.67"N - 26°34'38.97"E	ETL	10	39°56'7.66"N - 26°35'13.55"E	39°56'22.39"N - 26°35'10.88"E	ETL - T9 - T5
11	39°57'59.45"N - 26°34'31.17"E	ETL	11	39°56'30.08"N - 26°34'58.92"E	39°56'42.56"N - 26°34'51.02"E	ETL - T4 - T8
12	39°58'41.31"N - 26°33'52.24"E	ETL	12	39°56'51.57"N - 26°34'47.28"E	39°57'6.58"N - 26°34'52.53"E	ETL
13	39°59'28.79"N - 26°34'6.79"E	ETL	13	39°57'8.65"N - 26°34'39.43"E	39°57'24.20"N - 26°34'29.38"E	ETL
14	39°54'3.19"N - 26°32'56.82"E	Target Flora Species	14	39°57'52.37"N - 26°34'27.31"E	39°58'3.71"N - 26°34'35.61"E	ETL
			15	39°58'49.16"N - 26°34'12.25"E	39°58'38.04"N - 26°33'52.21"E	ETL
			16	39°59'17.76"N - 26°34'20.42"E	39°59'28.69"N - 26°34'7.22"E	ETL
			17	39°58'40.89"N - 26°34'43.71"E	39°58'31.00"N - 26°34'58.22"E	ETL
			18	39°58'27.84"N - 26°30'53.71"E	39°58'4.66"N - 26°31'19.56"E	Access Road
			19	39°54'4.21"N - 26°32'59.07"E	39°54'5.16"N - 26°32'47.21"E	Target Flora Species

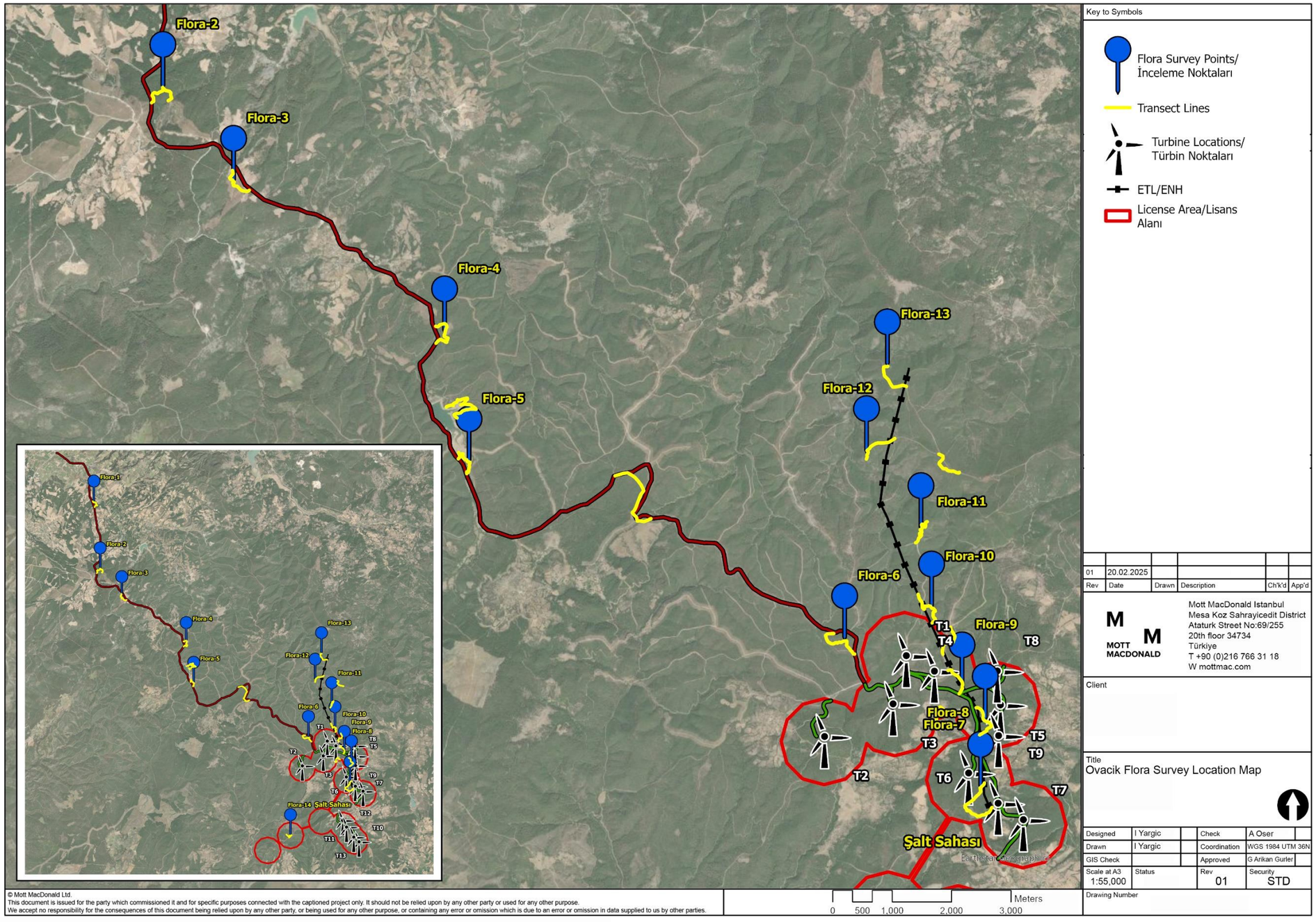


Figure 3-1 Flora Survey Location Map

3.2 Mammal

3.2.1 Mammal Methodology

In order to reveal the mammals inventory in the study area, the studies were carried out in three steps. These are 1-Desktop studies (Basic Preparation), 2-Field studies, 3-Survey (interview) studies. The mammal studies, as a supplementary component, have been specifically concentrated on the ETL and Access Road areas, with research efforts focused on identifying suitable locations for camera traps and transects, while turbine locations may be considered but are not the primary focus of the study.

Desktop Studies:

- Station selection and literature review were conducted utilizing GIS.
- As part of the GIS studies, point and transect locations were initially determined using satellite imagery for preliminary preparation.
- Previous mammals studies near the study area were examined within the scope of literature review.
- For mammals, firstly, satellite maps were analysed within the scope of field preparation studies.
- As part of the field preparation for terrestrial mammal, satellite maps were initially analysed. Subsequently, fieldwork was conducted to assess the status of the species and their relationship with the habitat. The precise locations of the stations were determined during the fieldwork.
- Information on the distribution of species was obtained from literature sources and this information was used as a base. The literature sources given in Section 6.2 were reviewed.
- The synonyms of the species were also taken into consideration in the literature review.
- Within the scope of literature reviews, nationally protected and internationally recognized areas were investigated and surveyed.

Field Studies:

- Field studies were conducted in areas that were not surveyed previously. The terrestrial mammal studies, as a supplementary component, have been specifically concentrated on the, ETL and access road area. while turbine locations may be considered but are not the primary focus of the study.
- The first phase of field studies for terrestrial mammals aimed to assess the suitability of camera trap and transect locations identified in the desktop studies. Stations were relocated, if necessary, with consideration given to natural and semi-natural habitats in and around the Project area.
- Mammal field studies was conducted in two main parts. Direct observation (camera trap) and Indirect observation (Footprints, faeces, and body hair).
- In the field studies habitats suitable for mammals were identified and observations were made for a total of 20 days according to the size of the habitat.
- Paths that could be the passage routes of medium and large mammals etc. were checked for camera trap installation. Camera traps were installed at points where animal signs (tracks, feces etc.) were seen.
- Indirect observation was made on the existing roads and footpaths within the Area of Influence.
- Camera traps remained in the field for 15 consecutive days at each survey point in April 2024 and 5 consecutive days in June 2024.

3.2.2 Field Schedule

A total of 20 days of survey was conducted in 2024 during the active season (April and June) for mammals to thoroughly assess and document the mammal species present within the study area. The field survey was strategically planned to align with the period of increased mammal activity, ensuring that observation of the mammal species, including both common and rare species, could be accurately recorded. This timing facilitated the identification of potential habitats and the collection of relevant data regarding species distribution and behaviour.

3.2.3 Survey Locations

For the purpose of evaluating mammals diversity within the scope of the Project, the boundaries of the study area were first defined. The study area was determined by considering all components and aspects of the Project, including land preparation, excavation works, installation and construction, transportation, energy production activities, any solid/liquid waste, dust, air emissions, noise, electromagnetic impacts, and the environmental effects and spread distances of any emissions. (See Table 3-2 and Figure 3-2)

Table 3-2 Terrestrial Mammals Survey Locations (Camera Trap and Transect)

Camera Trap			Transect			
Station No	Camera Trap Point	Nearest Project Element	Transect No	Transect Start Location	Transect End Location	Nearest Project Element
1	40° 2'14.87"N - 26°25'9.37"E	Access Road	1	40° 4'6.20"N - 26°25'6.94"E	40° 3'38.22"N - 26°25'18.16"E	Access Road
2	39°58'55.28"N - 26°29'5.87"E	Access Road - Salihler Lake	2	40° 2'27.46"N - 26°25'29.70"E	40° 2'4.43"N - 26°25'18.08"E	Access Road
3	39°58'0.09"N - 26°30'8.71"E	Access Road	3	40° 0'48.00"N - 26°27'27.74"E	40° 0'24.05"N - 26°27'59.38"E	Access Road
4	39°57'4.96"N - 26°33'12.02"E	Access Road	4	39°59'18.16"N - 26°28'38.77"E	39°58'19.47"N - 26°29'13.54"E	Access Road - Salihler Lake
5	39°55'34.61"N - 26°35'11.70"E	ETL - Switch Yard - T6	5	39°58'43.86"N - 26°29'11.08"E	39°58'42.72"N - 26°29'30.12"E	Access Road - Salihler Lake
6	39°57'53.43"N - 26°34'24.80"E	ETL	6	39°57'54.48"N - 26°29'46.24"E	39°58'5.57"N - 26°30'11.85"E	Access Road
7	39°58'42.18"N - 26°29'20.34"E	Access Road- Salihler Lake	7	39°57'45.58"N - 26°32'12.37"E	39°57'30.57"N - 26°32'25.74"E	Access Road
8	39°56'50.59"N - 26°34'57.44"E	ETL- T4 - T8	8	39°57'16.70"N - 26°33'5.58"E	39°56'58.61"N - 26°32'53.39"E	Access Road
			9	39°55'42.24"N - 26°35'21.43"E	39°55'29.84"N - 26°34'45.09"E	ETL - Switch Yard - T6
			10	39°56'54.52"N - 26°34'47.51"E	39°56'31.97"N - 26°35'3.94"E	ETL - T4 - T8

	11	39°57'15.48"N - 26°34'32.43"E	39°57'48.72"N - 26°34'10.85"E	ETL
	12	39°58'31.63"N - 26°34'3.80"E	39°58'57.29"N - 26°34'1.64"E	ETL

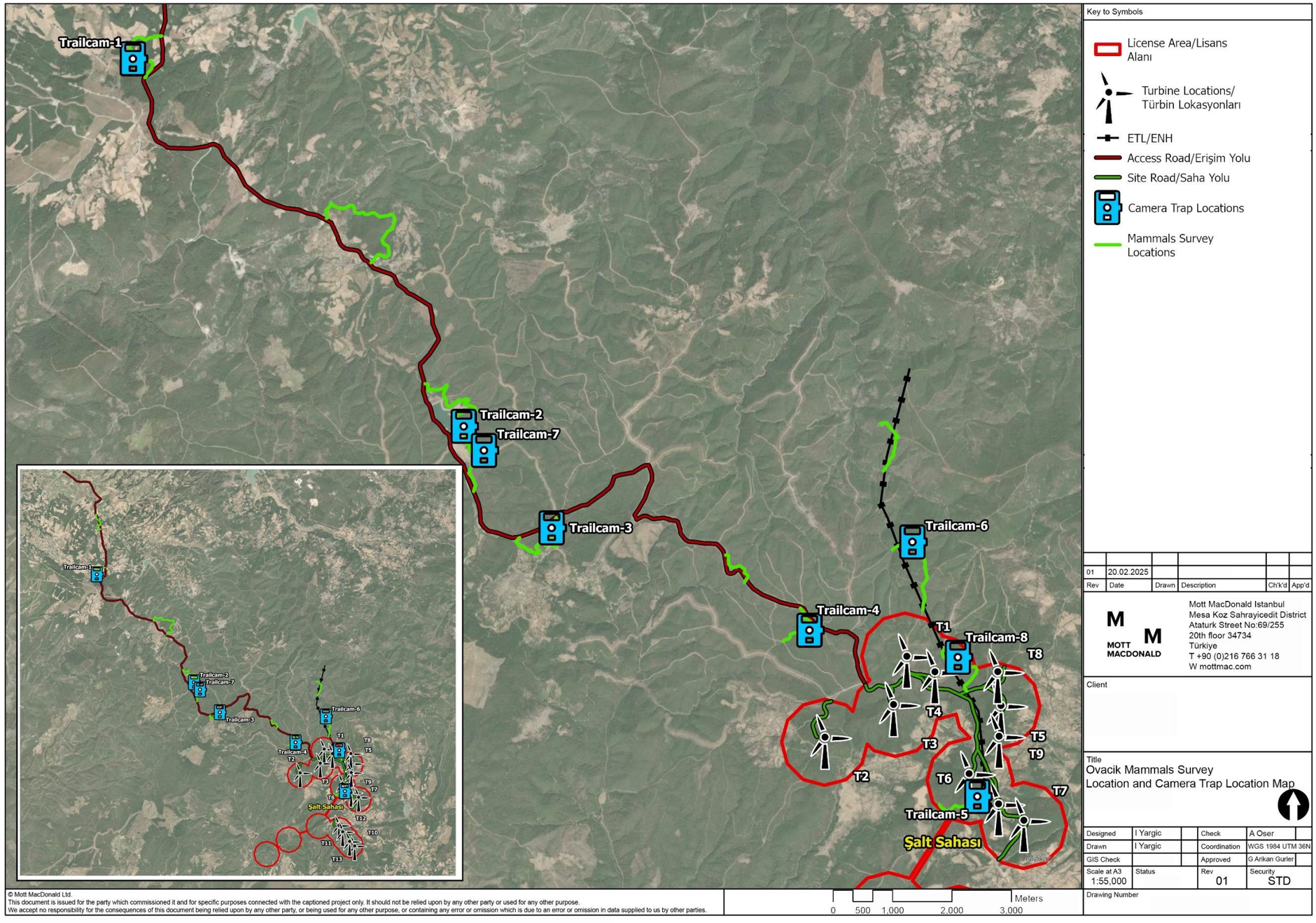


Figure 3-2 Terrestrial Mammal Camera Trap and Transect Survey Locations

3.3 Herpetofauna

3.3.1 Herpetofauna Methodology

In order to reveal the herpetofauna inventory in the study area, the studies were carried out in three steps. These are 1-Desktop studies (Basic Preparation), 2-Field studies, 3-Survey (interview) studies. The herpetofauna studies, as a supplementary component, have been specifically concentrated on the ETL and Access areas, with research efforts focused on identifying suitable locations for sampling points and transects, while turbine locations may be considered but are not the primary focus of the study.

- Station selection and literature review were conducted utilizing GIS.
- As part of the GIS studies, point and transect locations were initially determined using satellite imagery for preliminary preparation.
- Previous herpetofauna studies near the study area were examined within the scope of literature review.
- As part of the field preparation for herpetofauna, satellite maps were initially analysed. Subsequently, fieldwork was conducted to assess the status of the species and their relationship with the habitat. The precise locations of the stations were determined during the fieldwork.
- Information on the distribution of species was obtained from literature reviews and this information was used as a base. The literature sources given in section 6.3 were reviewed.
- The synonyms of the species were also taken into consideration in the literature review.
- Within the scope of literature reviews, nationally protected and internationally recognized areas were investigated and surveyed.

Field Studies:

- Field studies were conducted in areas that were not surveyed previously. The herpetofauna studies, as a supplementary component, have been specifically concentrated on the, ETL and access road area. while turbine locations may be considered but are not the primary focus of the study.
- The first phase of field studies for herpetofauna aimed to assess the suitability of point and transect locations identified in the desktop studies. Stations were relocated, if necessary, with consideration given to natural and semi-natural habitats in and around the Project area.
- In the following studies, habitats suitable for amphibians and reptiles were identified and observations were made for a total of 4 days according to the size of the habitat. Fieldwork started in the morning at daylight and continued until dusk for nocturnal species.
- Observations were conducted at total 10 stations and 10 transects for varying periods of time depending on the size of the habitat.
- In order to identify amphibians and reptiles, water sources, areas close to water sources, under stones and rocks, rock crevices and cracks, tree hollows, etc. were checked in the field work carried out in and around the study area.
- During the observations, ‘Visual Encounter Survey (VES)’ and Call Survey were used to determine the presence of amphibians and reptile species.

3.3.2 Survey Locations

For the purpose of evaluating herpetofauna diversity within the scope of the Project, the boundaries of the study area were first defined. The study area was determined by considering all components and aspects of the Project, including land preparation, excavation works,

installation and construction, transportation, energy production activities, any solid/liquid waste, dust, air emissions, noise, electromagnetic impacts, and the environmental effects and spread distances of any emissions. (See Table 3-3 and Figure 3-3)

Table 3-3 Herpetofauna Survey Locations

Herpetofauna Point			Transect			
Station No	Survey Point	Nearest Project Element	Transect No	Transect Start Location	Transect End Location	Nearest Project Element
1	40° 4'44.18"N - 26°25'4.68"E	Access Road	1	40° 4'57.59"N - 26°24'56.70"E	40° 4'39.13"N - 26°25'12.34"E	Access Road
2	40° 2'48.54"N - 26°25'28.37"E	Access Road	2	40° 3'3.91"N - 26°25'26.69"E	40° 2'47.38"N - 26°25'30.79"E	Access Road
3	40° 1'27.61"N - 26°25'41.58"E	Access Road	3	40° 1'26.70"N - 26°25'34.94"E	40° 1'25.79"N - 26°25'58.07"E	Access Road
4	40° 0'11.64"N - 26°28'16.37"E	Access Road	4	40° 0'18.83"N - 26°28'10.78"E	40° 0'9.28"N - 26°28'23.19"E	Access Road
5	39°58'59.84"N - 26°29'2.17"E	Access Road - Salihler Lake	5	39°59'4.22"N - 26°29'14.59"E	39°58'44.75"N - 26°29'10.81"E	Access Road - Salihler Lake
6	39°57'58.83"N - 26°31'41.29"E	Access Road	6	39°58'5.84"N - 26°31'29.37"E	39°57'52.51"N - 26°31'48.35"E	Access Road
7	39°55'33.34"N - 26°35'19.08"E	ETL - Switch Yard - T6	7	39°55'27.52"N - 26°35'22.10"E	39°55'52.04"N - 26°35'16.97"E	ETL - Switch Yard - T6
8	39°56'25.11"N - 26°35'11.70"E	ETL - T5 - T8	8	39°56'5.69"N - 26°35'11.48"E	39°56'33.98"N - 26°35'1.98"E	ETL - T9 - T5 - T8 - T4
9	39°57'32.63"N - 26°34'24.08"E	ETL	9	39°57'26.58"N - 26°34'27.23"E	39°57'35.98"N - 26°34'27.18"E	ETL
10	39°58'43.80"N - 26°34'24.61"E	ETL	10	39°58'32.70"N - 26°34'4.67"E	39°58'32.04"N - 26°34'49.42"E	ETL

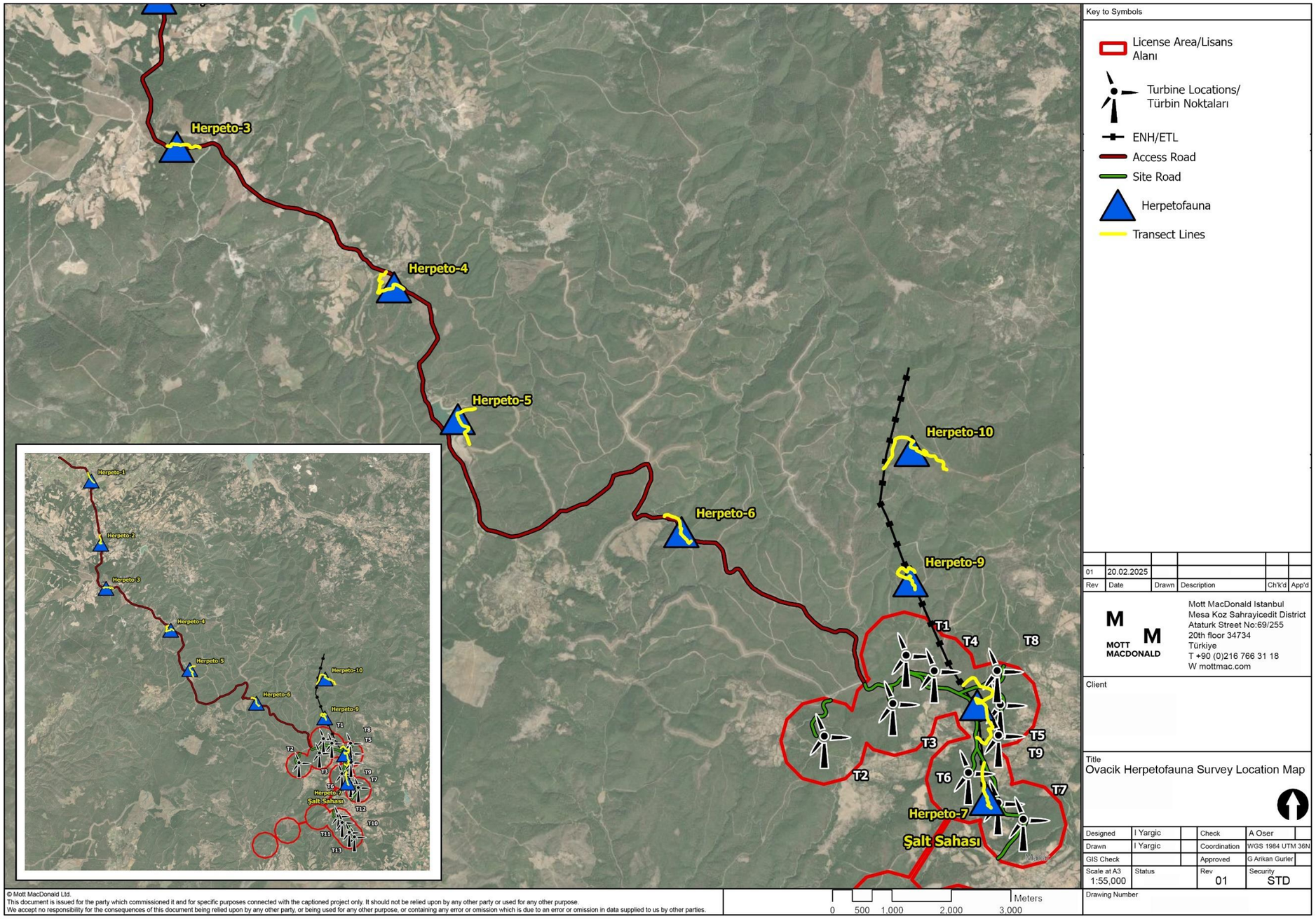


Figure 3-3 Transect and Point Survey Locations of Herpetofauna

3.4 Bird

As previously presented in the standalone methodology reports[3], studies on birds were carried out on 3 main topics: Turbine Vantage Point (VP) survey, ETL VP survey, and Breeding Bird Survey.

No major changes to bird methodology were made. On the other hand, a short summary of minor changes to established methodologies based on field ground truthing are summarised below, and discussed in further detail under Section 3.4.1, 3.4.2 and 3.4.4;

- VP located near T2 was moved 600 m north for improved coverage (see Section 3.4.1).
- Since southern external ETL was removed from the scope, 2 VP ETLs covering the external ETL was removed. (see Section 3.4.2).
- VP ETL was moved 1 km west for improved coverage (see Section 3.4.2).
- VPs were renamed (numeration) for field surveyor convenience (see Section 3.4.1, and Section 3.4.2.

Spring season for the Project region was considered as extending to mid-June as confirmed by the local ornithology experts. (see Section 3.4.4).

3.4.1 Vantage Point Methodology

Bird survey is based on a vantage point survey, hereafter VP, on high ground methodology both for migratory and breeding/resident species as defined by NatureScot (formerly known as SNH) guidelines, which are widely used for ecological impact assessment studies on wind farms.

VP involves conducting observations from a fixed location, from where the whole Project area can be seen and all the birds flying through the wind farm airspace can be detected. A minimum of 36 hours of observations are required for each season.

The appropriate time of observations is determined as when target species are active which is between 09:00 - 17:00, though changing daylight conditions between seasons are also considered when scheduling observations. The observer scans the area within the main viewing angle every 5 minutes, using the maximum angle if a bird contact moves outside of the main angle. When a bird is detected, the species is identified, total number of birds is noted, minimum and maximum flight height during the course is estimated, first and last time of the sighting is noted. A standard field recording sheet was used (see Appendix 6.9).

The observer pays particular attention to the flight height of the birds. The height levels of a wind turbine can be marked as: (a) below rotor height (<42 m), (b) at rotor height (42-180 m), (c) above rotor height (>180 m). When the birds possibly fly near the turbines, the flight line cross the location of the turbine. On maps specifically designed for each VP, the flight path of each bird is drawn.

3.4.1.1 Vantage Point Field Schedule

During spring of 2024, a total of 112 hours and 23 minutes of surveys were conducted across three vantage points (VP1, VP2, and VP3) as presented Table 3-4. Week number of the year are denoted with Monday as first day. The surveys started at the end of March and continued until early June. On average, approximately 37 hours and 28 minutes of surveys were conducted per vantage point.

[3] Ovacık WPP Biodiversity Monitoring Methodology. Mott MacDonald. Issue date 28 March 2024.

Table 3-4 VP survey effort and dates in spring.

Week	First Day	VP1	VP2	VP3	Total (h)
W13	25/03	10:16	07:32	-	17:48
W18	29/04	06:45	12:35	10:51	30:11
W23	03/06	20:28	16:01	27:55	64:24
Total	-	37:29	36:08	38:46	112:23

During the summer of 2024, a total of 116 hours and 17 minutes of surveys were conducted across three vantage points (VP1, VP2, and VP3). The surveys started in mid-June and continued until the end of August. On average, approximately 38 hours and 46 minutes of surveys were conducted per vantage point. (Table 3-5).

Table 3-5 VP survey effort and dates in summer.

Week	First Day	VP1	VP2	VP3	Total (h)
W26	24/06	14:05	15:05	14:12	43:22
W31	29/07	13:37	7:41	12:28	33:46
W34	19/08	13:30	13:29	12:10	39:09
Total	-	41:12	36:15	38:50	116:17

During the autumn of 2024, a total of 116 hours and 40 minutes of surveys were conducted across three vantage points (VP1, VP2, and VP3). Autumn surveys started at the beginning of September and continued until mid-November. On average, approximately 38 hours and 39 minutes of surveys were conducted per vantage point (Table 3-6)

Table 3-6 VP survey effort and dates in autumn.

Week	First Day	VP1	VP2	VP3	Total (h)
W38	16/09	6:47	6:17	12:07	25:11
W39	23/09	6:42	6:08	-	12:50
W42	14/10	12:25	13:18	13:56	39:39
W45	04/11	-	-	12:46	12:46
W46	11/11	12:45	13:29	-	26:14
Total	-	38:39	39:12	38:49	116:40

3.4.1.2 VP Locations

3 VPs are used for the best visual coverage of the turbine areas. Locations of the VPs are shown on Figure 3-4 and coordinates of the VPs are provided in Table 3-7.

Table 3-7 Locations of the VPs (WGS 84 UTM 35N)

VP	Easting	Northing
VP1	464723	4416890
VP2	464992	4421124
VP3	462037	4420612

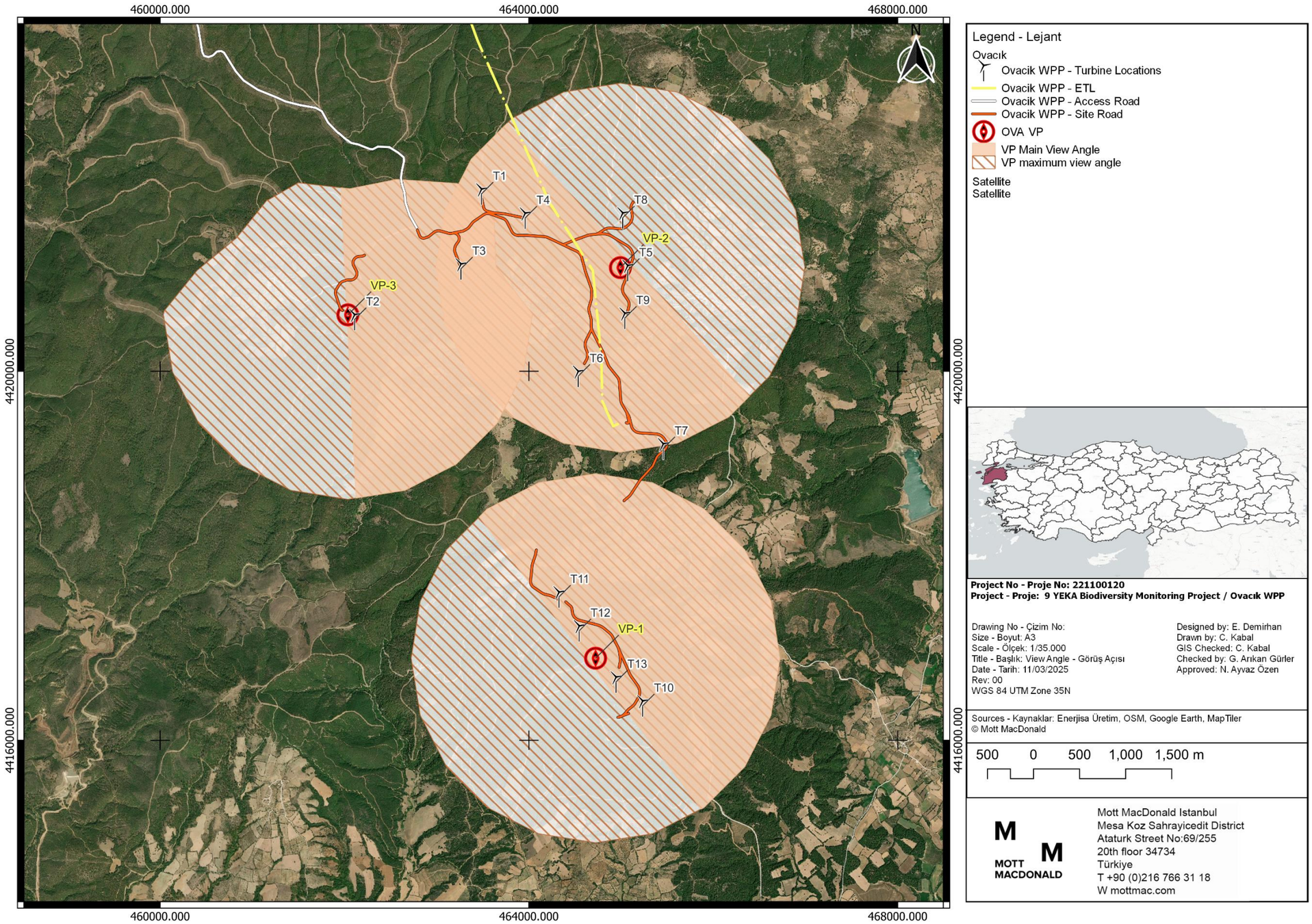


Figure 3-4 Locations of the VPs

3.4.2 ETL Observations

The impact of the wind farm is not complete without considering the related and connected infrastructure. The transmission lines are known to cause death to birds by physical injuries and electrocution. The isolation of the pylons and the installation of the bird diverters are important.

ETL monitoring provides valuable insights into the bird species present at the ETL route and potential environmental considerations related to the observed habitats. In order to assess the potential impact of ETL on the areas it will traverse post-construction, 2 vantage points (VP ETLs) were thoughtfully selected, and observations were conducted at these points. An observer was present at the selected VP ETL and scanned the area each 5 minutes at the maximum possible view angle. When a bird is detected, the species is identified, and the flight height of the bird is recorded as above or below the ETL.

To analyse bird passage rates, the number of bird passages per hour was calculated for each vantage point (TLs) along the ETL. The average passage rate was then determined for three seasons. ETL segments were classified into low, medium, or high-risk categories based on passage rates of target species:

- Low risk: Up to 0.35 bird passages/hour (average value: 0.25 bird passages/hour)
- Medium risk: Between 0.35 and 0.70 bird passages/hour (average value: 0.50 bird passages/hour)
- High risk: Above 0.70 bird passages/hour

These threshold values were established by comparing data from the 9 WPP projects. Current guidelines do not provide explicit thresholds for risk levels; therefore, these classifications were determined based on an arbitrary but consistent decision-making process informed by the comparative dataset.

3.4.2.1 ETL Observation Field Schedule

A total of 76 hours and 25 minutes of surveys were conducted during the spring of 2024, starting on 25 March 2024, and finishing on 15 June 2024. The surveys were carried out at 2 transmission line points (VPs ETL1, ETL2). On average, approximately 38 hr of survey was conducted per vantage point (VP ETL) as shown in Table 3-8.

Table 3-8 ETL survey effort and dates in spring

Week	First Day	VP ETL1	VP ETL2	Total
W13	25/03	06:58	05:26	12:24
W14	01/04	06:52	06:09	13:01
W18	29/04	14:58	12:35	27:33
W23	03/06	07:26	16:01	23:27
Total	-	36:14	40:11	76:25

A total of 82 hours and 39 minutes of surveys were conducted during the summer of 2024. The surveys were carried out at 2 transmission line points (VPs ETL1, ETL2). On average, approximately 38 hr of survey was conducted per vantage point (VP ETL) as shown in Table 3-9.

Table 3-9 ETL survey effort and dates in summer

Week	First Day	VP ETL1	VP ETL2	Total
W26	24/06	15:16	15:05	30:21
W31	29/07	12:24	13:38	26:02

Week	First Day	VP ETL1	VP ETL2	Total
W34	19/08	12:47	13:29	26:16
Total	-	40:27	42:12	82:39

A total of 78 hours and 18 minutes of surveys were conducted during the autumn of 2024, between on 1 September and finishing on 15 November. The surveys were carried out at three transmission line points (VPs ETL1, ETL2). On average, approximately 39 hr 9 min of survey was conducted per vantage point (VP ETL) as shown in Table 3-10.

Table 3-10 ETL survey effort and dates in autumn

Week	First Day	VP ETL1	VP ETL2	Total
W38	16/09	12:18	6:17	18:35
W39	23/09	-	6:08	6:08
W42	14/10	13:51	13:18	27:09
W45	04/11	12:57	-	12:57
W46	11/11	-	13:29	13:29
Total	-	39:06	39:12	78:18

3.4.2.2 ETL Observation Locations

2 VPs are used for the best visual coverage of the turbine areas. Locations of the ETL VPs are shown on Figure 3-5. Coordinates of the ETL VPs are provided in Table 3-11.

Table 3-11 Locations of the VPs (WGS 84 UTM 35N)

VP	Easting	Northing
VP ETL1	463183	4424650
VP ETL2	464992	4421123

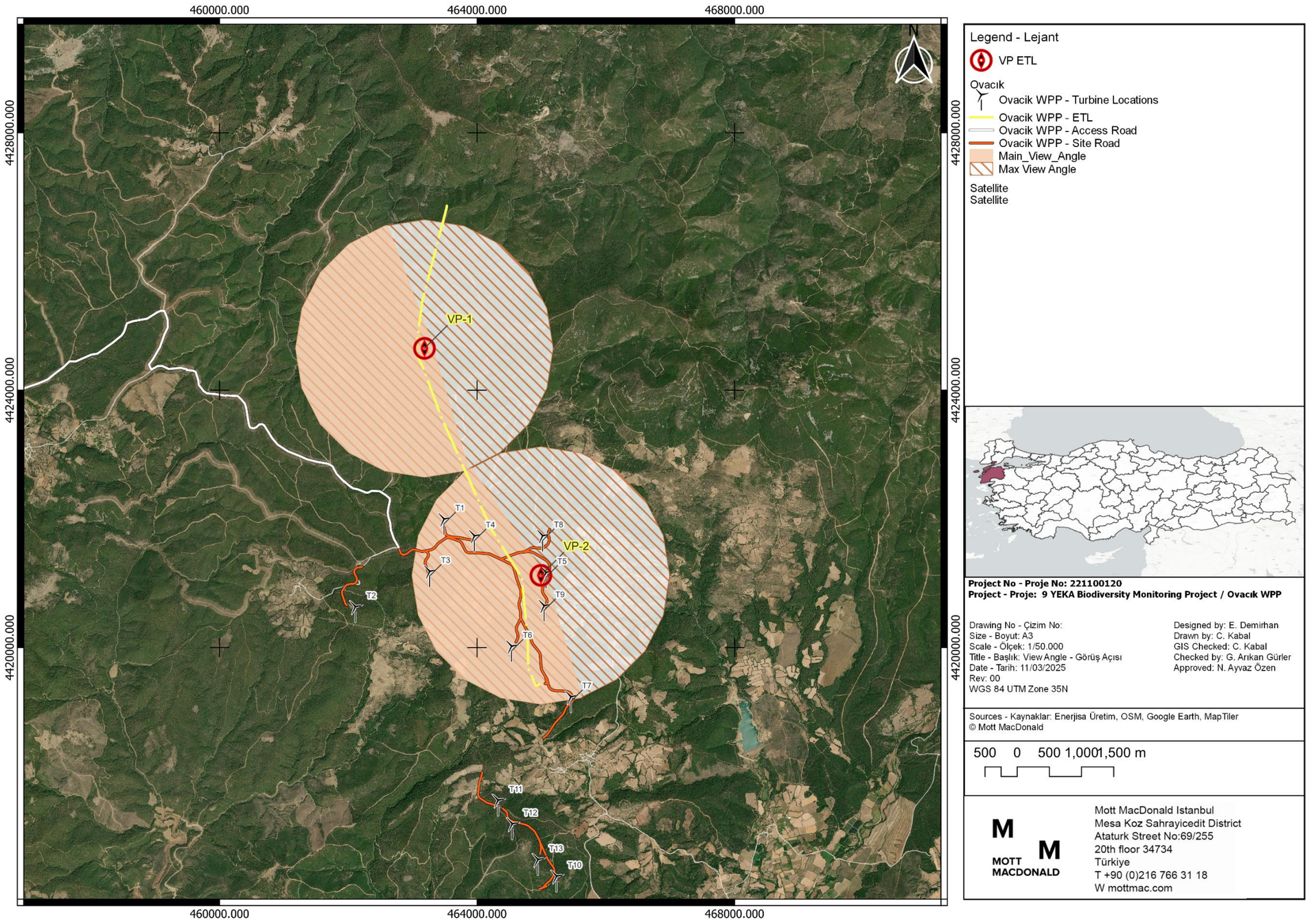


Figure 3-5 Locations of the ETL VPs

3.4.3 Collision Risk Methodology

NatureScot Guidance note describes a methodology for assessing the full impact of wind farms on ornithological interests which includes a two-stage process for the assessment of collision risk (NatureScot 2000). Stage (1) involves the calculation of the number of birds that fly through the rotors, which itself consists of two separate approaches, modified in order to calculate (a) resident bird numbers and (b) migratory bird numbers. Stage (2) involves the calculation of the probability of a bird being hit by a rotor when flying through. Avoidance rates in both approaches are accounted for according to NatureScot (2018), which for raptors is specified as 98% (see Appendix 6.4).

For the purposes of this analysis, a resident bird is defined as individuals of either resident species or migrant species that spend more time at the Project site than simply passing by. In other words, any bird that spent more time for feeding, resting, hunting was regarded as resident. A migrant bird was defined as birds that only pass through the area once in a certain direction, typically in order to migrate.

3.4.3.1 Approach 1: Regular Flights through a Wind Farm

The first approach was designed for cases in which a bird population makes regular flights through the wind farm, possibly in a reasonably defined direction. This is usually applied for species that exhibit regular flights between the feeding and sleeping (roosting) areas, such as wintering geese, gulls and cranes.

In this analysis, approach 1 was modified to be applicable to migrant birds. This approach was utilized to estimate the mortality of birds that only fly through and not sleep (roost), feed or exhibit other behaviour that causes the bird to spend time in the area.

Calculation of the collision risk for the birds during regular flights according to NatureScot is:

1. Identify a 'risk window' i.e. a window of width equal to the width of the wind farm across the general flight direction of the birds, and of height equal to the maximum height of the highest turbine. The cross-sectional area W = width x height.
2. Estimate the number of birds flying through this risk window per annum, i.e. flock size x frequency of flight. Make allowance in the flock size for occasions on which birds which may fly higher than this risk window and for the fact that the risk window may only straddle a proportion of the overall flight corridor used by the birds.
3. Calculate the area A presented by the wind farm rotors. Assume the rotors are aligned in the plane of the risk window as, to a first approximation, any reduction in cross-sectional area because the rotors are at an oblique angle is offset by the increased risk to birds which have to make a longer transit through the rotors. Where rotors overlap when viewed in cross-section, allow for the full cross-sectional area of separate rotors as the risk to birds is doubled if passing through two successive rotors: $A = N \times \pi R2$ where N is the number of rotors and R is the rotor radius
4. Express the total rotor area as a proportion A / W of the risk window.
5. Number of birds passing through rotors = number of birds through risk window x proportion occupied by rotors = n x (A / W)

3.4.3.2 Approach 2: Birds using the Wind Farm Airspace

The second approach was designed for birds such as raptors which occupy a recognised territory, and there is a certain level of understanding of the likely distribution of flights within that territory.

In this analysis, Approach 2 was adapted to estimate the mortality of resident birds, i.e. birds that spend a certain amount of time hunting, territory defence, displaying and nesting in the area.

Calculation of the collision risk for the birds using the airspace of the wind farm following NatureScot (2000) is:

1. Identify a 'flight risk volume' Vw which is the area of the wind farm multiplied by the height of the turbines.
2. Calculate the combined volume swept out by the wind farm rotors Vr = N x πR2 x (d + l) where N is the number of wind turbines, d is the depth of the rotor back to front, and l is the length of the bird.
3. Estimate the bird occupancy n within the flight risk volume. This is the number of birds present multiplied by the time spent flying in the flight risk volume, within the period (usually one year) for which the collision estimate is being made.

For good results the data available should be based on actual observations within the area of the wind farm alone (provided the observation is done without disturbance), and the best results will be based on observational data about flight heights, such as will enable informed estimate of the proportion of flights at a level which may collide with the wind farm rotors. However, in the absence of such data, an estimate can be made knowing only the number of birds, and proportion of time flying, within the bird's territory, and using some knowledge of flight behaviour to gauge the proportion of flights at a height to be at risk.

4. The bird occupancy of the volume swept by the rotors is then

n x (Vr / Vw) bird-secs.

5. Calculate the time taken for a bird to make a transit through the rotor and completely clear the rotors:

t = (d + l) / v where v m/sec is the speed of the bird through the rotor

6. To calculate the number of bird transits through the rotors, divide the total occupancy of the volume swept by the rotors in bird-secs by the transit time t:

Number of birds passing through rotors = n x (Vr / Vw) / t

3.4.4 Breeding Bird Methodology

In the region, the breeding season for most bird species is between March and July, according to the Turkish Breeding Bird Atlas (which was incorporated into European Breeding Bird Atlas[4]). Breeding bird surveys were conducted for early and late breeding seasons at the Wind Farm. These surveys utilized both line transect (VPs) and points counts (TLs) methods. For the line transect method, transects were selected adjacent to vantage points. Observers walked along these transect lines, recording each potential breeding bird observed, along with the species and the highest level of breeding code for each bird species as given in Table 3-12. For the point count method, observers recorded each potential breeding bird observed at VP and VP ETL points during bird monitoring surveys, along with the species and the highest level of breeding code for each bird species.

Table 3-12 Breeding bird survey atlas codes.

Breeding categories and Atlas codes
A Possible breeding

[4] https://ebba2.info/

1 Species observed in breeding season in possible nesting habitat
2 Singing male(s) present (or breeding calls heard) in breeding season
B Probable breeding
3 Pair observed in suitable nesting habitat in breeding season
4 Permanent territory presumed through registration of territorial behaviour (song, etc.) on at least two different days a week or more apart at same place
5 Courtship and display
6 Visiting probable nest site
7 Agitated behaviour or anxiety calls from adults
8 Breed patch on adult examined in the hand
9 Nest building or excavating of nest hole
C Confirmed breeding
10 Distraction display or injury feigning
11 Used nest or eggshells found (occupied or laid within period of survey)
12 Recently fledged young (nidicolous species) or downy young (nidifugous species)
13 Adults entering or leaving nest site in circumstances indicating occupied nest (including high nests or nest holes, the contents of which cannot be seen) or adult seen incubating
14 Adult carrying a faecal sac or food for young
15 Nests containing eggs
16 Nests with young seen or heard

3.4.4.1 Breeding Bird Field Schedule and Locations

During the breeding bird surveys, a total of 6 transect walks were conducted in May and June (Table 3-13). Point counts from July are also included. The walks lasted an average of 58.6 minutes and covered 1.2 km. Most walks were conducted at around 09:30 in the morning (Figure 3-6).

In addition, bird sighting data collated from all VPs and VP ETLs between March and June were used for additional data points on breeding birds.

Table 3-13 Breeding bird survey dates and nearest VPs.

Transect Location	Date	Month	Time	Duration (min)	Distance (km)
OVA-VP3	03/05	May	09:28:00	50	2
OVA-VP2	03/05	May	09:41:00	63	1
OVA-VP1	05/05	May	10:27:00	67	1
OVA-VP2	07/06	Jun	09:24:00	60	2
OVA-VP3	07/06	Jun	09:35:00	60	2
OVA-VP1	08/06	Jun	09:30:00	63	2

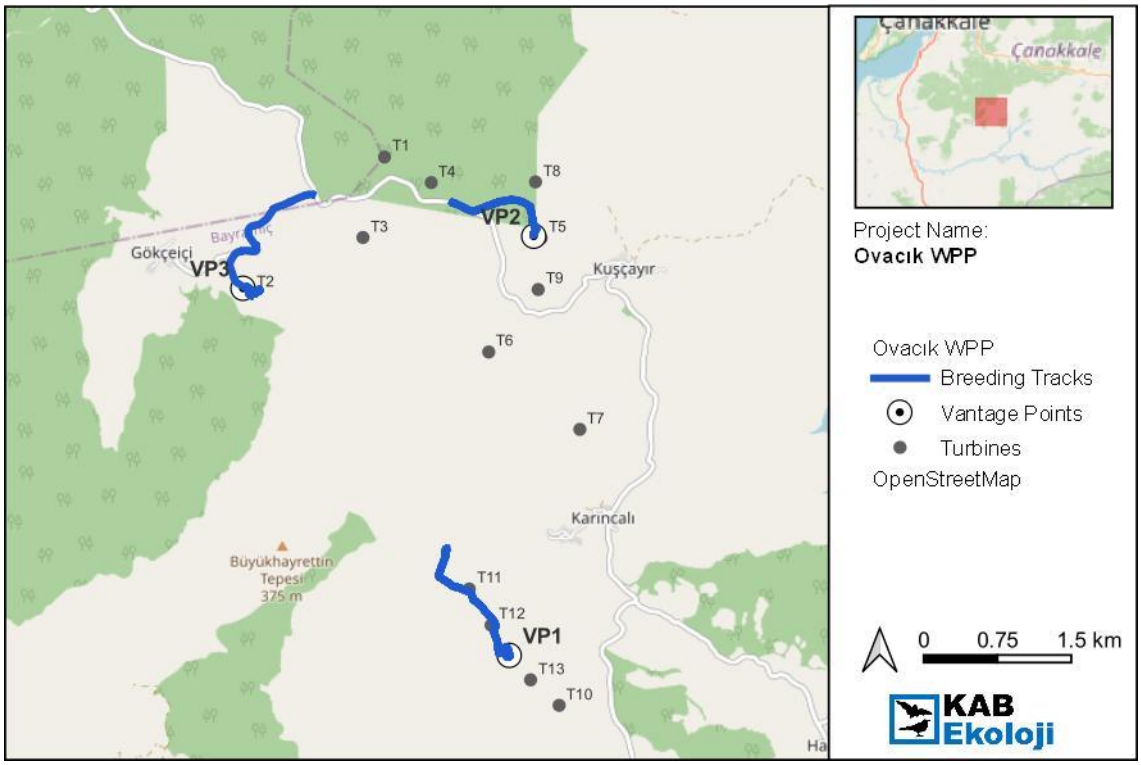


Figure 3-6 Line transects used for breeding surveys at the project site

3.5 Bat

No major changes to the established bat methodology were made and there are no minor ones to mention.

Some data loss occurred due to device failures of unknown causes. Despite device recording failures which were intermittent and unpredictable, enough nights of data were collected for analysis due to NatureScot methodology's high consecutive recording requirements. Detector recording success for spring can be seen in Table 4-42, summer inTable 4-47 (no failures) and autumn in Table 4-54. Failures resulted in no recordings and show up as blank in table cells for the device.

3.5.1 Ground Static and Mobile Acoustic Survey Methodology

Ground static bat surveys followed NatureScot guidelines which prescribe the following:

- At sites where the proposed turbine locations are known, static detectors should be placed to provide a representative sample of bat activity at or close to these points.
- Detectors should be placed at all known turbine locations at wind farms containing less than ten proposed turbines.
- Where developments have more than ten turbines, detectors should be placed within the developable area at ten potential turbine locations plus a third of additional potential turbine sites up to a maximum of 40 detectors for the largest developments.
- At key-holed woodland/plantation sites (and other proposals involving extensive habitat alteration), pre-application survey data may not represent the situation post-construction, as the habitat available for bats will change following construction. Automated survey locations should therefore also include open areas including existing nearby rides/clearings in the forestry, to provide an indication of how bats may adapt to and use the new habitat created through turbine construction.
- Ideally, surveys should aim for 10 consecutive nights, but in practice weather conditions may preclude this particularly early or late in the year and in more northerly latitudes.

Static and transect acoustic surveys were conducted in order to assess bat activity in the Project site. For static surveys, 7 full spectrum bat detectors (Wildlife Acoustic Song Meter Mini Bat 2 AA) used at each selected sampling point for ten nights. For transect surveys, surveyors travelled slowly along a designated route within the project site, using a full-spectrum bat detector (Wildlife Acoustics Song Meter Mini Bat 2 AA) to record bat activity. Additionally, geo-tracking was conducted using a mobile phone application (Figure 3-7). Transect surveys were carried out after sundown on the same nights as the static surveys. The detectors were triggered by bat calls. The detectors were located at around 1 m above the ground.

3.5.2 Acoustic Analysis Methodology

Bat recordings obtained from bat detectors were analysed using BatExplorer and Kaleidoscope Pro (produced by Wildlife Acoustics) and species identifications were done by following established scientific literature and industry best practice (Appendix 6.5). Echolocation signal characteristics including signal shape, peak frequency of maximum energy, signal slope, pulse duration, start frequency, end frequency, pulse bandwidth, inter-pulse interval and power spectra are compared to published signal characteristics for local bat species. As the call parameters of some species overlap, in such cases definitive species identification is difficult and their identifications were reported as "possible." Feeding buzzes and social calls were also noted.

Since Auto-ID yields mixed results in sound identification, i.e. performs very well for some species, or shows biases for some over others, or sometimes identifies species which are not

even distributed in a particular region, manual analysis was performed in a sampling type approach in order to account for Auto-ID corrections. For each consecutive ten nights of recording, two nights with the highest number of recordings were identified via filters. These nights were then prioritized for detailed manual analysis. Additionally, it was also ensured that the nights selected represented all the bat species identified through Auto-ID. If the two nights with the highest bat activity did not capture all species for some SPs, additional nights were added into the manual analysis set for a more complete representation.

Myotis genus identifications remain some of the most challenging species to differentiate in Turkiye, and experts are often not comfortable providing species level identifications. A through Myotis analysis is very time intensive, with a small percentage of recordings allowing for further species analysis, and even in that case, most efforts can usually narrow it down to 2-3 species clusters, again not resulting in confident species IDs. If Myotis species IDs are of specific concern, targeted methodologies and approaches would be necessary. Usually for Myotis, a mixture of sound and morphology is preferred for species identification, which in some cases may not even be sufficient, and genetic evidence may be necessary. Bat experts often indicate Myotis at genus level and this has become common practice since Myotis species are not defined in literature or carcass studies as especially collision prone at WPPs.

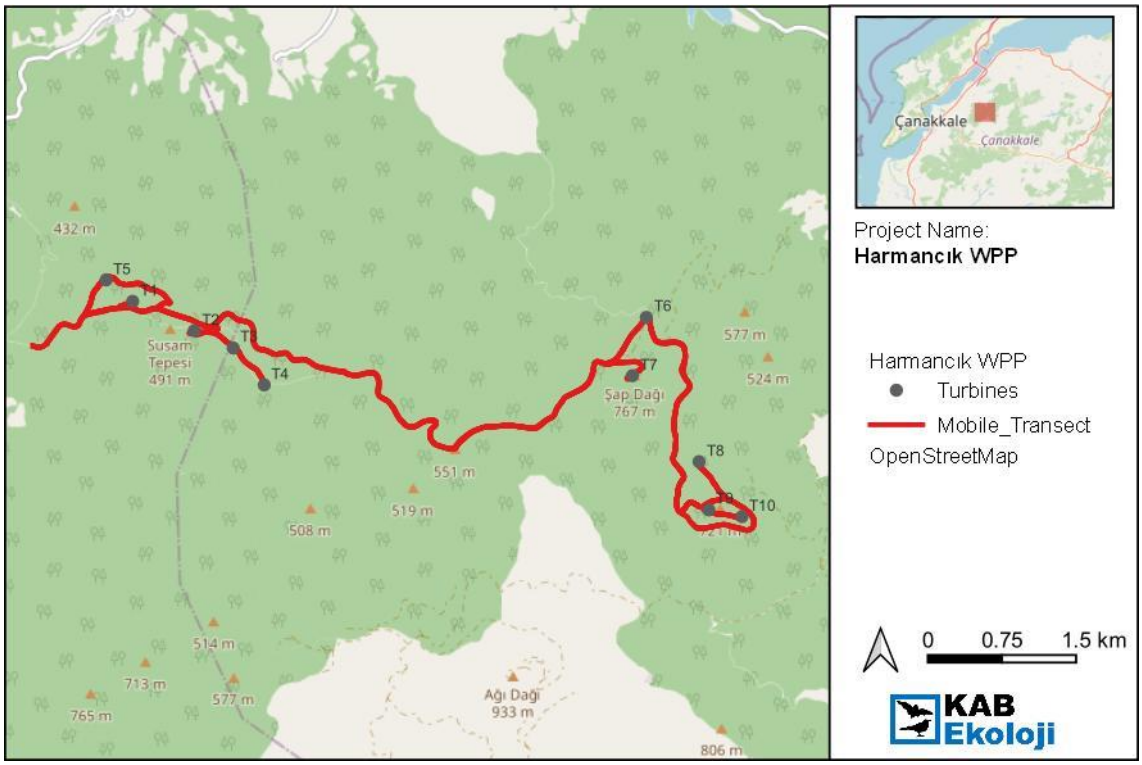


Figure 3-7 Transect survey route at the project

3.5.3 Field Schedule

A set of static and transect acoustic bat surveys were conducted (Table 3-14). Weather conditions during surveys are given in Table 3-15.

Table 3-14 Acoustic bat surveys for 2024 spring, summer, and autumn season.

Survey Season	Start Date	Finish Date	Number of Nights
Spring Static Surveys	27 June	6 July	10 nights

Survey Season	Start Date	Finish Date	Number of Nights
Spring Transect Survey 1	29 June	29 June	1 night
Spring Transect Survey 2	6 July	6 July	1 night
Summer Static Surveys	10 August	20 August	10 nights
Summer Transect Survey 1	14 August	14 August	1 night
Summer Transect Survey 2	20 August	20 August	1 night
Autumn Static Surveys	26 September	9 October	10 nights
Autumn Transect Survey 1	26 September	26 September	1 night
Autumn Transect Survey 2	01 October	01 October	1 night

Table 3-15 Weather conditions during the completed surveys.

Date	Temperature (°C)	Wind Speed (m/s)	Cloud cover %	Precipitation (mm)
2024-06-27	20	6	0	0
2024-06-28	21	4	0	0
2024-06-29	21	6	10	0
2024-06-30	21	5	0	0
2024-07-01	22	1	0	0
2024-07-02	22	1	0	0
2024-07-03	23	2	0	0
2024-07-04	22	2	30	0
2024-07-05	20	1	20	0
2024-07-06	22	2	0	0
2024-08-10	24	2	0	0
2024-08-11	24	3	10	0
2024-08-12	24	3	0	0
2024-08-13	24	4	0	0
2024-08-14	26	3	0	0
2024-08-15	25	6	0	0
2024-08-16	24	4	0	0
2024-08-17	22	4	0	0
2024-08-18	22	4	0	0
2024-08-19	22	2	0	0
2024-08-20	23	1	0	0
2024-09-26	15	1	0	0
2024-09-27	17	2	0	0
2024-09-28	18	2	0	0
2024-09-29	18	0	0	0
2024-09-30	17	3	70	4
2024-10-01	13	1	40	0
2024-10-02	12	1	0	0
2024-10-03	14	1	0	0
2024-10-04	17	1	0	0
2024-10-05	19	1	0	0
2024-10-06	22	1	60	0
2024-10-07	18	1	10	0
2024-10-08	17	2	10	0

Date	Temperature (°C)	Wind Speed (m/s)	Cloud cover %	Precipitation (mm)
2024-10-09	15	1	0	0
2024-10-10	17	2	10	0

3.5.4 Survey Locations

Ground static bat detector locations (Sampling Point, SP) are provided in (Table 3-16) and shown on Figure 3-8.

Turbines 10, 11, 12, and 13 will be key holed into woodland, and therefore this group of turbines needs a representative sampling point which can mimic the turbine pads once the forest is cleared. These turbines are located in close proximity and located in similar habitat. SP1 was selected to represent this group. Similarly, T1 and T3 are represented by SP6. While the sampling point count is less than the prescribed number by NatureScot, due to the forest cover at the Project, SP1 and SP6 areas are ideal locations for sampling which is also why these groupings make sense. The methodology is still much more comprehensive than the minimum acceptable standard for WPPs which is EUROBATS guidelines.

Table 3-16 Ground static bat detector locations (WGS84 UTM35N).

SP	Easting	Northing	Nearest Turbine
SP1	465128	4416926	T13
SP2	465401	4419134	T7
SP3	464694	4420387	T6
SP4	465094	4421166	T5
SP5	465063	4421660	T8
SP6	463885	4421652	T4
SP7	461772	4420587	T2

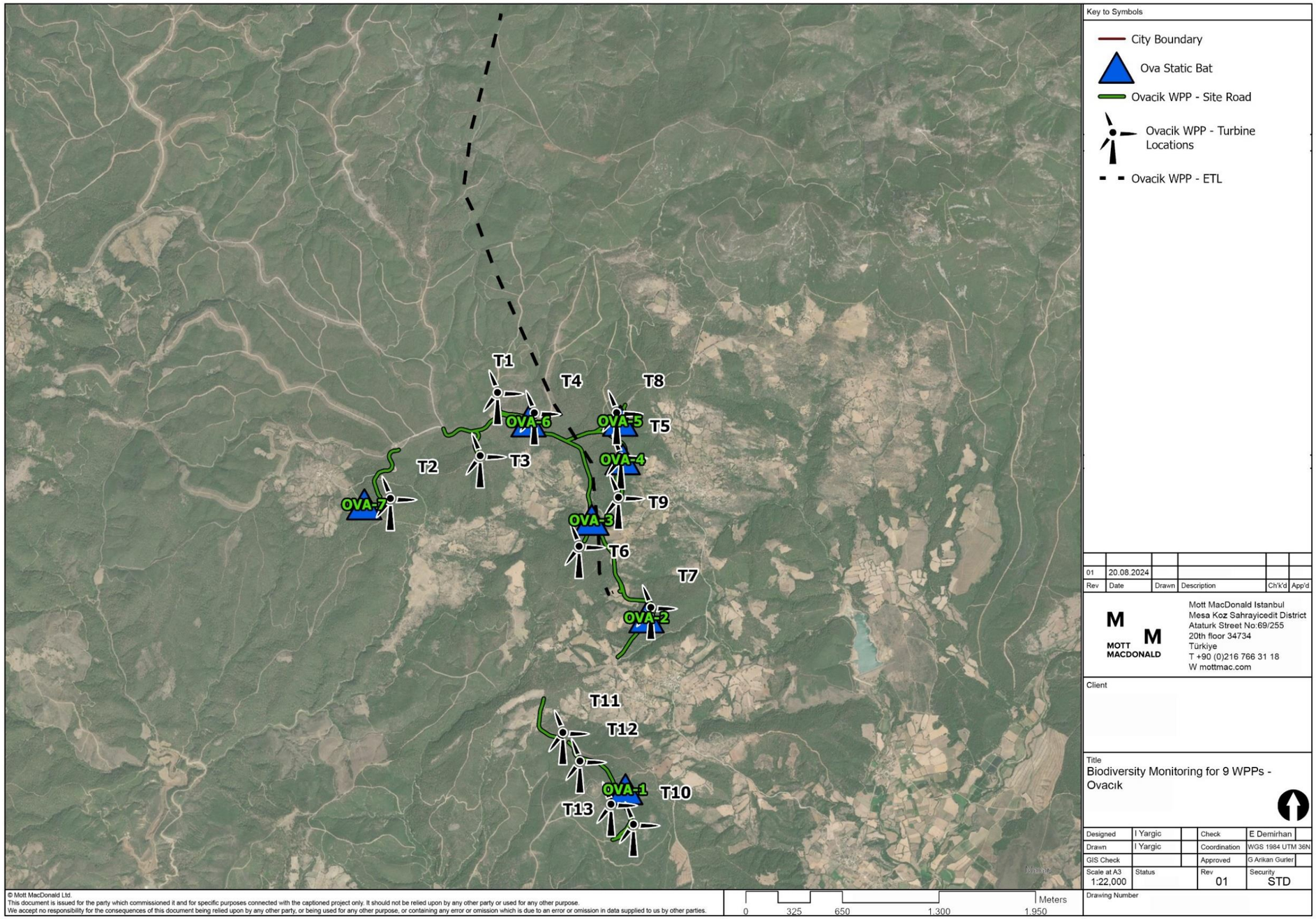


Figure 3-8 Ground static bat detector locations

4 Results

4.1 Flora

4.1.1 Biga Mountains and Çanakkale Strait Key Biodiversity Areas

The direct footprint of the Ovacık Wind Power Plant (WPP), including access roads and the ETL, is not situated within any legally protected or internationally recognized area. However, the Area of Influence partially overlaps with the Biga Mountains KBA[5], and Çanakkale Strait KBA[6].

Table 4-1 lists the plant species identified within the Biga Mountains KBA. According to the Çanakkale Strait KBA database, no plant species with KBA triggers are present in the area. KBAs are internationally recognised areas that currently do not have legal protection in Türkiye but are widely used for various conservation aims. Biga Mountains KBA does not have any national protection status.

During the previous field survey conducted within the Project area, *Crocus candidus* was observed, and further identification of this species was supported by relevant findings from literature studies[7]. The *Crocus candidus* is assessed as Vulnerable (VU) according to the Turkish Red Data Book (TRDB) and is classified as a regional endemic species.

Table 4-1 KBA Flora Species

Family	Species	Observation Status
AMARYLLIDACEAE	*Galanthus trojanus* A.P.Davis & Özhatay	Not observed
IRIDACEAE	*Crocus candidus* E.D.Clarke	Not observed in 2024

4.1.2 Habitat Types

The classification of habitat types within terrestrial and freshwater ecosystems was carried out using the European Nature Information System (EUNIS) 2012 Habitat Classification.

The recorded habitats are listed in the Table 4-2 below, along with their wide distribution areas within the study area shown on Figure 4-1. The amount of habitat lost due to roads, turbine footprints and switchyard area are given in Table 4-3 through Table 4-7.

Table 4-2 Habitat Types of the Project AoI

Broad habitat type	EUNIS Habitat Type	Extend within AoI (ha)	Percentage (%)
Inland surface waters	C2.3 Permanent non-tidal, smooth-flowing watercourses	57.14134	0.2%
Woodland	G1.7 Termophilus deciduous woodland	155.442	0.7%
	G3.7 *Pinus brutia* woodland	13759.06	60.1%
	G3.F Plantation (*P.brutia*)	793.7173	3.5%
Maquis	F5.2 Maquis	219.0202	1.0%

[5] https://www.keybiodiversityareas.org/site/factsheet/28338
[6] https://www.keybiodiversityareas.org/site/factsheet/28345
[7] https://www.keybiodiversityareas.org/site/factsheet/28338

Constructed, industrial and other artificial habitats	J2.2 Rural public buildings	405.7745	1.8%
	J5.3 Highly artificial non-saline standing water	69.20728	0.3%
Agricultural	I1.1 Intensive unmixed crops	7429.924	32.5%

Table 4-3 Habitat Loss on Access Roads

EUNIS	Area (ha)	Percentage
G1.7 Termophilus deciduous woodland	24.86644835	0.18%
G3.7 Pinus brutia woodland	2.705795871	0.34%
G3.F Plantation (P.brutia)	6.631280838	0.09%
J2.2 Rural public buildings	0.098430299	0.02%

Table 4-4 Habitat Loss on Site Roads

EUNIS	Area (ha)	Percentage
G1.7 Termophilus deciduous woodland	0.09	0.0575%
G3.7 Pinus brutia woodland	11.00	0.0800%
G3.F Plantation (P.brutia)	1.92	0.2419%
I1.1 Intensive unmixed crops	1.47	0.0198%
Total	**14.48**	

Table 4-5 Habitat Loss on Turbine Footprint

EUNIS	Area (ha)	Percentage
G1.7 Termophilus deciduous woodland	1.52	0.9749%
G3.7 Pinus brutia woodland	13.04	0.0948%
G3.F Plantation (P.brutia)	5.14	0.6481%
I1.1 Intensive unmixed crops	0.00	0.0000%
Total	**19.70**	

Table 4-6 Habitat Loss on Switchyard Area

EUNIS	Area (ha)	Percentage
G1.7 Termophilus deciduous woodland	0.000	0.0000%
G3.7 Pinus brutia woodland	0.000	0.0000%
G3.F Plantation (P.brutia)	0.0127	0.0016%
I1.1 Intensive unmixed crops	1.3526	0.0182%
Total	**1.3653**	

Table 4-7 Habitat Loss on ETL

EUNIS	Area (ha)	Percentage
G3.7 Pinus brutia woodland	128.5982	0.93%
C2.3 Permanent non-tidal, smooth-flowing watercourses	31.35323	54.87%
G1.7 Termophilus deciduous woodland	34.79968	22.39%
G3.F Plantation (P.brutia)	19.56718	2.47%
I1.1 Intensive unmixed crops	88.06555	1.19%
Total	**302.3839**	

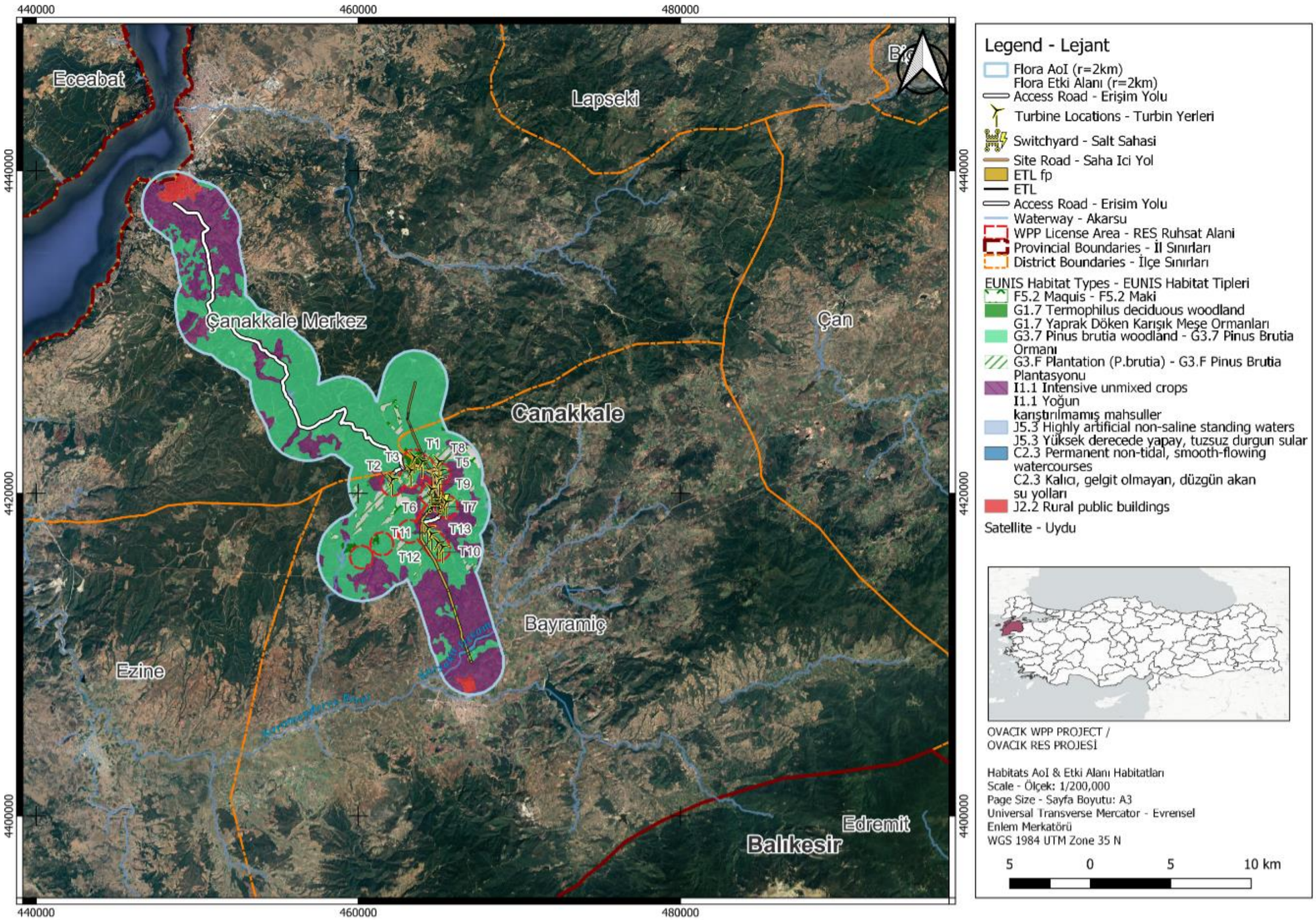


Figure 4-1 EUNIS Habitat Classification of Ovacık WPP Area of Influence

4.1.3 Floristic Analyses

The most common vegetation type in the Project area is red pine (*Pinus brutia*) forests. While *Pinus brutia* forests form the upper layer, *Quercus infectoria, Erica arborea, Juniperus oxycedrus, Cistus creticus, Cistus salviifolis* species are distributed in the shrub layer. Termophilus deciduous forests constitutes the second most common vegetation type of the Project area. These forests are quite common in the Marmara and Western Black Sea regions of our country. The characteristic species of vegetation are deciduous oaks. The dominant tree species of this habitat are *Quercus frainetto, Quercus cerris, Quercus infectoria subsp. infectoria*. Additionally, the project area has plantation areas where *Pinus brutia* trees were planted. Since the natural habitat of plantation areas is destroyed red pine forest, many species representing red pine forest habitats are distributed in plantation areas.

As a result of the field studies, 259 plant taxa at the species and subspecies level from 49 families were identified in the Project area. The list of the plant taxa identified in the Project area and its surroundings is provided in Table 4-8.

Table 4-8 Plant Taxa and Threatened Categories Identified in the Project Area of Influence

Family	No	Species	Phytogeographic Region	Endemism		TRDB	Bern	CITES			Habitat					Relative Abundance				
				R	W		App 1	App 1	App 2	App 3	1	2	3	4	5	1	2	3	4	5
ANACARDIACEAE	1	*Pistacia terebinthus* L. subsp. *terebinthus*	Mediterranean										X	X			X			
ARISTOLACHIACEAE	2	*Aristolochia bodamae* Dingler	Euro-Siberia								X						X			
ASTERACEAE	3	*Achillea wilhelmsii* C. Koch	Widespread								X			X			X			
	4	*Anthemis austriaca* Jacq.	Widespread								X						X			
	5	*Anthemis chia* L.	Mediterranean								X			X		X				
	6	*Anthemis cotula* L.	Widespread											X			X			
	7	*Anthemis cretica* subsp. *leucanthemoides* (Boiss.) Grierson Grierson	Widespread								X						X			
	8	*Anthemis tinctoria* L. *var. tinctoria*	Widespread								X	X	X				X			
	9	*Bellis annua* L.	Mediterranean								X	X		X			X			
	10	*Bellis perennis* L.	Mediterranean								X	X		X			X			
	11	*Bellis sylvestris* Cyr.	Widespread									X	X				X			
	12	*Carduus nutans* L. sensu lato	Widespread								X	X		X			X			
	13	*Carlina vulgaris* L.	Widespread									X					X			
	14	*Carthamus lanatus* L.	Widespread								X			X			X			
	15	*Centaurea cyanus* L.	Widespread								X	X	X				X			
	16	*Centaurea solstitialis* L. subsp. *solstitialis*	Widespread								X						X			
	17	*Centaurea urvillei* DC. subsp. *stepposa* Wagenitz	Irano-Turanian								X			X			X			
	18	*Centaurea virgata* Lam.	Widespread								X		X				X			
	19	*Cichorium intybus* L.	Widespread								X			X			X			
	20	*Chondrilla juncea* L. var. *juncea*	Widespread								X			X			X			
	21	*Cirsium vulgare* (Savi) Ten.	Widespread								X						X			
	22	*Conyza canadensis* (L.) Cronquist	Widespread								X		X	X			X			
	23	*Crepis alpina* L.	Widespread								X	X					X			
	24	*Crepis foetida* L.	Widespread								X	X		X			X			
	25	*Crepis sancta* (L.) Babcock	Widespread								X	X	X	X			X			
	26	*Doronicum orientale* Hoffm.	Widespread								X	X		X			X			
	27	*Echinops ritro* L.	Widespread								X			X			X			
	28	*Filago pyramidata* L.	Mediterranean								X			X			X			
	29	*Helminthotheca echioides* (L.) Holub	Widespread								X	X		X			X			
	30	*Hyphocoeris radicata* L.	Euro-Siberia								X	X	X				X			
	31	*Jurinea mollis* (L.) Reichb	Mediterranean								X			X			X			
	32	*Lactuca serriola* L.	Euro-Siberia								X			X			X			

Family	No	Species	Phytogeographic Region	Endemism		TRDB	Bern	CITES			Habitat					Relative Abundance				
				R	W		App 1	App 1	App 2	App 3	1	2	3	4	5	1	2	3	4	5
	33	*Lapsana communis* L. subsp. *intermedia* (Bieb.) Hayek	Widespread								X	X		X			X			
	34	*Leontodon tuberosus* L.	Mediterranean								X	X	X				X			
	35	*Onopordum illycum* L. var. *carduncul*us Boiss.	Mediterranean								X			X			X			
	36	*Picnomon acarna* (L.) Cass.	Mediterranean								X			X			X			
	37	*Pilosella hoppeana* (Schultes) C.H.& F.W.Schultz	Widespread								X	X		X			X			
	38	*Scariola viminea* (L.) F.W. Schmidt	Widespread								X			X			X			
	39	*Senecio vernalis* Waldst. et Kit	Widespread								X			X			X			
	40	*Senecio vulgaris* L.	Widespread								X		X				X			
	41	*Sonchus asper* (L.) Hill subsp. *glaucescens* (Jordan) Ball.	Widespread								X			X			X			
	42	*Tragopogon longirostris* Bisch. ex Schultz Bip.	Widespread								X			X			X			
	43	*Tripleurospermum oreades* (Boiss.) Rech. Fil. Var. *oreades*	Widespread								X			X			X			
	44	*Tussilago farfara* L.	Euro-Siberia									X					X			
	45	*Xeranthemum annuum* L.	Widespread								X			X			X			
BORAGINACEAE	46	*Buglossoides arvensis* (L.) Johnston	Widespread								X		X				X			
	47	*Echium italicum* L.	Mediterranean								X	X		X			X			
	48	*Heliotropium europaeum* L.	Mediterranean								X						X			
	49	*Myosotis arvensis* L.	Euro-Siberia								X	X		X			X			
	50	*Myosotis refracta* Boiss. subsp. *refracta*	Mediterranean								X	X		X			X			
BRASSICACEAE	51	*Alliaria petiolata* (Bieb.) Cav. & Grande	Widespread								X			X			X			
	52	*Alyssum minutum* Schlecht. ex DC.	Widespread								X	X		X			X			
	53	*Alyssum murale* Waldst. & Kit.	Widespread								X	X	X				X			
	54	*Arabis verna* (L.) DC.	Widespread								X	X		X			X			
	55	*Capsella bursa-pastoris* (L.) Medik.	Widespread								X	X					X			
	56	*Cardamine graeca* L.	Widespread								X			X			X			
	57	*Cardamine hirsuta* L.	Widespread								X		X				X			
	58	*Clypeola jonthlaspi* L.	Widespread								X			X			X			
	59	*Erophila verna* (L.) Chevall. subsp. *verna*	Widespread								X	X					X			
	60	*Erysimum smyrnaeum* Boiss. & Bal.	Widespread								X			X			X			
	61	*Hirschfeldia incana* (L.) Lag.-Foss	Widespread								X						X			

Family	No	Species	Phytogeographic Region	Endemism		TRDB	Bern	CITES			Habitat					Relative Abundance				
				R	W		App 1	App 1	App 2	App 3	1	2	3	4	5	1	2	3	4	5
	62	*Thlaspi perfolatum* L.	Widespread								X			X			X			
CYPERACEAE	63	*Carex divulsa* Stokes ssp. *divulsa*	Euro-Siberia								X	X					X			
CAMPANULACEAE	64	*Legousia pentagonia* (L.) Thellung	Mediterranean								X	X		X			X			
CAPRIFOLIACEAE	65	*Lonicera etrusca* Santi	Mediterranean								X	X		X			X			
CARYOPHYLLACEAE	66	*Arenaria serpyllifolia* L. var *leptoclados* Reichb.	Widespread								X	X					X			
	67	*Cerastium gracile* Duf.	Widespread								X	X		X			X			
	68	*Cerastium illyricum* Ard. subsp. *comatum* (Pesv.) P.D.Seel & Whitehead	Mediterranean								X	X		X			X			
	69	*Dianthus calocephalus* Boiss.	Widespread								X	X					X			
	70	*Moenchia mantica* (L.) Bartl. Subsp. *mantica*	Widespread								X			X			X			
	71	*Petrorhagia velutina velutina* (Guss.) Ball & Heywood	Mediterranean								X	X		X			X			
	72	*Silene italica* (L.) Pers.var. *incana* Gris.	Mediterranean								X	X		X			X			
	73	*Silene vulgaris* (Moench) Garcke var. *vulgaris*	Widespread								X	X		X			X			
	74	*Stellaria media* (L.) Vill.	Widespread								X	X		X			X			
	75	*Velezia rigida* L. var. *fasciculata* (Boiss.) Post.	Mediterranean								X		X				X			
CISTACEAE	76	*Cistus salviifolius* L.	Mediterranean								X			X			X			
	77	*Cistus creticus* L.	Mediterranean								X			X			X			
	78	*Tuberaria guttata* (L.) Fourr. var. *guttata*	Widespread								X		X				X			
CONVOLVULACEAE	79	*Convolvulus arvensis* L.	Widespread								X			X			X			
CRASSULACEAE	80	*Sedum album* L.	Widespread								X		X				X			
	81	*Sedum confertiflorum* Boiss.	Mediterranean								X			X			X			
	82	*Sedum pallidum* Bieb. var. *bithynicum* (Boiss.) Chamberlain	Euro-Siberia								X			X			X			
CUPRESSACEAE	83	*Juniperus oxycedrus* L. ssp. *oxycedrus* L.	Mediterranean								X	X		X			X			
CUSCUTACEAE	84	*Cuscuta australis* R. *subsp. tinei.*	Mediterranean								X		X				X			
CYPERACEAE	85	*Carex panicea* L.	Euro-Siberia								X	X					X			
DIPSACACEAE	86	*Knautia integrifolia* (L.) Bert var. *bidens* (Sm.) Borbas	Mediterranean								X			X			X			
	87	*Pterocephalus plumosus* (L.) Coulter	Widespread								X	X					X			
	88	*Scabiosa argentea* L.	Widespread								X	X		X			X			
ERICACEAE	89	*Erica arborea* L.	Mediterranean								X	X		X				X		

Family	No	Species	Phytogeographic Region	Endemism		TRDB	Bern	CITES			Habitat					Relative Abundance				
				R	W		App 1	App 1	App 2	App 3	1	2	3	4	5	1	2	3	4	5
EUPHORBIACEAE	90	*Euphorbia amygdaloides* L. *var. amygdaloides*	Euro-Siberia								X	X		X				X		
	91	*Euphorbia myrsinites* L.	Widespread								X						X			
	92	*Euphorbia rigida* Bieb.	Mediterranean								X			X			X			
	93	*Mercurialis perennis* L.	Euro-Siberia											X			X			
FABACEAE	94	*Adenocarpus complicatus* (L.) Gay	Widespread										X				X			
	95	*Coronilla parviflora* Willd. var. *luchani* Uhrova	Mediterranean								X			X			X			
	96	*Genista anatolica* Boiss.	Mediterranean									X					X			
	97	*Hippocrepis unisiliquosa* L. subsp. *unisiliquosa*	Mediterranean								X			X			X			
	98	*Hymenocarpus circinnatus* (L.) Savi	Mediterranean								X	X		X			X			
	99	*Lathyrus aphaca* L. var. *affinis* (Guss.) Arc.	Mediterranean								X	X		X			X			
	100	*Lathyrus laxiflorus* (Desf.) O. Kuntze	Widespread								X	X		X			X			
	101	*Lens nigricans* (Bieb.) Godr.	Mediterranean								X	X		X			X			
	102	*Lotus corniculatus* L.var. *corniculatus*	Widespread														X			
	103	*Medicago orbicularis* (L.) All.	Mediterranean								X	X		X			X			
	104	*Medicago sativa* L. subsp. *sativa*	Widespread								X	X		X			X			
	105	*Medicago polymorpha* L. var. *vulgaris* (Benth.) Shinners	Widespread									X					X			
	106	*Ornithopus compressus* L.	Mediterranean								X	X		X			X			
	107	*Trifolium angustifolium* L. var.*angustifolium*	Widespread								X	X		X			X			
	108	*Trifolium arvense* L. var. *arvense*	Widespread								X	X					X			
	109	*Trifolium campestre* Schreb.	Mediterranean								X	X		X			X			
	110	*Trifolium hybridum* L. *var. hybridum*	Widespread								X	X					X			
	111	*Trifolium isthmocarpum* Brot.	Widespread								X	X		X			X			
	112	*Trifolium pratense* L. var. *pratense*	Widespread								X	X		X			X			
	113	*Trifolium repens* L. var. *repens*	Widespread								X	X	X				X			
	114	*Trifolium stellatum* L.	Widespread								X	X		X			X			
	115	*Trifolium uniflorum* L.	Mediterranean								X	X		X			X			
	116	*Vicia cracca* L. subsp. *stenophylla* Vel.	Widespread								X			X			X			
	117	*Vicia hybrida* L.	Mediterranean								X		X				X			
	118	*Vicia narbonensis* L. var. *narbonensis*	Widespread								X	X		X			X			

Family	No	Species	Phytogeographic Region	Endemism		TRDB	Bern	CITES			Habitat					Relative Abundance				
				R	W		App 1	App 1	App 2	App 3	1	2	3	4	5	1	2	3	4	5
FAGACEAE	119	*Quercus cerris* L. var. *cerris*	Mediterranean								X	X		X				X		
	120	*Quercus frainnetto* Ten.	Widespread								X	X		X				X		
	121	*Quercus infectoria* Olivier subsp. *infectoria*	Euro-Siberia								X	X	X						X	
GENTIANACEAE	122	*Centaurium erythraea* Rafn. ssp. *rumelicum* (Velen.) Melderis	Mediterranean								X			X			X			
GERANIACEAE	123	*Erodium ciconium* (L.) L'Herit	Widespread								X			X			X			
	124	*Geranium lucidum* L.	Widespread								X	X					X			
	125	*Geranium purpureum* Vill.	Widespread								X	X	X				X			
	126	*Geranium rotundifolium* L.	Widespread								X	X		X			X			
HYPERICACEAE	127	*Hypericum perforatumn* L.	Widespread								X						X			
HYPOLEPIDACEAE	128	*Pteridium aquilinum* (L.) Kuhn	Widespread								X	X	X				X			
IRIDACEAE	129	***Crocus candidus* E.D. Clarke**	**Mediterranean**	**X**		**VU**					X	X					X			
	130	*Crocus pulchellus* Herbert	Mediterranean								X	X					X			
	131	*Romulea bulbocodium* (L.) Seb.&Mauri	Mediterranean								X						X			
JUNCACEAE	132	*Luzula forsteri* (Sm.) DC.	Euro-Siberia								X	X						X		
	133	*Juncus gerardi* Loisel subsp. *gerardi*	Widespread								X	X		X				X		
LAMIACEAE	134	*Acinos rotundifolius* Pers.	Widespread								X	X					X			
	135	*Clinopodium vulgare* L. *subsp. arundonum* (Boiss.) Nyman	Widespread								X	X					X			
	136	*Lamium amplexicaule* L.	Euro-Siberia								X	X					X			
	137	*Lamium garganicum* L. subsp. *striatum* (Sm.) Hayek var. *striatum*	Mediterranean								X	X					X			
	138	*Lamium purpureum* L. var. *purpureum*	Euro-Siberia								X	X					X			
	139	*Lavandula stoechas* L. subsp. *stoechas*	Mediterranean									X					X			
	140	*Melissa officinalis* L. subsp. *officinalis*	Widespread								X	X					X			
	141	*Micromeria myrtifolia* Boiss. & Hohen	Mediterranean									X					X			
	142	*Origanum vulgare* L. subsp. *hirtum* (Link) Letswaart	Mediterranean								X	X					X			
	143	*Prunella vulgaris* L. var. *laciniata*	Euro-Siberia								X	X					X			
	144	*Salvia tomentosa* Miller	Mediterranean								X	X					X			
	145	*Salvia virgata* Jacq.	Irano-Turanian								X	X					X			
	146	*Teucrium chamaedrys* L. subsp. *chameedrys*	Euro-Siberia								X	X					X			
	147	*Teucrium lamiifolium* d'Urv. Subsp. *lamiifolium*	Widespread								X	X	X	X			X			

Family	No	Species	Phytogeographic Region	Endemism		TRDB	Bern	CITES			Habitat					Relative Abundance				
				R	W		App 1	App 1	App 2	App 3	1	2	3	4	5	1	2	3	4	5
LILIACEAE	148	*Allium paniculatum* L. subsp.*paniculatum*	Mediterranean								X						X			
	149	*Allium scorodoprasum* L. ssp.*rotundum* (L.) Stearn.	Mediterranean								X	X		X			X			
	150	*Asparagus acutifolius* L.	Mediterranean								X	X	X				X			
	151	*Asphodelus aestivus* Brot.	Mediterranean									X		X			X			
	152	*Gagea bohemica* (Zauschn.)Schultes& Schultes fil.	Widespread								X	X					X			
	153	*Ornithogalum nutans* L.	Mediterranean								X	X		X			X			
	154	*Ornithogalum umbellatum* L.	Widespread								X	X					X			
	155	*Muscari neglectum* Guss.	Mediterranean								X	X		X			X			
	156	*Muscari comosum* (L.) Miller	Mediterranean											X			X			
	157	*Ruscus aculeatus L.* var. *angustifolius* Boiss.	Widespread								X	X	X				X			
	158	*Scilla autumnalis* L.	Widespread								X	X		X			X			
	159	*Smilax excelsa* L.	Euro-Siberia								X				X		X			
MALVACEAE	160	*Alcea pallida* Waldst. & Kit.	Widespread								X			X			X			
	161	*Lavatera punctata* All.	Mediterranean								X			X			X			
	162	*Malva sylvestris* L.	Widespread								X		X				X			
OLEACEAE	163	*Jasminum fruticans* L.	Mediterranean								X	X		X			X			
ORCHIDACEAE	164	*Phillyrea latifolia* L.	Mediterranean								X	X						X		
	165	*Limodorum abortivum* (L.) Swartz	Widespread								X	X		X			X			
PAPAVERACEAE	166	*Corydalis integra* Barbey & Major	Widespread								X	X					X			
	167	*Fumaria vaillantii* Lois.	Widespread								X	X		X			X			
	168	*Papaver dubium* L.	Widespread								X		X				X			
	169	*Papaver rhoeas* L.	Widespread								X						X			
PINACEAE	170	*Pinus brutia* Ten.	Mediterranean									X		X						X
PLANTAGINACEAE	171	*Plantago bellardii* All.	Widespread								X						X			
	172	*Plantago coronopus* L. subsp. *coronopus*	Euro-Siberia								X	X	X				X			
	173	*Plantago lagopus* L.	Mediterranean								X	X		X			X			
	174	*Plantago lanceolata* L.	Widespread								X			X			X			
POACEAE	175	*Aegilops triuncialis* L. subsp. *triuncialis*	Widespread								X						X			
	176	*Aegilops umbellulata* Zhuk. subsp. *umbellulata*	Irano-Turanian								X		X				X			
	177	*Agrostis capillaris* L. var. *aristata* (Boiss.) M. Doğan	Euro-Siberia								X	X		X			X			
	178	*Aira elegantissima* Schur subsp. *ambigua* (Arc.) M. Doğan	Widespread								X						X			

Family	No	Species	Phytogeographic Region	Endemism		TRDB	Bern	CITES			Habitat					Relative Abundance				
				R	W		App 1	App 1	App 2	App 3	1	2	3	4	5	1	2	3	4	5
	179	*Alopecurus myosuroides* Hudson var. *myosuroides*	Euro-Siberia								X	X		X			X			
	180	*Brachypodium sylvaticum* (Hudson) P. Beauv	Euro-Siberia								X	X					X			
	181	*Briza maxima* L.	Widespread								X	X	X				X			
	182	*Briza media* L.	Widespread								X	X		X						
	183	*Bromus japonicus* Thunb.subsp. *japonicus*	Widespread								X	X		X			X			
	184	*Bromus squamosus* L. subsp. *noëanus* Boiss. ex Pénzes	Widespread								X	X	X				X			
	185	*Bromus sterilis* L.	Widespread								X	X					X			
	186	*Bromus tectorum* L.	Widespread								X	X		X			X			
	187	*Cynodon dactylon* (L.) Pers.var. *dactylon*	Widespread											X	X		X			
	188	*Cynosurus cristatus* L.	Euro-Siberia								X	X					X			
	189	*Dactylis glomerata* L. subsp. *hispanica* (Roth) Nyman	Mediterranean								X	X	X				X			
	190	*Festuca valesiaca* Schleicher ex Gaudin	Widespread								X	X					X			
	191	*Hordeum bulbosum* L.	Widespread								X	X		X			X			
	192	*Hordeum murinum* L. subsp. *leporinum* (Link) Arc.	Mediterranean								X	X					X			
	193	*Lolium rigidum* Gaudin var.	Mediterranean								X	X	X				X			
	194	*Milium vernale* Bieb. Subsp. *vernale*	Mediterranean								X		X	X			X			
	195	*Piptatherum coerulescens* (Desv.) P. Beauv.	Widespread								X	X	X				X			
	196	*Poa annua* L.	Widespread								X						X			
	197	*Poa bulbosa* L.subsp. *timeolontis* (Boiss.) Hayek	Widespread								X	X	X	X			X			
	198	*Stipa bromoides* (L.) Dörfler	Mediterranean									X					X			
	199	*Taeniatherum caput-medusae* (L.) Nevski subsp.*crinitum* (Schreber) Melderis	Irano-Turanian								X			X			X			
	200	*Trachynia distachya* (L.) Link	Mediterranean								X	X	X				X			
	201	*Vulpia ciliata* Dumort subsp. *ciliata*	Widespread									X					X			
POLYGONACEAE	202	*Polygonum bellardii* All.	Widespread								X			X			X			
	203	*Rumex acetosella* L.	Widespread								X	X					X			
	204	*Rumex tuberosus* L. subsp. *tuberosus*	Widespread								X	X		X			X			
PRIMULACEAE	205	*Anagallis arvensis L.var. arvensis*	Widespread								X						X			

Family	No	Species	Phytogeographic Region	Endemism		TRDB	Bern	CITES			Habitat					Relative Abundance				
				R	W		App 1	App 1	App 2	App 3	1	2	3	4	5	1	2	3	4	5
	206	*Androsace maxima* L.	Widespread								X			X			X			
RANUNCULACEAE	207	*Ceratocephalus falcatus* (L.) Pers.	Widespread								X		X				X			
	208	*Clematis vitalba* L.	Widespread									X					X			
	209	*Nigella arvensis* L. var. *involucrata* Boiss.	Widespread								X		X				X			
	210	*Ranunculus arvensis* L.	Mediterranean								X						X			
	211	*Ranunculus constantinopolitanus* (DC.) d'Urv.	Widespread											X			X			
	212	*Ranunculus ficaria* L. subsp. *ficariiformis* Rouy & Fouc.	Widespread								X	X	X				X			
	213	*Ranunculus illyricus* L. subsp. *illyricus*	Widespread								X	X					X			
	214	*Ranunculus marginatus* d'Urv. subsp. *trachycarpos* (Fisch. & Mey.) Azn.	Widespread								X		X				X			
RESEDACEAE	215	*Reseda lutea* L. var. *lutea*	Widespread								X						X			
RHAMNACEAE	216	*Paliurus spina-christi* Miller	Widespread											X			X			
ROSACEAE	217	*Agrimonia eupatoria* L.	Widespread								X		X				X			
	218	*Crataegus monogyna* Jacq. Subsp. *monogyna*	Widespread												X		X			
	219	*Geum urbanum* L.	Euro-Siberia								X	X					X			
	220	*Potentilla micrantha* Ramond ex DC	Widespread								X	X		X			X			
	221	*Potentilla recta* L.	Widespread								X	X					X			
	222	*Potentilla reptans* L.	Widespread								X	X					X			
	223	*Prunus divaricata* Ledeb. subsp. *divaricata*	Widespread								X			X			X			
	224	*Pyrus elaeagnifolia* Pallas subsp. *elaeagnifolia*	Widespread								X	X		X			X			
	225	*Rosa canina* L.	Widespread								X	X					X			
	226	*Rubus sanctus* Schreber	Mediterranean									X					X			
	227	*Sanguisorba minor* Scop. subsp. *muricata* (Spach)Brig	Widespread								X			X			X			
RUBIACEAE	228	*Asperula involucrata* Wahlenb	Euro-Siberia								X	X					X			
	229	*Crucianella angustifolia* L.	Mediterranean								X	X	X				X			
	230	*Cruciata taurica* (Pallas ex Willd.) Ehrend.	Irano-Turanian								X	X		X			X			
	231	*Galium paschale* Forsskal	Mediterranean								X	X					X			
	232	*Galium spurium* L. subsp. *spurium*	Euro-Siberia								X		X				X			
	233	*Sherardia arvensis* L.	Mediterranean								X	X					X			
SANTALACEAE	234	*Osyris alba* L.	Mediterranean								X	X		X			X			

Family	No	Species	Phytogeographic Region	Endemism		TRDB	Bern	CITES			Habitat					Relative Abundance				
				R	W		App 1	App 1	App 2	App 3	1	2	3	4	5	1	2	3	4	5
SCROPHULARIACEAE	235	*Bellardia trixago* (L.) All.	Mediterranean								X	X					X			
	236	*Kickxia elatine* (L.) Dumort *subsp. crinita* (Mabille) Greuter	Mediterranean								X		X	X			X			
	237	*Linaria pelisseriana* (L.) Miller	Mediterranean								X						X			
	238	*Parentucellia latifolia* (L.) Caruel subsp. *latifolia*	Mediterranean								X		X				X			
	239	*Veronica chamaedrys* L.	Euro-Siberia								X	X		X			X			
	240	*Veronica cymbalaria* Bodard	Mediterranean								X	X					X			
	241	*Veronica hederifolia* L. subsp. *triloba (*Opiz) Celak.	Widespread								X						X			
STYRACACEAE	242	*Styrax officinalis* L.	Widespread								X	X		X			X			
APIACEAE	243	*Anthriscus nemorosa* (Bieb.) Sprengel	Widespread								X						X			
	244	*Caucalis platycarpos* L.	Mediterranean								X		X				X			
	245	*Conium maculatum* L.	Widespread								X	X					X			
	246	*Daucus carota* L.	Widespread											X			X			
	247	*Eryngium campestre* L. var. *campestre*	Widespread								X						X			
	248	*Lagoecia cuminoides* L.	Mediterranean								X			X			X			
	249	*Myrrhoides nodosa* (L.) Cannon	Widespread								X	X					X			
	250	*Oenanthe pimpinelloides* L.	Widespread								X	X		X			X			
	251	*Oenanthe silaifolia* Bieb.	Widespread								X	X	X				X			
	252	*Scandix australis* subsp. *grandiflora* (L.) Thell.	Widespread								X			X			X			
	253	*Torilis arvensis* (Huds.) Link subsp. *elongata* (Hoffmanns. & Link) Cannon	Mediterranean								X						X			
URTICACEAE	254	*Urtica dioica* L.	Widespread								X	X					X			
	255	*Urtica pilulifera* L.	Mediterranean								X	X					X			
VALERIANACEAE	256	*Valerianella carinata* Lois.	Widespread								X						X			
	257	*Valeriana dioscoridis* Sm	Mediterranean								X	X					X			
VIOLACEAE	258	*Viola sieheana* Becker	Widespread								X	X					X			
	259	*Viola occulta* Lehm.	Widespread								X						X			

Relative abundance: 1: Very Rare, 2: Rare, 3: Moderately Abundant 4: Abundant 5: Very Abundant

Endemism: **R**: Regional **W**: Widespread

TRDB: Turkish Red Data Book: Cr: Critically Endangered, En: Endangered, VU: Vulnerable, NT: Near Threatened, LC: Least Concern

Habitat Classification:

1: G1.7: Thermophilous deciduous woodland

2: G3.7: Lowland to montane mediterranean *Pinus* woodland (excluding black pine *Pinus nigra*)

3: G3.F: Highly artificial coniferous plantations

4: F5.2: Maquis

Family	No	Species	Phytogeographic Region	Endemism		TRDB	Bern	CITES			Habitat					Relative Abundance				
				R	W		App 1	App 1	App 2	App 3	1	2	3	4	5	1	2	3	4	5
5: I1.1: Intensive unmixed crops																				

4.1.4 Status of Plants in Terms of Threatened Category and Endemism

There is no data different from which was identified in the local EIA process for the ETL and access road, and no endangered plant species are present in these locations.

Crocus candidus is a regional endemic species, occurring in the provinces of Çanakkale and Balıkesir within Türkiye. As the population status within its distribution areas remains relatively stable, the species is classified under the TRDB Threatened category as "VU: Vulnerable." (Table 4-9 and Figure 4-2).

A KBA Trigger species recorded as "observed" in previous project data and was specified as a target species for 2024 studies, however it was removed from the PBF list due to its distance from the project footprint in Project CHA. When Mott MacDonald was commissioned for the 2024 supplementary baseline studies, the optimal season for detecting this species had already passed. Consequently, although the species was not directly observed in the field, habitats were assessed for their suitability for the species. The location specified for the studies prior to 2024 is not impacted by the project footprint. Therefore, it was concluded that there will be no direct loss of individuals due to the project. Suitable habitats for the species are extensive in the region. It is likely that the species will be detected in other areas within the project impact zone in the coming years. Suitable habitats for this species are indicated in the Table 4-8.

Table 4-9 The endemic species in the Project area of Influence and their coordinates

Taxon	National Red List Category	Bern	Coordinates
Regional Endemic Species			
Crocus candidus	VU	-	35 S 461442N 4416854 D

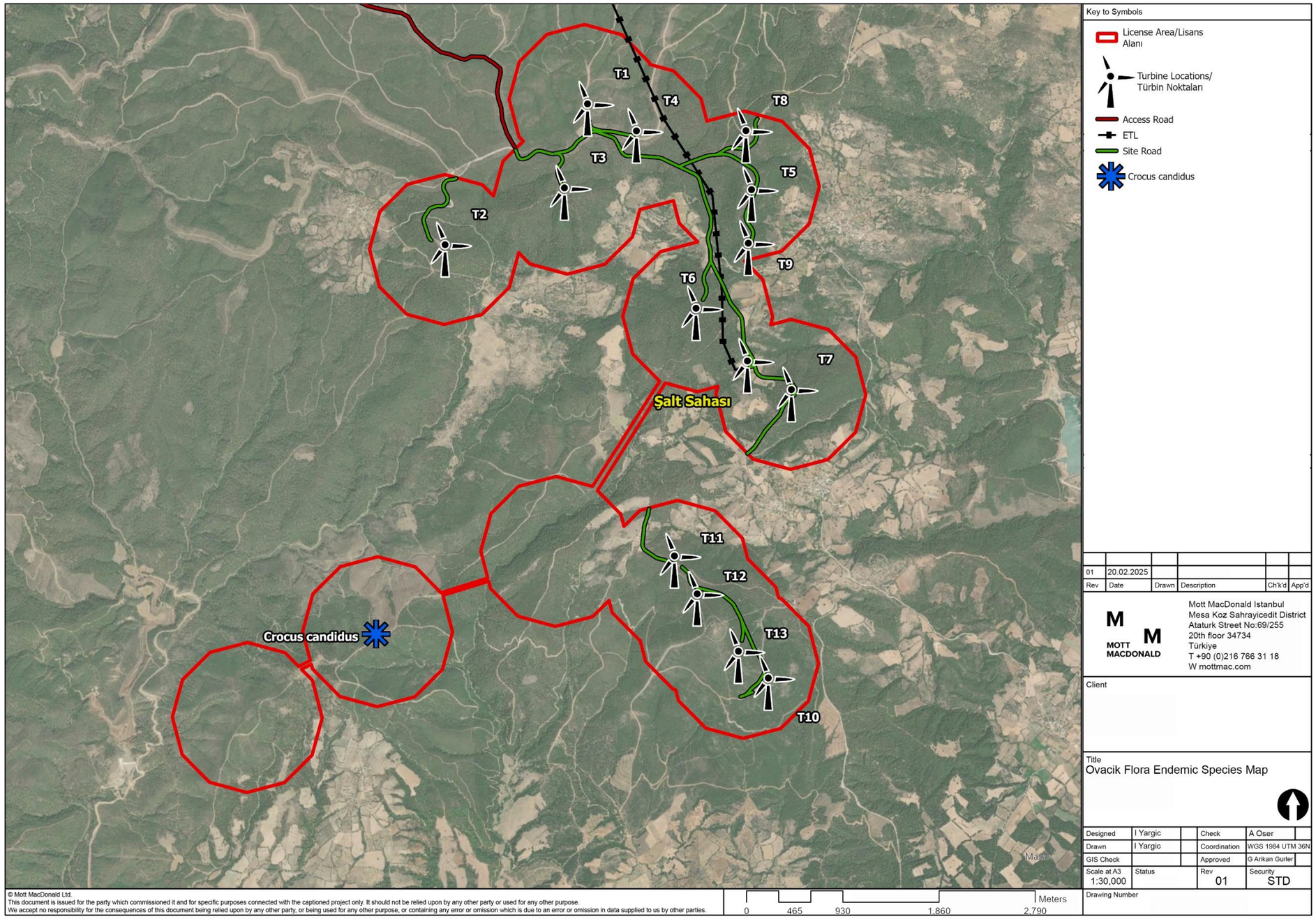


Figure 4-2 Endemic Flora Species Location Map

4.2 Terrestrial Mammal

4.2.1 Biga Mountains and Çanakkale Strait Key Biodiversity Area

The KBA (Key Biodiversity Area) report for the Biga Mountains, along with the online databases and resources reviewed, does not provide specific information regarding the presence of mammal species relevant to the KBA in the region.

According to the Çanakkale Strait KBA database[8], there is one terrestrial mammal species within the area that does not trigger KBA criteria (See Table 4-10).

Mouse-tailed dormouse (*Myomimus roachi*) (VU) was not observed in the field, it was identified as a species which would use the habitat at the Project area (especially the old trees) by the local mammal expert, and it has been recorded as literature data.

Table 4-10 Other species not triggering KBA criteria

Family	Species	English Name	Observation Status
GLIRIDAE	*Myomimus roachi*	Roach's Mouse-tailed Dormouse	Not observed

4.2.2 Mammals Surveys

The same data as provided in the ESIA regarding terrestrial mammals has been obtained. A total of 29 mammal species from 13 families were identified within the Project Area of Influence through a combination of field studies, and literature reviews. Among these species, 8 were directly observed during fieldwork, and 21 were identified through a review of existing literature (Table 4-11). There is no endemic mammal species among the identified species.

Among the mammal species identified in the Project Area of Influence, 4 species are listed in Annex II of the Bern Convention, 11 species in Annex III, and 3 species in Annex II of CITES. According to the IUCN Red List, no species in the area is classified as endangered, with 2 species categorized as Vulnerable (VU). The remaining species are classified as Least Concern (LC), indicating they are not currently at significant risk of extinction.

Roe deer (*Capreolus capreolus)* (LC), which is distributed in very few places in the Mediterranean and Aegean Regio. It has been recorded as literature data in field and survey studies. This species is under immense hunting pressure in the Canakkale province. Although its status is Least Concern, this species is considered to have national importance.

Mouse-tailed dormouse (*Myomimus roachi*) (VU) was not observed in the field, it was identified as a species which would use the habitat at the Project area (especially the old trees) by the local mammal expert. Mouse-tailed dormouse has been recorded as literature data.

Marbled polecat (*Vormela peregusna*) is Vulnerable (VU). Its habitat preference (open land, arid, steppe areas) does not majorly overlap with the habitat characteristics of the Project area (forest and forest clearings) but it could be a rare occurrence here. Marbled polecat has been recorded as literature data.

Brown bear (*Ursus arctos*) is Least Concern (LC) globally and in Europe, but Vulnerable in the Mediterranean. According to local mammal expert the species would be expected to occur at the site sporadically. Brown bear has been recorded as literature data.

[8] https://www.keybiodiversityareas.org/site/factsheet/28345

Table 4-11 Terrestrial Mammals Taxa and Threatened Categories Identified in the Project Area of Influence

Family	Species Name	English Name	Endemism	IUCN	BERN	CITES	Monitoring Criteria	Observation / Literature
Erinaceidae	*Erinaceus concolor*	Southern White-breasted Hedgehog	-	LC		-	-	L / O
Soricidae	*Neomys anomalus*	Southern Water Shrew	-	LC	Ann -III	-	-	L
Soricidae	*Crocidura suaveolens*	Lesser White-toothed Shrew	-	LC	Ann -II	-	-	L
Soricidae	*Crocidura leucodon*	Bicolored Shrew	-	LC	Ann -III	-	-	L
Talpidae	*Talpa levantis*	Levantine Mole	-	LC		-	-	L
Leporidae	*Lepus europaeus*	European Hare	-	LC		-	-	L / O
Sciuridae	*Sciurus anomalus*	Caucasian Squirrel	-	LC	Ann -III	-	-	L / O
Muridae	*Microtus hartingi*	Harting's Vole	-	LC	-	-	-	L
Muridae	*Microtus mystacinus*	East European Vole	-	LC	-	-	-	L
Muridae	*Cricetulus migratorius*	Grey Dwarf Hamster	-	LC	-	-	-	L
Muridae	*Apodemus mystacinus*	Broad-toothed Field Mouse	-	LC	-	-	-	L / O
Muridae	*Apodemus flavicollis*	Yellow-necked Field Mouse	-	LC	-	-	-	L
Muridae	*Apodemus witherbyi*	Steppe Field Mouse	-	LC	-	-	-	L
Muridae	*Mus domesticus*	House Mouse	-	LC	-	-	-	L / O
Muridae	*Mus macedonicus*	Macedonian Mouse	-	LC	-	-	-	L
Muridae	*Rattus rattus*	Black Rat	-	LC	-	-	-	L
Gliridae	*Dryomys nitedula*	Forest Dormouse	-	LC	Ann -III	-	-	L
Gliridae	*Myomimus roachi*	Roach's Mouse-tailed Dormouse	-	VU	Ann -II	-		L
Canidae	*Canis aureus*	Golden Jackal	-	LC	-	Ann -III	-	L
Canidae	*Canis lupus*	Grey Wolf	-	LC	Ann -II	Ann -I	-	L
Canidae	*Vulpes vulpes*	Red Fox	-	LC	-	Ann III	-	L / O
Ursidae	*Ursus arctos*	Brown Bear	-	LC	Ann -III	Ann -II	-	L
Mustelidae	*Mustela nivalis*	Least Weasel	-	LC	Ann -III	-	-	L / O

Mustelidae	*Martes foina*	Beech Marten	-	LC	Ann -III	-	-	L
Mustelidae	*Vormela peregusna*	Marbled Polecat	-	VU	Ann -III	-	-	L
Mustelidae	*Meles meles*	European Badger	-	LC	Ann -III	-	-	L
Felidae	*Felis silvestris*	Wildcat	-	LC	Ann -II	Ann-II	-	L
Suidae	*Sus scrofa*	Boar	-	LC	-	-	-	L / O
Cervidae	*Capreolus capreolus*	Roe Deer	-	LC	-	-	-	L

4.3 Herpetofauna

4.3.1 Biga Mountains and Çanakkale Strait Key Biodiversity Area

The KBA (Key Biodiversity Area) report for the Biga Mountains, along with the online databases and resources reviewed, does not provide specific information regarding the presence of herpetofauna species relevant to the KBA in the region.

According to the Çanakkale Strait KBA database[9], there is one reptile mammal species within the area that does not trigger KBA criteria (Table 4-12). Common tortoise (*Testudo graeca*) is Vulnerable (VU) and was observed in the field studies.

Table 4-12 Other species not triggering KBA criteria

Family	Species	English Name	Observation Status
TESTUDINIDAE	*Testudo graeca*	Common tortoise	Not observed

4.3.2 Amphibia

The similar data as provided in the ESIA regarding amphibia has been obtained. A total of 7 herpetofauna species from 5 families were identified within the Project Area of Influence through a combination of field studies, literature reviews, and survey interviews. Among these species, 2 were directly observed during fieldwork, and 5 were identified through a thorough review of existing literature. (See Table 4-13).

There is no endemic amphibia species among the identified species.

Among the amphibia species identified in the Project Area of Influence, 3 species are listed in Annex II of the Bern Convention, 4 species in Annex III. According to the IUCN Red List, no species in the area are classified as endangered. All species are classified as Least Concern (LC), indicating they are not currently at significant risk of extinction. According to the CITES Convention, none of the nine species are listed in the annexes.

During the field surveys, no permanent aquatic habitats, such as ponds, were identified within the project area. However, irrigation channels resulting from excessive agricultural watering were present in the surrounding farmlands, and the recorded species were observed in association with these temporary water sources.

4.3.3 Reptilia

The similar data as provided in the ESIA regarding Reptilia has been obtained. A total of 24 Reptilia species from 10 families were identified within the Project Area of Influence through a combination of field studies, literature reviews, and survey interviews. Among these species, 5 were directly observed during fieldwork, and 20 were identified through a thorough review of existing literature. (See Table 4-14)

There is no endemic reptile species among the identified species.

Among the Reptilia species identified in the Project Area of Influence, 12 species are listed in Annex II of the Bern Convention, 13 species in Annex III. According to the IUCN Red List, no species in the area are classified as endangered.

[9] https://www.keybiodiversityareas.org/site/factsheet/28345

With the exception of one species, the remaining species are categorized as Least Concern (LC) by the IUCN, signifying that they are not presently at a significant risk of extinction. One species, *Testudo graeca*, is classified as Vulnerable (VU) under IUCN criteria and is also listed in CITES Annex II. Furthermore, according to the CITES Convention, only one of the 24 species is included in its annexes.

Table 4-13 Amphibia Taxa and Threatened Categories Identified in the Project Area of Influence

Family	Species Name	English Name	Endemism	IUCN	BERN	CITES	Monitoring Criteria	Observation / Literature
Salamandridae	*Lissotriton schmidtleri*	Schmidtler's Smooth Newt	-	LC	Ann -III	-	-	L
Salamandridae	*Triturus ivanbureschi*	Buresch's Crested New	-	LC	Ann -II	-	-	L
Bufonidae	*Bufo bufo*	Common Toad	-	LC	Ann-III	-	-	L / O
Bufonidae	*Bufotes viridis*	European Green Toad	-	LC	Ann -II	-	-	L / O
Hylidae	*Hyla orientalis*	Eastern Tree Frog	-	LC	Ann -III	-	-	L
Pelobatidae	*Pelobates syriacus*	Eastern Spadefoot	-	LC	Ann -II	-	-	L
Ranidae	*Pelophylax bedriagae*	Levant Water Frog	-	LC	Ann -III	-	-	L

Table 4-14 Reptilia Taxa and Threatened Categories Identified in the Project Area of Influence

Family	Species Name	English Name	Endemism	IUCN	BERN	CITES	Monitoring Criteria	Observation / Literature
Testudinidae	*Testudo graeca*	Common Tortoise	-	VU	Ann -II	Ann -II	X	L
Gekkonidae	*Hemidactylus turcicus*	Mediterranean House Gecko	-	LC	Ann -III	-	-	L
Agamidae	*Stellagama stellio*	Starred Agama	-	LC	Ann -II	-	-	O / L
Anguidae	*Pseudopus apodus*	Sheltopusik	-	LC	Ann -II	-	-	L
Scincidae	*Ablepharus kitaibelii*	European Copper Skink	-	LC	Ann -II	-	-	L
Scincidae	*Heremites auratus*	Levant Skink	-	LC	Ann -III	-	-	L
Lacertidae	*Lacerta diplochondrodes*	Rhodos Green Lizard	-	LC	Ann -II	-	-	L
Lacertidae	*Lacerta viridis*	The European Green Lizard	-	LC	Ann -II	-	-	L
Lacertidae	*Ophisops elegans*	Snake-Eyed Lizard	-	LC	Ann -II	-	-	O / L
Lacertidae	*Podarcis muralis*	Common Wall Lizard	-	LC	Ann -II	-	-	L
Boidae	*Eryx jaculus*	Javelin Sand Boa	-	LC	Ann -III	-	-	L
Colubridae	*Coronella austriaca*	Smooth Snake	-	LC	Ann -III	-	-	L
Colubridae	*Dolichophis caspius*	Caspian Whipsnake	-	LC	Ann -III	-	-	O / L
Colubridae	*Eirenis modestus*	Ring-Headed Dwarf Snake	-	LC	Ann -III	-	-	L
Colubridae	*Elaphe sauromates*	Eastern Four-Lined Ratsnake	-	LC	Ann -III	-	-	L
Colubridae	*Hemorrhois nummifer*	Coin-Marked Snake	-	LC	Ann -III	-	-	L
Colubridae	*Malpolon insignitus*	Eastern Montpellier Snake	-	LC	Ann -III	-	-	L
Colubridae	*Platyceps najadum*	Dahl's Whip Snake	-	LC	Ann -II	-	-	L
Colubridae	*Platyceps collaris*	Red Whip Snake	-	LC	Ann -III	-	-	L
Colubridae	*Telescopus fallax*	Cat Snake	-	LC	Ann -II	-	-	L
Colubridae	*Zamenis situla*	European Ratsnake	-	LC	Ann -II	-	-	L
Natricidae	*Natrix natrix*	Grass Snake	-	LC	Ann -III	-	-	O / L
Typhlopidae	*Typhlops vermicularis*	Eurasian Blind Snake	-	LC	Ann -III	-	-	L
Viperidae	*Montivipera xanthina*	Ottoman Viper	-	LC	Ann -II	-	-	L

4.4 Bird

4.4.1 Vantage Point Observations

VP methodology records bird “contacts” and the results therefore are expected to feature repeat “contacts” of the same individuals especially for resident species.

Spring

During spring VP surveys, a total of 60 birds were detected at the site (Table 4-15). The most common three species observed were the Common Buzzard (*Buteo buteo*) with 43 contacts, the Short-toed Snake-Eagle (*Circaetus gallicus*) with 7 contacts, and the Eurasian Sparrowhawk (*Accipiter nisus*) with 3 contacts. Residents were more commonly observed than migrants, with 52 resident birds compared to 4 migrants. Among the species observed, no globally threatened species were recorded.

Table 4-15 Total number of soaring migratory and resident bird species observed in spring 2024.

Common Name	Scientific Name	IUCN	Migrant	Resident	Unknown	Total
Common Buzzard	*Buteo buteo*	LC	-	43	-	43
Short-toed Snake-Eagle	*Circaetus gallicus*	LC	-	7	-	7
Eurasian Sparrowhawk	*Accipiter nisus*	LC	3	-	-	3
unidentified Falcon	*Falco spp.*	-	-	-	2	2
unidentified Raptor	*Accipitridae spp.*	-	-	-	2	2
Eurasian Hobby	*Falco subbuteo*	LC	-	1	-	1
Booted Eagle	*Hieraaetus pennatus*	LC	1	1	-	2
Total	-	-	4	52	4	60

During the spring observation period, an average of 37 hours and 28 minutes of surveys were conducted at each vantage point. A total of 4 migrant birds were recorded during this time. The migration rate was determined to be 0.11 birds per hour for the spring migratory season.

Among the birds observed, 36 were reported to fly at risk height (both fly at rotor height and below and 500 m buffer of the project site), (Table 4-16). The most common three species observed were the Common Buzzard (*Buteo buteo*) with 23 contacts, the Short-toed Snake-Eagle (*Circaetus gallicus*) with 6 contacts, and the Eurasian Sparrowhawk (*Accipiter nisus*) with 2 contacts. However, these numbers do not represent unique birds and contain multiple reports of the same bird for residents.

Table 4-16 Resident and migrant bird occurrences at risk zone in spring 2024.

Common Name	Scientific Name	IUCN	Migrant	Resident	Unknown	Total
Common Buzzard	*Buteo buteo*	LC	-	23	-	23
Short-toed Snake-Eagle	*Circaetus gallicus*	LC	-	6	-	6
Eurasian Sparrowhawk	*Accipiter nisus*	LC	2	-	-	2
Booted Eagle	*Hieraaetus pennatus*	LC	1	1	-	2
Eurasian Hobby	*Falco subbuteo*	LC	-	1	-	1
unidentified Falcon	*Falco sp.*	-	-	-	1	1
unidentified Raptor	*Accipitridae spp.*	-	-	-	1	1
Total	-	-	3	31	2	36

Figure 4-3 Eurasian Hobby observed at the project (photo: Muammer Ülker)

Summer

During summer VP surveys, a total of 44 birds were detected at the site. The most frequently encountered species was the Common Buzzard (*Buteo buteo*), with 20 contacts observed, all of which were residents. No threatened species were observed during summer VP surveys. (Table 4-17).

Table 4-17 Total number of soaring migratory and resident bird species observed in summer 2024.

Common Name	Scientific Name	IUCN	Migrant	Resident	Unknown	Total
Common Buzzard	*Buteo buteo*	LC	3	17	-	20
Short-toed Snake-Eagle	*Circaetus gallicus*	LC	-	12	-	12
Eurasian Kestrel	*Falco tinnunculus*	LC	-	3	-	3
Eleonora's Falcon	*Falco eleonorae*	LC	-	2	-	2
Eurasian Hobby	*Falco subbuteo*	LC	-	2	-	2
Eurasian Sparrowhawk	*Accipiter nisus*	LC	1	1	-	2
Eurasian Marsh-Harrier	*Circus aeruginosus*	LC	1	-	-	1
unidentified Falcon	*Falco sp.*	-	-	1	-	1
unidentified Raptor	*Accipitridae sp.*	-	-	-	1	1
Total	-	-	5	38	1	44

During the summer of 2024, a survey averaging approximately 38 hours and 46 minutes was conducted per vantage point. Over this period, 5 birds were identified as a migrant. The migration rate was determined to be 0,13 birds per hour for the summer season. All 5 were recorded during the last week of August.

Among the birds observed, 28 (about 64% of all observed birds) were reported to fly at risk zone (both fly at rotor height and below and 500 m buffer of the project site). The species that most frequently entered the risk zone was Common Buzzard (*Buteo buteo*) with 20 contacts

observed. However, these numbers do not represent unique birds and contain multiple reports of the same bird for residents. (Table 4-18).

Table 4-18 Resident and migrant bird occurrences at risk zone in summer 2024.

Common Name	Scientific Name	IUCN	Migrant	Resident	Unknown	Total
Common Buzzard	*Buteo buteo*	LC	3	11	-	14
Short-toed Snake-Eagle	*Circaetus gallicus*	LC	-	6	-	6
Eurasian Kestrel	*Falco tinnunculus*	LC	-	3	-	3
Eleonora's Falcon	*Falco eleonorae*	LC	-	2	-	2
Eurasian Sparrowhawk	*Accipiter nisus*	LC	-	1	-	1
Eurasian Marsh-Harrier	*Circus aeruginosus*	LC	1	-	-	1
unidentified Raptor	*Accipitridae sp.*	-	-	-	1	1
Total	-	-	4	23	1	28

Autumn

During autumn VP surveys, a total of 44 birds were detected at the site. The most frequently encountered species was the Common Buzzard (*Buteo buteo*), with 15 contacts observed. Other notable species included the Eurasian Sparrowhawk (*Accipiter nisus*) with 14 contacts. No threatened species were observed during autumn VP surveys (Table 4-19).

Table 4-19 Total number of soaring migratory and resident bird species observed in autumn 2024.

Common Name	Scientific Name	IUCN	Migrant	Resident	Unknown	Total
Common Buzzard	*Buteo buteo*	LC	4	11	-	15
Eurasian Sparrowhawk	*Accipiter nisus*	LC	6	7	1	14
European Honey-buzzard	*Pernis apivorus*	LC	7	-	-	7
Short-toed Snake-Eagle	*Circaetus gallicus*	LC	4	-	2	6
unidentified Raptor	*Accipitridae spp.*	-	1	-	1	2
Total	-	-	22	18	4	44

During the autumn of 2024, a survey averaging approximately 38 hours and 39 minutes was conducted per vantage point. Over this period, 22 bird was identified as a migrant. The migration rate was determined to be 0.57 birds per hour for the autumn season.

Among the birds observed, 15 (about 34% of all observed birds) were reported to fly at risk zone (both fly at rotor height and below and 500 m buffer of the project site). The species that most frequently entered the risk zone was Eurasian Sparrowhawk (*Accipiter nisus*). However, these numbers do not represent unique birds and contain multiple reports of the same bird for residents. (Table 4-20).

Table 4-20: Resident and migrant bird occurrences at risk zone in autumn 2024.

Common Name	Scientific Name	IUCN	Migrant	Resident	Unknown	Total
Eurasian Sparrowhawk	*Accipiter nisus*	LC	-	7	-	7
Common Buzzard	*Buteo buteo*	LC	-	5	-	5
Short-toed Snake-Eagle	*Circaetus gallicus*	LC	2	-	-	2
unidentified Raptor	*Accipitridae sp.*	-	-	-	1	1
Total	-	-	2	12	1	15

4.4.2 ETL Observations

Spring

During the spring 2024 surveys at ETL points, a total of 46 birds were detected across various species (Table 4-21). Out of these, 14 birds were observed flying at the height of the transmission lines, placing them at potential risk of collision. The most common species observed was the Common Buzzard (*Buteo* buteo), with 11 of them flying at risk height. VP ETL1 has relatively higher rates of risky passage, however overall counts are considered low.

Table 4-21 Total number of bird species observed at TL points at risk height in spring 2024.

Common Name	Scientific Name	IUCN	VP ETL1	VP ETL2	Total
Common Buzzard	*Buteo buteo*	LC	9	2	11
Eurasian Sparrowhawk	*Accipiter nisus*	LC	2	-	2
Unidentified Raptor	-	-	-	1	1
Total	-	-	11	3	14

Summer

During the Summer 2024 surveys at VP ETL points, a total of 47 birds were detected across various species (Table 4-22). Out of these, 12 birds, which account for approximately 26% of the total, were observed flying at the height of the transmission lines, placing them at potential risk of collision. The most common species observed was the Common Buzzard (*Buteo buteo*), with 12 contacts detected and 4 of them flying at risk height Other notable species is Eurasian Sparrowhawk (*Accipiter nisus*) with 3 contacts observed, all observed at risk height, and the Eleonora's Falcon (*Falco eleonorae*) with 6 contacts, 2 of which were at risk height.

Table 4-22 Total number of bird species observed at VP ETL points at risk height in Summer 2024.

Common Name	Scientific Name	IUCN	VP ETL1	VP ETL2	Total
Common Buzzard	*Buteo buteo*	LC	2	2	4
Eurasian Sparrowhawk	*Accipiter nisus*	LC	3	-	3
Eleonora's Falcon	*Falco eleonorae*	LC	2	-	2
unidentified Falcom	*Falco spp.*	-	2	-	2
unidentified Raptor	*Accipitridae sp.*	-	-	1	1
Total	-	-	9	3	12

With the available data, the bird passages are distributed fairly uniform along the route of the transmission line.

Autumn

During the Autumn 2024 surveys at VP ETL points, a total of 45 birds were detected across various species (Table 4-23). Out of these 10 birds, were observed flying at the height of the transmission lines, placing them at potential risk of collision. The most common species observed was the Eurasian Sparrowhawk (*Accipiter nisus*), 7 of them flying at risk height.

Table 4-23 Total number of bird species observed at VP ETL points at risk height in autumn 2024.

Common Name	Scientific Name	IUCN	VP ETL1	VP ETL2	Total
Eurasian Sparrowhawk	Accipiter nisus	LC	6	1	7
Peregrine Falcon	Falco peregrinus	LC	2	-	2

Common Name	Scientific Name	IUCN	VP ETL1	VP ETL2	Total
Common Buzzard	Buteo buteo	LC	1	-	1
Total	-	-	9	1	10

With the available data, the bird passages are distributed fairly uniform along the route of the transmission line.

Summary

Based on the surveys conducted in spring, summer, and autumn 2024 at the transmission line points (TL1 and TL2), the overall risk of bird collision with the Energy Transmission Lines remains low (Figure 4-4). Although some bird species were observed flying at the height of the transmission lines, the percentage of contacts at potential risk was relatively low for each season.

Table 4-24: Total number of bird species observed across all TL points.

Common Name	Scientific Name	IUCN	VP ETL1	VP ETL2	Total	Total Risk
Common Buzzard	*Buteo buteo*	LC	39	19	58	16
Eurasian Sparrowhawk	*Accipiter nisus*	LC	17	7	24	12
Short-toed Snake-Eagle	*Circaetus gallicus*	LC	12	12	24	-
Eleonora's Falcon	*Falco eleonorae*	LC	10	-	10	2
Unidentified Raptor	*Accipiter spp.*	-	5	4	9	2
Peregrine Falcon	*Falco peregrinus*	LC	4	-	4	2
European Honey-buzzard	*Pernis apivorus*	LC	3	-	3	-
Unidentified Falcon	*Falco spp.*	-	2	-	2	2
Montagu's Harrier	*Circus pygargus*	LC	2	-	2	-
Hen Harrier	*Circus cyaneus*	LC	1	-	1	-
Booted Eagle	*Hieraaetus pennatus*	LC	-	1	1	-
Total			95	43	138	36

Additionally, the observed species are predominantly classified as Least Concern (LC) by the IUCN, indicating that they are not currently facing significant population threats.

Table 4-25: Risk quantification values of each TL point based on passage rates.

Season	VP ETL1	VP ETL2
Spring	0.30	0.07
Summer	0.22	0.07
Autumn	0.23	0.03
Average	0.25	0.06

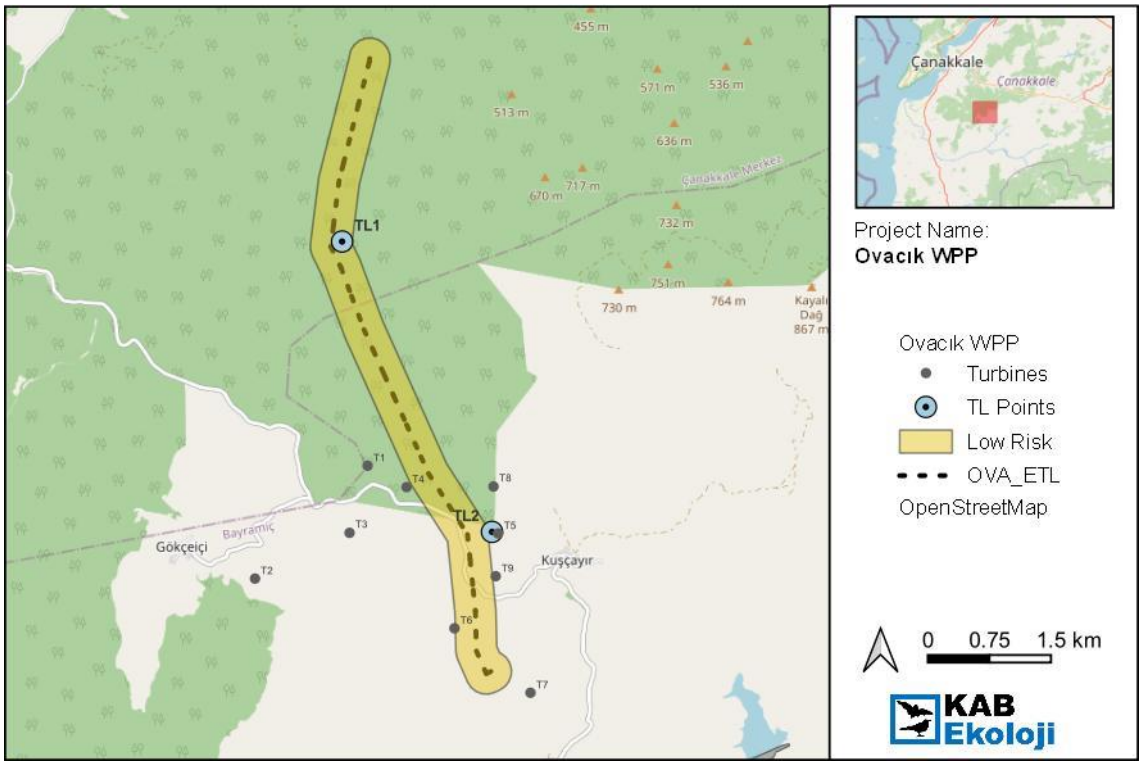


Figure 4-4: ETL segment risk assessment.

4.4.3 Collision Risk Model

For collision risk model, the average time spent at each VP for each season was utilized. It would be the most optimal and would provide the best possible results if the individual VP efforts are very similar. However often in field conditions survey effort at each VP may vary due to logistics, weather, surveyor wellbeing and other circumstances that may arise. While bigger differences in survey effort may degrade the predictive power of the model at locations where target bird species are highly active, where activity is even and at low – moderate levels the model's estimations are not considered significantly.

VP observations, where appropriate, ran in parallel to ETL observations to optimize field survey schedules, if shared VPs were available Similar to the first point, while for busy airspaces (such as major migration routes) this would have a negative impact on study results, at locations lower rates of activity, the two methodologies are compatible and do not detract from survey effort. This is due to NatureScot methodology not involving continuous surveillance of the airspace, but rather surveillance at intervals (every 5 minutes). The two methodologies can be stacked due to the interval observations approach.

Total daylight hours in each season are calculated based on 12 hours for residents and 10 hours for migrants. This is a practice that enhances the predictive power of the model which is backed by studies of migrant behaviour from Istanbul migration counts. Migrant soaring species, relative to their resident counterparts, are mostly inactive before the sun is higher and the thermal air currents are better developed since energy conservation during migration is of critical importance. This behaviour is reflected in the hourly distribution of bird passages in most raptor counts (typically between 09:00 and 17:00). Therefore, 2 hours from daylight are subtracted to reflect migrant active hours in the model. There are one published and two

unpublished reports on the bird migration over the Bosporus, which also features analysis of the hourly distribution of birds.[10][11][12]

Spring

Sample collision risk calculation for migrant species is shown in Table 4-26. Calculation for all species with risk above 0 is shown on Table 4-27.

The data indicates that the collision risk for migrant species during the spring period is negligible.

Table 4-26 Mortality rate calculation for migrant species in detail (spring).

Variable	Value	Unit
Species	Eurasian Sparrowhawk	
Recorded number of birds at risk height/zone	2	birds
Duration of observation	37.46	hr/VP
Study Period	2024-03-01	
	2024-06-15	
Total migration hours	1070	hr
Estimated number of birds at risk height/zone (n)	57	birds
N	13	
width	6817	m
height	180	m
W	1227060	m2
A	194442.6	m2
A/W	0.16	%
n x (A/W)	9.03	birds
P. Probability of bird being hit when flying through the rotor	0.08	
Mortality rate without avoidance	0.76	birds
(1 - avoidance rate)	0.02	
Mortality estimation per year	0.02	birds

Table 4-27 The estimated mortality rates of migrant species in spring 2024 (mort. w/o avo.: mortality without avoidance, mort. w/ avo.: mortality with avoidance)

Common Name	observed	# observed	# thru rotors	Mort. w/o avo.	Mort. w/ avo.
Eurasian Sparrowhawk	2	57	9	1.00	0.02
Booted Eagle	1	29	5	0.00	0.01
Total	3	86	14	1.00	0.03

[10] Üner, Ö., Boyla, K.A., Bacak, E., Birel, E., Çelikoba, İ., Dalyan, C., Tabur, E. & Yardım, Ü. (2006). Spring migration of soaring birds over the Bosphorus, Turkey, in 2006. Sandgrouse 32.

[11] İKGT. (2010). 2010 İstanbul Boğazı Kuş Göçü Sayımları. İstanbul Kuş Gözlem Topluluğu, İstanbul.

[12] Bilgin, S., Boyla, K.A. & Topluluğu, İ.K.G. (2011). İstanbul Boğazı Göçü–İlkbahar 2011. İstanbul Kuş Gözlem Topluluğu, İstanbul.

Sample collision risk calculation for resident species is shown in Table 4-28. Calculation for all species with risk above 0 is shown on Table 4-29.

Table 4-28 Mortality rate calculation for resident species in detail (spring).

Variable	Value	Unit
Species	Common Buzzard	
Total duration of individual bird observations	685.49	sec
Total duration of observations	37.46	hr/VP
Study Period	2024-03-01	
	2024-06-15	
Total migration hours	1284	hr
Estimated total birds x seconds	23495.66	bird x sec
N	13	
Area	8299061	m2
height	180	m
Vw	1493830980	m3
Sweeping Area	196137.1	m2
r	69.3	m
d	4	m
L	0.58	m
Vr = N x πR2 x (d + l)	897327.1	m3
n	23495.66	sec
n x (Vr / Vw)	14.11	sec
v	11.6	m/s
t = (d + l) / v	0.39	sec
n x (Vr / Vw) / t	35.79	birds
Probability of bird being hit when flying through the rotor	0.09	
Mortality rate without avoidance	3.36	birds
(1 - avoidance rate)	0.02	
Mortality estimation for study period	0.07	birds

Table 4-29 The estimated mortality rates of resident species in spring 2024 (mort. w/o avo.: mortality without avoidance, mort. w/ avo.: mortality with avoidance)

Common Name	Total	Total (sec/year)	Occupancy	# passage	Mort. w/o avo.	Mort. w/ avo.
Common Buzzard	685	23496	14	36	3.36	0.07
Short-toed Snake-Eagle	81	2765	2	5	0.42	0.01
Eurasian Hobby	7	253	0	0	0.03	0.00
Booted Eagle	5	186	0	0	0.02	0.00
Total	779	26699	16	41	3.84	0.08

Summer

Sample collision risk calculation for migrant species is shown in Table 4-30. Calculation for all species with risk above 0 is shown on Table 4-31.

The data indicates that the collision risk for migrant species during the spring period is negligible.

Table 4-30 Mortality rate calculation for migrant species in detail (summer).

Variable	Value	Unit
Species	Common Buzzard	
Recorded number of birds at risk height/zone	3	birds
Duration of observation	38.76	hr/VP
Study Period	2024-06-16	
	2024-08-31	
Total migration hours	770	hr
Estimated number of birds at risk height/zone (n)	59.6	birds
N	13	
width	6818	m
height	180	m
W	1227240	m2
A	196137.1	m2
A/W	0.16	%
n x (A/W)	9.52	birds
P. Probability of bird being hit when flying through the rotor	0.09	
Mortality rate without avoidance	0.90	birds
(1 - avoidance rate)	0.02	
Mortality estimation per year	0.02	birds

Table 4-31 The estimated mortality rates of migrant species in summer 2024 (mort. w/o avo.: mortality without avoidance, mort. w/ avo.: mortality with avoidance)

Common Name	observed	# observed	# thru rotors	Mort. w/o avo.	Mort. w/ avo.
Eurasian Sparrowhawk	3	59.6	9.52	0.90	0.02
Levant Sparrowhawk	1	19.87	3.17	0.29	0.01
Total	4	79.46	12.7	1.19	0.03

Sample collision risk calculation for resident species is shown in Table 4-32. Calculation for all species with risk above 0 is shown on Table 4-33.

Table 4-32 Mortality rate calculation for resident species in detail (summer).

Variable	Value	Unit
Species	Common Buzzard	
Total duration of individual bird observations	274.73	sec
Total duration of observations	38.76	hr/VP
Study Period	2024-06-16	
	2024-08-31	
Total migration hours	924	hr
Estimated total birds x seconds	6549.07	bird x sec
N	13	
Area	8299061	m2
height	180	m
Vw	1493830980	m3
Sweeping Area	196137.1	m2

Variable	Value	Unit
r	69.3	m
d	4	m
L	0.58	m
Vr = N x πR2 x (d + l)	897327.1	m3
n	6549.07	sec
n x (Vr / Vw)	3.93	sec
v	11.6	m/s
t = (d + l) / v	0.39	sec
n x (Vr / Vw) / t	9.97	birds
Probability of bird being hit when flying through the rotor	0.09	
Mortality rate without avoidance	0.94	birds
(1 - avoidance rate)	0.02	
Mortality estimation for study period	0.02	birds

Table 4-33 The estimated mortality rates of resident species in summer 2024 (mort. w/o avo.: mortality without avoidance, mort. w/ avo.: mortality with avoidance)

Common Name	Total	Total (sec/year)	Occupancy	# passage	Mort. w/o avo.	Mort. w/ avo.
Common Buzzard	275	6549	4	10	0.94	0.02
Short-toed Snake-Eagle	233	5564	3	10	0.85	0.02
Eurasian Kestrel	163	3875	2	5	0.48	0.01
Eleonora's Falcon	113	2682	2	5	0.35	0.01
Eurasian Sparrowhawk	47	1112	1	2	0.14	0.00
Total	830	19782	12	31	2.75	0.06

Autumn

Sample collision risk calculation for migrant species is shown in Table 4-34. Calculation for all species with risk above 0 is shown on Table 4-35.

The data indicates that the collision risk for migrant species during the spring period is negligible.

Table 4-34 Mortality rate calculation for migrant species in detail (autumn).

Variable	Value	Unit
Species	Short-toed Snake-Eagle	
Recorded number of birds at risk height/zone	2	birds
Duration of observation	38.89	hr/VP
Study Period	2024-09-01	
	2024-11-15	
Total migration hours	760	hr
Estimated number of birds at risk height/zone (n)	39.09	birds
N	13	
width	6818	m
height	180	m
W	1227240	m2
A	196137.1	m2

Variable	Value	Unit
A/W	0.16	%
n x (A/W)	6.25	birds
P. Probability of bird being hit when flying through the rotor	0.09	
Mortality rate without avoidance	0.54	birds
(1 - avoidance rate)	0.02	
Mortality estimation per year	0.01	birds

Table 4-35 The estimated mortality rates of migrant species in autumn 2024 (mort. w/o avo.: mortality without avoidance, mort. w/ avo.: mortality with avoidance)

Common Name	observed	# observed	# thru rotors	Mort. w/o avo.	Mort. w/ avo.
Short-toed Snake-Eagle	2	39.09	6.25	0.54	0.01
Total	2	39.09	6.25	0.54	0.01

Sample collision risk calculation for resident species is shown in Table 4-36. Calculation for all species with risk above 0 is shown on Table 4-37.

Table 4-36 Mortality rate calculation for resident species in detail (autumn).

Variable	Value	Unit
Species	Eurasian Sparrowhawk	
Total duration of individual bird observations	124.92	sec
Total duration of observations	38.89	hr/VP
Study Period	2024-09-01	
	2024-11-15	
Total migration hours	912	hr
Estimated total birds x seconds	2929.66	bird x sec
N	13	
Area	8299061	m2
height	180	m
Vw	1493830980	m3
Sweeping Area	196137.1	m2
r	69.3	m
d	4	m
L	0.35	m
Vr = N x πR2 x (d + l)	853196.3	m3
n	2929.66	sec
n x (Vr / Vw)	1.67	sec
v	11.3	m/s
t = (d + l) / v	0.38	sec
n x (Vr / Vw) / t	4.35	birds
Probability of bird being hit when flying through the rotor	0.08	
Mortality rate without avoidance	0.37	birds
(1 - avoidance rate)	0.02	
Mortality estimation for study period	0.01	birds

Table 4-37 The estimated mortality rates of resident species in autumn 2024 (mort. w/o avo.: mortality without avoidance, mort. w/ avo.: mortality with avoidance)

Common Name	Total	Total (sec/year)	Occupancy	# passage	Mort. w/o avo.	Mort. w/ avo.
Eurasian Sparrowhawk	125	2930	2	4	0.37	0.01
Common Buzzard	116	2720	2	4	0.39	0.01
Total	241	5650	3	8	0.75	0.02

4.4.4 Additive Collision Risk (Project Galeforce)

Since each WPP within the financial package is a project of Project Galeforce consisting of 9 WPPs, the Lenders would like an evaluation of avian collision risks of the package in its entirety. The additive collision risk which is a collation of collision risk estimation results from each project are presented in this section.

It should be noted that this section presents an “additive” collision risk evaluation, not a “cumulative” evaluation. Previously, the Consultant has provided a regional, high-level, qualitative assessment for the Project. In this assessment, the Project’s potential impact on the migratory flyways was considered. Submitted qualitative assessment in ESIA Report for each project’s Chapter 17 was based on Gauld et al (2022) study[13] where collision vulnerability of migratory species is identified which was also restricted by the lack of data for majority of the grids for the regional assessment.

The main limitations regarding a qualitative Cumulative Collision Risk for the Project are (1) WPPs in Türkiye either do not carry out collision risk assessments or mortality studies, or do not carry those up to IFI standards, or if conducted, do not publicly disclose such studies, and this leads to (2) a lack of credible publications on mortality risks for WPPs in Türkiye which the quantitative cumulative assessment for Project Galeforce would have benefitted from in terms of data points.

Furthermore, (3) a regional level Cumulative CRA requires an understanding of how the WPPs in the region might potentially synergize, publications on which are not available from the region either. (4) Due to the vast geographical extent of the Project Galeforce, the variety of terrain and habitats, etc., gathering the data needed for a quantitative cumulative assessment is a high effort and long-term task.

Finally, (5) a cumulative risk assessment of the 9 WPPs would need to include rates associated with ETL collision mortality since those are considered project components, the quantitative data for which is also scarce from the region, and modelling methods, such as those associated with turbine mortality, are not well established in literature. These limitations must be considered if a cumulative collision risk assessment is to be undertaken in the future.

For the additive assessment section of the interim reports, National EIA data was incorporated into the evaluations for the purpose of having as little data gap as possible. However, it was already well established that the National EIA collision risk tables were incomplete on multiple accounts, such as on project or season levels, or had methodological inconsistencies or gaps that challenged robust comparison. Additionally, the risk tables clock almost all mortality estimations at “zero” except for *Buteo buteo* at 0.03 bird/spring season at Dampınar, and Falco tinnunculus at 0.03 birds/spring season for Akköy.

With the completion of the supplementary baseline in 2024 at hand, which was conducted by the same team, applying consistent methodology over 3 seasons across all projects over the same time period, and seeing that the inclusion of National EIA would simply complicate the dataset and dilute the risk estimations, it is more sensible to only consider 2024 results in the final baseline report for 2024 and interim reports for 2024 baseline may be reviewed for a compilation of National EIA results.

An overview of baseline collision risk estimation at each project broken down by resident or migrant status, covering spring, summer and autumn seasons based on 2024 studies are shown in Table 4-38. The results demonstrate that baseline risk over the study period was

[13] Gauld et al (2022). Hotspots in the grid: Avian sensitivity and vulnerability to collision risk from energy infrastructure interactions in Europe and North Africa. Journal of Applied Ecology.

driven mainly by resident activity as opposed to migratory movement over the minor pathways which was a picture that was already emerging at the interim stage.

It is important to note that none of the 2024 surveys account for winter periods. Though activity in winter is expected to be significantly diminished, it is not expected to be non-existent either. Projects located in high altitudes, with extensive precipitation and high winds over the winter are not expected to host significant activity over the winter (e.g. Kestanederesi, potentially) while those projects in lowlands and near important wetlands may indeed receive activity (such as Ihlamur, with anecdotal findings, and Akköy, near a well-known protected wetland for wintering bird species). Therefore, the data from the three seasons was not extrapolated to cover winter (such as substituting an average or a minimum value or applying a coefficient to represent "winter" data) since the effect of winter on collision risk is mixed across the projects.

The table features additional lines to account for the potential effect of the discontinued surveys in Hacıhıdırlar WPP which resulted in missed seasons for autumn and summer. The line 8 WPP without Hacıhıdırlar calculates the %migrant and collision per turbine per year values without the project. The line 8 WPP with extrapolated Hacıhıdırlar is obtained by assuming the same collision risk values in summer and autumn as the spring results for the project.

Table 4-38 Collision risk summary for Project Galeforce and each of its projects as calculated in 2024

Projects	Migrant /yr*	Resident /yr*	Total /yr*	%migrant	Turbine count	Collision/ turbine/ yr*
Akköy	0.05	0.49	0.54	9.26	6	0.09
Armutçuk	0.19	0.43	0.62	30.65	20	0.03
Dampınar	0.06	1.44	1.50	4.00	11	0.14
Hacıhıdırlar**	0.00	0.50	0.50	0.00	15	0.03
Harmancık	0.05	0.06	0.11	45.45	10	0.01
Ihlamur	0.27	2.51	2.78	9.71	18	0.15
Kestanederesi	0.18	5.10	5.28	3.41	28	0.19
Ovacık	0.07	0.16	0.23	30.43	13	0.02
Uygar	0.65	1.76	2.41	26.97	60	0.04
Project Galeforce	1.52	12.45	13.97	10.88	181	0.08
8 WPP (- Hacıhıdırlar)	1.52	11.95	13.47	11.28	166	0.08

*Though denoted year (yr), the survey period consists of spring, summer and autumn, and does not account for winter periods

**Hacıhıdırlar WPP baseline collection was disrupted, and summer and autumn data could not be collected.

The data table summarizing the project specific collision risk estimations from the data is presented in Table 4-39.

Table 4-39 Additive Collision Risk Assessment summary for the Project Galeforce

Common Name	Projects	Migrant	Resident	Total
Black Kite	Harmancık	0.00	0.00	0.00
Subtotal		0.00	0.00	0.00
Black Stork	Ihlamur	0.00	0.02	0.02
	Uygar	0.01	0.01	0.02
Subtotal		0.01	0.03	0.04
Booted Eagle	Akköy	0.00	0.00	0.00
	Armutçuk	0.00	0.00	0.00
	Harmancık	0.00	0.00	0.00
	Ihlamur	0.01	0.00	0.01
	Kestanederesi	0.00	0.02	0.02
	Ovacık	0.01	0.00	0.01
	Uygar	0.00	0.02	0.02
Subtotal		0.02	0.04	0.06
Common Buzzard	Akköy	0.00	0.01	0.01
	Armutçuk	0.15	0.21	0.36
	Dampınar	0.00	0.19	0.19
	Hacıhıdırlar	0.00	0.40	0.40
	Harmancık	0.02	0.03	0.05
	Ihlamur	0.11	0.50	0.61
	Kestanederesi	0.00	1.00	1.00
	Ovacık	0.02	0.10	0.12
	Uygar	0.25	0.98	1.23
Subtotal		0.55	3.42	3.97
Dalmatian Pelican	Akköy	0.00	0.06	0.06
Subtotal		0.00	0.06	0.06
Eleonora's Falcon	Armutçuk	0.00	0.07	0.07
	Dampınar	0.00	0.48	0.48
	Hacıhıdırlar	0.00	0.04	0.04
	Harmancık	0.00	0.02	0.02
	Ihlamur	0.04	0.65	0.69
	Kestanederesi	0.00	0.35	0.35
	Ovacık	0.00	0.01	0.01
	Uygar	0.00	0.02	0.02
Subtotal		0.04	1.64	1.68
Eurasian Hobby	Ihlamur	0.00	0.06	0.06
	Ovacık	0.00	0.00	0.00
	Uygar	0.01	0.00	0.01
Subtotal		0.01	0.06	0.07
Eurasian Kestrel	Akköy	0.00	0.05	0.05
	Armutçuk	0.00	0.03	0.03
	Dampınar	0.01	0.00	0.01
	Hacıhıdırlar	0.00	0.02	0.02
	Harmancık	0.00	0.00	0.00
	Ihlamur	0.00	0.74	0.74
	Kestanederesi	0.00	1.06	1.06
	Ovacık	0.00	0.01	0.01
	Uygar	0.01	0.10	0.11
Subtotal		0.02	2.01	2.03
Eurasian Marsh-Harrier	Akköy	0.00	0.00	0.00
	Ihlamur	0.01	0.00	0.01
	Kestanederesi	0.03	0.00	0.03
	Ovacık	0.01	0.00	0.01
Subtotal		0.05	0.00	0.05
Eurasian Sparrowhawk	Akköy	0.00	0.04	0.04
	Armutçuk	0.01	0.04	0.05
	Dampınar	0.03	0.03	0.06
	Hacıhıdırlar	0.00	0.02	0.02
	Harmancık	0.02	0.00	0.02
	Ihlamur	0.03	0.02	0.05
	Kestanederesi	0.03	0.00	0.03
	Ovacık	0.02	0.01	0.03
	Uygar	0.30	0.05	0.35
Subtotal		0.44	0.21	0.65
European Honey-buzzard	Armutçuk	0.02	0.04	0.06
	Dampınar	0.01	0.01	0.02
	Harmancık	0.01	0.00	0.01
	Ihlamur	0.01	0.06	0.07
	Kestanederesi	0.11	0.00	0.11
	Uygar	0.04	0.04	0.08
Subtotal		0.20	0.15	0.35
Hen Harrier	Ihlamur	0.01	0.00	0.01
Subtotal		0.01	0.00	0.01
Lesser Kestrel	Kestanederesi	0.00	1.91	1.91
Subtotal		0.00	1.91	1.91
Levant Sparrowhawk	Harmancık	0.00	0.00	0.00
	Uygar	0.02	0.00	0.02
Subtotal		0.02	0.00	0.02
Long-legged Buzzard	Akköy	0.01	0.01	0.02
	Dampınar	0.00	0.00	0.00
	Kestanederesi	0.00	0.28	0.28
Long-legged Buzzard Total		0.01	0.29	0.30
Montagu's Harrier	Akköy	0.00	0.00	0.00
	Dampınar	0.01	0.00	0.01
	Kestanederesi	0.01	0.00	0.01
Subtotal		0.02	0.00	0.02
Peregrine Falcon	Dampınar	0.00	0.00	0.00
	Kestanederesi	0.00	0.04	0.04
Peregrine Falcon Total		0.00	0.04	0.04
Red-footed Falcon	Ihlamur	0.01	0.00	0.01
Red-footed Falcon Total		0.01	0.00	0.01
Short-toed Snake-Eagle	Akköy	0.03	0.15	0.18
	Armutçuk	0.01	0.04	0.05
	Dampınar	0.00	0.73	0.73
	Hacıhıdırlar	0.00	0.02	0.02
	Harmancık	0.00	0.01	0.01
	Ihlamur	0.04	0.46	0.50
	Kestanederesi	0.00	0.44	0.44
	Ovacık	0.01	0.03	0.04
	Uygar	0.00	0.54	0.54
Subtotal		0.09	2.42	2.51
unidentified Falcon	Harmancık	0.00	0.00	0.00
	Uygar	0.01	0.00	0.01
Subtotal		0.01	0.00	0.01
White Stork	Akköy	0.01	0.17	0.18
Subtotal		0.01	0.17	0.18
Total		1.52	12.45	13.97

4.4.5 Breeding Bird Observations

The survey recorded a total of 59 bird species. Among these, 44 species have a breeding code higher than 0, indicating active breeding. The most common species observed were the Common Wood-Pigeon (*Columba palumbus*), European Stonechat (*Saxicola rubicola*), and Common Chiffchaff (*Phylloscopus collybita*). Significant observations also include the Red-backed Shrike (*Lanius collurio*) and the Ortolan Bunting (*Emberiza hortulana*). Notably, the vulnerable European Turtle-Dove (*Streptopelia turtur*) was recorded, as well as the near-threatened Woodchat Shrike (*Lanius senator*). As a non-breeding bird, Eurasian Curlew (*Numenius arquata*) was observed. Additionally, species observed during breeding bird surveys which are not breeding were included (denoted -) All species are listed in Table 4-40.

Table 4-40 List of species encountered during breeding bird surveys and highest number recorded each month. (X: observed but not counted)

Common Name	Scientific Name	IUCN	Breeding Code	Mar	Apr	May	Jun	Jul
Common Wood-Pigeon	*Columba palumbus*	LC	B3	-	-	9	3	-
European Turtle-Dove	*Streptopelia turtur*	VU	B3	-	-	-	2	-
Common Cuckoo	*Cuculus canorus*	LC	A2	-	X	3	X	-
Common Swift	*Apus apus*	LC	-	-	-	X	X	-
European Honey-buzzard	*Pernis apivorus*	LC	-	-	-	-	X	-
Short-toed Snake-Eagle	*Circaetus gallicus*	LC	-	X	-	X	X	X
Booted Eagle	*Hieraaetus pennatus*	LC	-	-	-	X	-	-
Eurasian Sparrowhawk	*Accipiter nisus*	LC	-	X	-	X	-	-
Common Buzzard	*Buteo buteo*	LC	B3	X	-	2	5	1
Eurasian Hoopoe	*Upupa epops*	LC	A2	-	-	X	1	1
European Bee-eater	*Merops apiaster*	LC	-	-	-	28	-	-
Middle Spotted Woodpecker	*Dendrocoptes medius*	LC	-	-	-	X	-	-
Syrian Woodpecker	*Dendrocopos syriacus*	LC	A1	-	-	-	2	-
Lesser Spotted Woodpecker	*Dryobates minor*	LC	-	-	-	-	1	-
Eurasian Kestrel	*Falco tinnunculus*	LC	-	-	-	-	-	X
Eleonora's Falcon	*Falco eleonorae*	LC	-	-	-	2	2	1
Eurasian Hobby	*Falco subbuteo*	LC	-	-	-	-	X	-
Peregrine Falcon	*Falco peregrinus*	LC	-	-	-	1	-	-
Eurasian Golden Oriole	*Oriolus oriolus*	LC	-	-	-	X	-	-
Woodchat Shrike	*Lanius senator*	NT	A1	-	-	1	-	-
Eurasian Jay	*Garrulus glandarius*	LC	C12	-	-	1	4	-
Common Raven	*Corvus corax*	LC	A1	X	X	6	1	2
Coal Tit	*Periparus ater*	LC	A1	-	-	1	2	-
Eurasian Blue Tit	*Cyanistes caeruleus*	LC	B3	X	-	3	-	-
Great Tit	*Parus major*	LC	B3	X	X	5	2	-
Wood Lark	*Lullula arborea*	LC	C14	X	X	15	6	-
Eurasian Skylark	*Alauda arvensis*	LC	A2	-	-	2	-	-
Crested Lark	*Galerida cristata*	LC	C12	-	-	2	4	-
Barn Swallow	*Hirundo rustica*	LC	A1	-	-	10	X	4
Common House-Martin	*Delichon urbicum*	LC	-	-	-	2	1	-
European red-rumped swallow	*Cecropis rufula*	LC	A1	X	X	5	2	2
Common Chiffchaff	*Phylloscopus collybita*	LC	A2	X	-	9	2	-

Common Name	Scientific Name	IUCN	Breeding Code	Mar	Apr	May	Jun	Jul
Long-tailed Tit	*Aegithalos caudatus*	LC	C12	-	-	4	7	X
Eurasian Blackcap	*Sylvia atricapilla*	LC	B3	-	-	2	1	-
Sardinian Warbler	*Curruca melanocephala*	LC	A2	X	-	5	4	1
Eastern Subalpine Warbler	*Curruca cantillans*	LC	B3	X	-	1	4	-
Greater Whitethroat	*Curruca communis*	LC	B5	-	-	9	4	-
Krüper's Nuthatch	*Sitta krueperi*	LC	A2	-	-	2	3	1
Short-toed Treecreeper	*Certhia brachydactyla*	LC	A2	X	X	3	3	-
Eurasian Wren	*Troglodytes troglodytes*	LC	A2	X	-	3	2	-
Mistle Thrush	*Turdus viscivorus*	LC	A1	-	-	1	-	-
Eurasian Blackbird	*Turdus merula*	LC	C14	-	-	5	2	-
Spotted Flycatcher	*Muscicapa striata*	LC	C12	-	-	-	3	-
European Robin	*Erithacus rubecula*	LC	A2	-	-	4	4	-
Common Nightingale	*Luscinia megarhynchos*	LC	A2	-	-	1	-	-
European Stonechat	*Saxicola rubicola*	LC	C12	X	X	4	7	-
Northern Wheatear	*Oenanthe oenanthe*	LC	-	-	-	-	1	-
Eastern Black-eared Wheatear	*Oenanthe melanoleuca*	LC	B3	-	-	2	2	-
House Sparrow	*Passer domesticus*	LC	C13	X	-	3	3	-
White Wagtail	*Motacilla alba*	LC	A2	X	X	2	-	-
Tawny Pipit	*Anthus campestris*	LC	A2	-	-	1	1	-
Common Chaffinch	*Fringilla coelebs*	LC	C12	X	X	13	9	2
European Greenfinch	*Chloris chloris*	LC	B3	-	X	6	5	-
Eurasian Linnet	*Linaria cannabina*	LC	C12	X	X	X	4	-
European Goldfinch	*Carduelis carduelis*	LC	B3	-	X	3	4	-
European Serin	*Serinus serinus*	LC	B3	X	X	9	4	X
Corn Bunting	*Emberiza calandra*	LC	A2	-	-	1	5	-
Cirl Bunting	*Emberiza cirlus*	LC	A2	X	-	4	3	-
Ortolan Bunting	*Emberiza hortulana*	LC	B6	-	-	4	4	-

4.5 Bat

Spring

Based on Auto-ID results, a total of 56,264 recordings were made. 6,587 recordings, or 11.71%, identified as bat recordings in spring. Noise accounted for the majority of the recordings (88.29%), with an average nightly noise percentage ranging from 63.94% to 97.58%. Nights 4 and 5 were selected for manual species identification. A summary is shown on Table 4-41.

Table 4-41 Number of bat recordings and noise recorded each night based on Auto-ID in spring.

Night	Detectors	Bat	Noise	Total	Noise Ratio	Analysis
1	7	287	5027	5314	94.60%	
2	7	725	3300	4025	81.99%	
3	7	293	8627	8920	96.72%	
4	7	225	9060	9285	97.58%	Manual_ID
5	7	784	6143	6927	88.68%	Manual_ID
6	7	750	4762	5512	86.39%	
7	7	1682	4433	6115	72.49%	
8	7	536	1960	2496	78.53%	
9	7	732	1298	2030	63.94%	
10	7	450	2241	2691	83.28%	
11	7	82	1950	2032	95.96%	
12	7	41	876	917	95.53%	
Total	-	6587	49677	56264	88.29%	-

Table 4-42 presents the distribution of bat recordings across 7 SPs based on Auto-ID results. SP07 had the highest average recordings, accounting for average 192, followed by SP04 and SP03. Night 7 recorded the highest bat activity (1,682 recordings), showing the highest potential of the site. Failures of the recorders are indicated by blank cells in the table.

Table 4-42 Distribution of bat recordings across SPs by night based on Auto-ID results in spring

Night	SP01	SP02	SP03	SP04	SP05	SP06	SP07	Total
1	16	5	24	46	12	1	183	287
2	378	8	43	99	15	7	175	725
3	12	6	18	39	3	6	209	293
4	14	5	13	42	0	7	144	225
5	30	23	175	252	38	50	216	784
6	22	11	258	194	43	37	185	750
7	69	370	190	414	348		291	1682
8	51	13		203	53		216	536
9	48	28		287	164		205	732
10	33			120	38		259	450
11	19			51	12			82
12	10			20	11			41
Ave	58	52	103	147	67	18	208	93
Ave_corrected	54	48	95	135	62	17	192	86

Table 4-43 and Table 4-44 summarizes the results of the Manual-ID analysis of bat recordings for the selected nights (4 and 5), yielding a total of 930 recordings across 7 SPs over two nights. Overall, the number of recordings identified through Manual-ID closely aligns with those identified through Auto-ID, with a difference of approximately 7.83%. However, in some instances, noise was misclassified as bat calls by one detector, widening the discrepancy. Ultimately, the total number of bat recordings identified through Manual-ID corresponds to 92.17% of the total results from Auto-ID for spring.

Table 4-43 Distribution of bat recordings across SPs by selected nights based on Auto-ID results in spring

Night	Method	SP01	SP02	SP03	SP04	SP05	SP06	SP07	Total
4	Auto ID	14	5	13	42	0	7	144	225
5	Auto ID	30	23	175	252	38	50	216	784
Total	Auto ID	44	28	188	294	38	57	360	1009

Table 4-44 Distribution of bat recordings across SPs by selected nights based on Manual-ID results in spring

Night	Method	SP01	SP02	SP03	SP04	SP05	SP06	Total
4	Manual ID	11	5	8	5	0	3	146
5	Manual ID	30	22	124	287	39	39	211
Total	Manual ID	41	27	132	292	39	42	357

The Auto-ID of the sounds at all nights shows the most common species was Common Pipistrelle (*Pipistrellus pipistrellus*) with 40.69% of recordings and 59.02% of recordings when non-identified species are distributed evenly. Remarkably, the second most common species is Schreiber's Bent-winged Bat (*Miniopterus schreibersii*), Vulnerable (VU), with 8.87% of recordings and 12.86% of recordings when non-identified species are distributed evenly. Among the species identified, the Vulnerable Schreiber's Bent-winged Bat (*Miniopterus schreibersii*) and Giant Noctule (*Nyctalus lasiopterus*) were recorded. The software failed to identify more than 31.06% of the recordings. (Table 4-45).

Table 4-45 Bat groups and species recorded during selected nights at each SP based on Auto-ID in spring

Group	Species	IUCN	SP01	SP02	SP03	SP04	SP05	SP06	SP07	Total	Percent	Percent_2
Pipistrelloid	PIPPIP	LC	149	197	191	841	223	40	1039	2680	40.69%	59.02%
Pipistrelloid	MINSCH	VU	22	34	26	114	110	1	277	584	8.87%	12.86%
Pipistrelloid	PIPKUH	LC	48	62	15	88	16	4	31	264	4.01%	5.81%
Pipistrelloid	PIPNAT	LC	3	3	0	29	1	0	4	40	0.61%	0.88%
Pipistrelloid	PIPPYG	LC	1	2	3	1	0	1	19	27	0.41%	0.59%
Pipistrelloid	HYPSAV	LC	2	3	4	4	1	0	5	19	0.29%	0.42%
Nyctaloid	EPTSER	LC	8	1	13	89	103	1	119	334	5.07%	7.36%
Nyctaloid	NYCLEI	LC	8	4	7	37	20	2	45	123	1.87%	2.71%
Nyctaloid	NYCNOC	LC	41	0	5	0	4	0	11	61	0.93%	1.34%

Group	Species	IUCN	SP01	SP02	SP03	SP04	SP05	SP06	SP07	Total	Percent	Percent_2
Nyctaloid	NYCLAS	VU	8	3	0	18	5	0	9	43	0.65%	0.95%
Nyctaloid	VESMUR	LC	3	0	3	13	3	1	8	31	0.47%	0.68%
Tadarida	TADTEN	LC	14	103	9	108	10	2	18	264	4.01%	5.81%
Plecotus	PLESPE	NA	1	1	1	0	1	0	2	6	0.09%	0.13%
Myotis	MYOSPE	NA	11	1	4	12	6	1	28	63	0.96%	1.39%
Rhinolophus	RHIHIP	NT(E,M)	0	0	0	1	0	0	1	2	0.03%	0.04%
-	NoID	-	383	55	440	412	234	55	467	2046	31.06%	
Total	-	-	702	469	721	1767	737	108	2083	6587	-	-
Pipistrelloid	PIPPIP	LC	149	197	191	841	223	40	1039	2680	40.69%	59.02%

When checking the Manual-ID species of 930 records in total, we can see some differences compared to the Auto-ID results. Common Pipistrelle (*Pipistrellus pipistrellus*) remained the most frequently recorded species in both methods, but its proportion is significantly higher in the Manual-ID analysis (44.84%) compared to the Auto-ID (40.69%). Schreiber's Bent-winged Bat (*Miniopterus schreibersii*) accounted for a higher proportion in Manual-ID (18.82%) than in Auto-ID (8.87%), indicating improved detection of this vulnerable species through manual analysis. Lesser Noctule (*Nyctalus leisleri*) showed a dramatic increase in Manual-ID results, representing 19.46% of the total recordings compared to only 1.87% in Auto-ID. (Table 4-46).

Table 4-46 Bat groups and species recorded during selected nights at each SP based on Manual ID in spring

Group	Species	IUCN	SP01	SP02	SP03	SP04	SP05	SP06	SP07	Total	Percent
Pipistrelloid	PIPPIP	LC	22	17	73	105	18	32	150	417	44.84%
Pipistrelloid	MINSCH	VU	4	3	17	23	9	1	118	175	18.82%
Pipistrelloid	PIPKUH/PIPNAT	-	2	0	4	51	0	3	4	64	6.88%
Pipistrelloid	PIPPYG	LC	0	1	2	1	0	1	0	5	0.54%
Pipistrelloid	HYPSAV	LC	0	0	0	1	0	0	0	1	0.11%
Nyctaloid	NYCLEI	LC	4	5	26	100	3	3	40	181	19.46%
Nyctaloid	EPTSER	LC	1	0	6	2	5	2	16	32	3.44%
Nyctaloid	NYCNOC	LC	0	0	0	2	2	0	4	8	0.86%
Nyctaloid	NYCLAS	VU	1	0	0	2	0	0	1	4	0.43%
Tadarida	TADTEN	LC	3	0	1	1	0	0	0	5	0.54%
Plecotus	PLESPE	NA	0	0	2	0	1	0	2	5	0.54%
Myotis	MYOSPE	NA	3	1	1	4	1	0	22	32	3.44%
Rhinolophus	RHIFER	NT(E,M)	1	0	0	0	0	0	0	1	0.11%
Total	-	-	41	27	132	292	39	42	357	930	-

The bat activity during the hours of the night was analyzed for Pipistrelloid, Nyctaloid, and Tadarida groups, as they are known to be high and middle altitude fliers (Rodrigues et al. 2014), making them potential subjects to possible curtailment planning. Figure 4-5 illustrates the activity patterns of these selected species throughout the night during the spring season, spanning from 21:00 to 05:00.

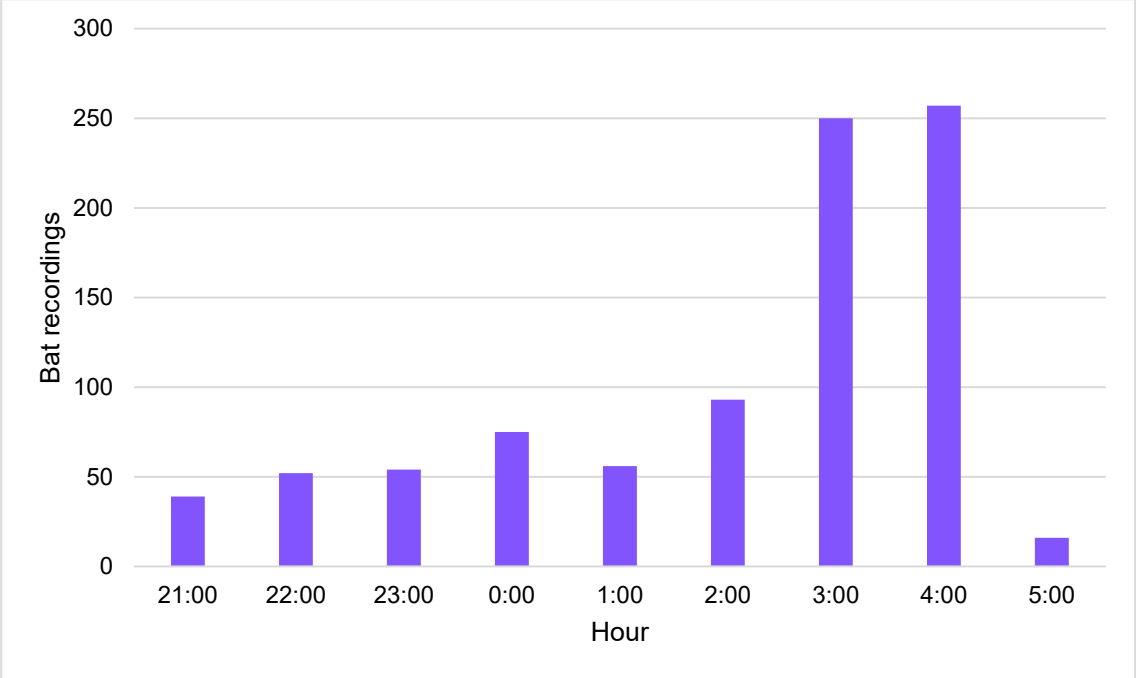


Figure 4-5 Hourly distribution of bat recordings through the night in spring

Summer

Based on the Auto-ID results, a total of 50,179 recordings were made. 17,104 recordings, or 34.05%, were identified as bat recordings in the summer season. Noise accounted for the majority of the recordings, with a total of 33,075 recordings, or 65.91% of the total. The average nightly noise percentage ranged from 8.54% (night 9) to 87.23% (night 5). Nights 8 and 9 were selected for manual species identification (Table 4-47).

Table 4-47 Number of bat recordings and noise recorded each night based on Auto-ID in summer

Night	Detectors	Bat	Noise	Total	Noise Ratio	Analysis
1	7	1805	2541	4346	58.47%	
2	7	1194	4104	5298	77.46%	
3	7	949	4925	5874	83.84%	
4	7	1993	3685	5678	64.90%	
5	7	1125	7687	8812	87.23%	
6	7	1611	3162	4773	66.25%	
7	7	1198	2939	4137	71.04%	
8	7	850	2515	3365	74.74%	Manual_ID
9	7	3544	331	3875	8.54%	Manual_ID
10	7	2624	533	3157	16.88%	

Night	Detectors	Bat	Noise	Total	Noise Ratio	Analysis
11	7	211	653	864	75.58%	
Total	-	17104	33075	50179	65.91%	-

Table 4-48 presents the distribution of bat recordings across 7 SPs based on Auto-ID results. SP07 had the highest average recordings, accounting average for 638, followed by SP02 and SP04. Night 9 recorded the highest bat activity 3544 detections, 14.7% to the average value, showing the highest potential of the site.

Table 4-48 Distribution of bat recordings across SPs by night based on Auto-ID results in summer

Night	SP01	SP02	SP03	SP04	SP05	SP06	SP07	Total
1	157	445	109	425	71	41	557	1805
2	103	385	44	163	22	5	472	1194
3	58	254	28	112	6	7	484	949
4	113	383	49	294	188	8	958	1993
5	80	18	8	26	5	16	972	1125
6	82	259	77	339	28	23	803	1611
7	66	321	34	233	31	76	437	1198
8	43	14	48	172	22	43	508	850
9	319	834	220	906	425	69	771	3544
10	201	969	342	141	505	128	338	2624
11	79	28	40	0	24	6	34	211
Ave	118	355	91	281	121	38	576	226
Ave_corrected	131	393	101	311	134	42	638	250

Table 4-49 and Table 4-50 summarizes the results of the Manual-ID analysis of bat recordings for the selected nights (8 and 9), yielding a total of 4864 recordings across 7 SPs over two nights. Overall, the number of recordings identified through Manual-ID closely aligns with those identified through Auto-ID, with a difference of approximately 5%. However, in some instances, noise was misclassified as bat calls by one detector, widening the discrepancy. Ultimately, the total number of bat recordings identified through Manual-ID corresponds to 110.7% of the total results from Auto-ID for summer.

Table 4-49 Distribution of bat recordings across SPs by selected nights based on Manual-ID results in summer

Night	Method	SP01	SP02	SP03	SP04	SP05	SP06	SP07	Total
8	Manual ID	42	13	49	173	22	43	515	857
9	Manual ID	333	1030	228	1031	475	66	844	4007
Total	Manual ID	375	1043	277	1204	497	109	1359	4864

Table 4-50 Distribution of bat recordings across SPs by selected nights based on Auto-ID results in summer

Night	Method	SP01	SP02	SP03	SP04	SP05	SP06	SP07	Total
8	Auto ID	43	14	48	172	22	43	508	850
9	Auto ID	319	834	220	906	425	69	771	3544

Night	Method	SP01	SP02	SP03	SP04	SP05	SP06	SP07	Total
Total	Auto ID	362	848	268	1078	447	112	1279	4394

The Auto ID of the sounds at all nights shows the most common species was Common Pipistrelle (*Pipistrellus pipistrellus*) with 56.47% recordings and with 64.07% recordings when non-ID species are distributed evenly. The second most common species is Kuhl's Pipistrelle (*Pipistrellus kuhlii*) with 20.72% recordings and with 23.51% recordings when non-ID species are distributed evenly.

Schreiber's Bent-winged Bat (*Miniopterus schreibersii*) and Giant Noctule (*Nyctalus lasiopterus*) is of conservation concern as it is classified as Vulnerable. The software failed to identify more than 11.86% of the recordings. (Table 4-51).

Table 4-51 Bat groups and species recorded during selected nights at each SP based on Auto-ID in summer

Group	Species	IUCN	SP01	SP02	SP03	SP04	SP05	SP06	SP07	Total	Percent	Percent_2
Pipistrelloid	PIPPIP	LC	694	553	627	1940	787	190	4867	9658	56.47%	64.07%
Pipistrelloid	PIPKUH	LC	238	2552	77	200	246	26	205	3544	20.72%	23.51%
Pipistrelloid	MINSCH	VU	70	50	40	79	93	22	82	436	2.55%	2.89%
Pipistrelloid	PIPNAT	LC	26	31	21	171	9	14	75	347	2.03%	2.30%
Pipistrelloid	HYPSAV	LC	13	5	9	18	6	8	13	72	0.42%	0.48%
Pipistrelloid	PIPPYG	LC	0	1	5	0	1	1	19	27	0.16%	0.18%
Nyctaloid	NYCLEI	LC	9	258	12	20	10	22	58	389	2.27%	2.58%
Nyctaloid	EPTSER	LC	0	33	11	4	10	2	164	224	1.31%	1.49%
Nyctaloid	NYCLAS	VU	10	16	6	11	9	0	10	62	0.36%	0.41%
Nyctaloid	VESMUR	LC	2	9	2	5	4	3	7	32	0.19%	0.21%
Nyctaloid	NYCNOC	LC	1	5	5	2	0	4	7	24	0.14%	0.16%
Tadarida	TADTEN	LC	37	22	18	34	6	8	12	137	0.80%	0.91%
Plecotus	PLESPE	NA	1	0	5	1	2	0	6	15	0.09%	0.10%
Myotis	MYOSPE	NA	20	10	5	11	9	5	26	86	0.50%	0.57%
Rhinolophus	RHIHIP	NT(E,M)	0	0	1	0	1	1	1	4	0.02%	0.03%
Rhinolophus	RHIFER	NT(E,M)	0	0	0	0	1	0	0	1	0.01%	0.01%
Rhinolophus	RHIEUR	VU(E,M)	0	0	0	0	0	0	1	1	0.01%	0.01%
Barbastella	BARBAR	VU (E)	10	1	1	0	1	0	3	16	0.09%	0.11%
-	NoID	-	170	364	154	315	132	116	778	2029	11.86%	
Total	-	-	1301	3910	999	2811	1327	422	6334	17104	-	-

When checking the manual ID species of 4864 records in total, we can see some differences. Common Pipistrelle (*Pipistrellus pipistrellus*) recorded 58.37% of the total in the Manual ID results, which is significantly higher than the 56.47% recorded in the Auto ID results, showing a slight difference in the proportions of this species across methods. Kuhl's Pipistrelle (*Pipistrellus kuhlii*) and Nathusius' Pipistrelle (*Pipistrellus nathusii*) are grouped together in the Manual ID table, accounting for 26.79% of the total, while the Auto ID table shows 20.72% for Pipistrellus kuhlii alone, indicating a higher proportion of this species in the Manual ID results. Schreiber's Bent-winged Bat (*Miniopterus schreibersii*) has 6.13% in the Manual ID results, while the Auto ID results show a much lower proportion of 2.55%, reflecting a notable increase in its detection via Manual ID (Table 4-52).

Table 4-52 Bat groups and species recorded during selected nights at each SP based on Manual ID in summer

Group	Species	IUCN	SP01	SP02	SP03	SP04	SP05	SP06	SP07	Total	Percent
Pipistrelloid	PIPPIP	LC	219	221	166	862	272	36	1063	2839	58.37%
Pipistrelloid	PIPKUH/PIPNAT	-	103	723	24	204	157	17	75	1303	26.79%
Pipistrelloid	MINSCH	VU	18	22	53	53	38	20	94	298	6.13%
Pipistrelloid	HYPSAV	LC	4	0	5	10	1	0	1	21	0.43%
Pipistrelloid	PIPPYG	LC	0	2	0	3	0	0	2	7	0.14%
Nyctaloid	NYCLEI	LC	8	54	6	42	7	26	61	204	4.19%
Nyctaloid	EPTSER	LC	0	4	7	4	4	0	38	57	1.17%
Nyctaloid	NYCLAS	VU	2	0	6	11	1	0	1	21	0.43%
Nyctaloid	NYCNOC	LC	0	0	0	3	4	1	0	8	0.16%
Tadarida	TADTEN	LC	6	6	7	3	6	0	1	29	0.60%
Plecotus	PLESPE	NA	0	0	0	0	0	6	0	6	0.12%
Myotis	MYOSPE	NA	9	10	2	5	6	3	22	57	1.17%
Rhinolophus	RHIFER	NT(E,M)	1	1	1	2	1	0	1	7	0.14%
Barbastella	BARBAR	VU (E)	5	0	0	2	0	0	0	7	0.14%
Total	-	-	375	1043	277	1204	497	109	1359	4864	-

The bat activity during the hours of the night was analyzed for Pipistrelloid, Nyctaloid, and Tadarida groups, as they are known to be high and middle altitude fliers (Rodrigues et al. 2014), making them potential subjects to possible curtailment planning. Figure 4-6 illustrates the activity patterns of these selected species throughout the night during the summer season, spanning from 20:00 to 06:00.

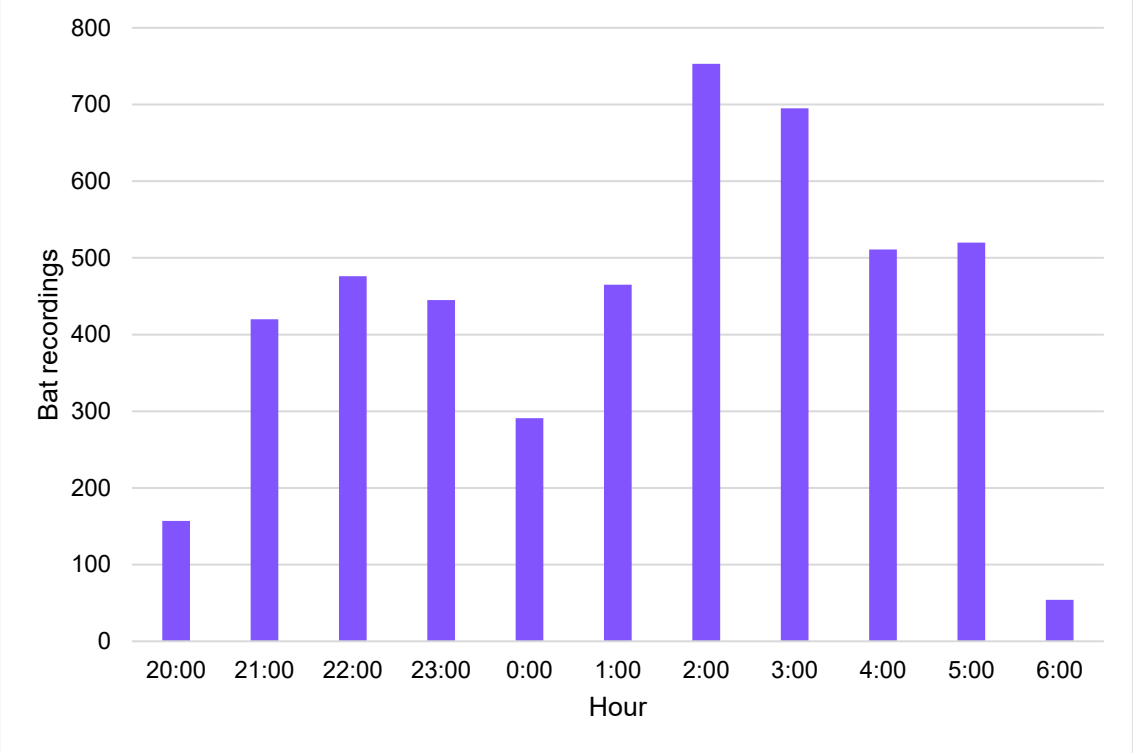


Figure 4-6 Hourly distribution of bat recordings through the night in summer

Autumn

Based on Auto-ID results, a total of 58,184 recordings were made. 24,527 recordings, or 42.2%, were identified as bat recordings in autumn. Noise accounted for the majority of the recordings (33,657), which is 57.85% of the total, with an average nightly noise percentage ranging from 42.40% to 76.58%. Nights 2, 3, 7, and 9 were selected for manual species identification. A summary is shown on Table 4-53.

Table 4-53 Number of bat recordings and noise recorded each night based on Auto-ID in autumn

Night	Detectors	Bat	Noise	Total	Noise Ratio	Analysis
1	7	3514	3734	7248	51.52%	
2	7	3407	2642	6049	43.68%	Manual_ID
3	7	2661	4410	7071	62.37%	Manual_ID
4	7	1054	776	1830	42.40%	
5	7	977	2453	3430	71.52%	
6	7	1050	1942	2992	64.91%	
7	7	1302	4257	5559	76.58%	Manual_ID
8	7	1404	2094	3498	59.86%	
9	7	1360	1732	3092	56.02%	Manual_ID
10	7	2836	4140	6976	59.35%	
11	7	1774	2385	4159	57.35%	
12	7	1853	1466	3319	44.17%	
13	7	1335	1626	2961	54.91%	
Total	-	24527	33657	58184	57.85%	-

Table 4-54 presents the distribution of bat recordings across 7 SPs based on Auto-ID results. SP03 had the highest average recordings, accounting for average 362 detections, followed by SP06 and SP04. Night 1 recorded the highest bat activity with 3514 bat recordings, which is 12.2 times the average value, showing the highest potential of the site. Failures of the recorders are indicated by blank cells in the table.

Table 4-54 Distribution of bat recordings across SPs by night based on Auto-ID results in autumn

Night	SP01	SP02	SP03	SP04	SP05	SP06	SP07	Total
1	685	131	702	907	62	996	31	3514
2	555	162	699	761	45	553	632	3407
3	374	247	616	409	176	411	428	2661
4	40	140	168	224	63	186	233	1054
5	44	46	117	200	24	173	373	977
6	48	79	148	176	31	164	404	1050
7	167	154	249	266	42	393	31	1302
8	265	210	384	171	18	280	76	1404
9	175	240	539	179	21	206		1360
10	320	846	1069	205	14	382		2836
11	161	86	534	340	49	604		1774
12	71	41	696	449	42	554		1853

Night	SP01	SP02	SP03	SP04	SP05	SP06	SP07	Total
13	59	0	347	502	97	330		1335
Ave	228	198	482	368	53	402	276	287
Ave_corrected	171	149	362	277	40	302	207	215

Table 4-55 and Table 4-56 summarizes the results of the Manual-ID analysis of bat recordings for the selected nights (nights), yielding a total of 2,774 recordings across 7 SPs over two nights. Overall, the number of recordings identified through Manual-ID closely aligns with those identified through Auto-ID, with a difference of approximately 5%. However, in some instances, noise was misclassified as bat calls by one detector, widening the discrepancy. Ultimately, the total number of bat recordings identified through Manual-ID corresponds to 75% of the total results from Auto-ID for autumn.

Table 4-55 Distribution of bat recordings across SPs by selected nights based on Auto-ID results in autumn

Night	Method	SP01	SP02	SP03	SP04	SP05	SP06	SP07	Total
2	Manual ID	0	0	0	0	0	0	57	57
3	Manual ID	0	0	0	0	0	0	280	280
7	Manual ID	166	132	184	275	37	415	0	1209
9	Manual ID	182	124	532	178	19	193	0	1228
Total	Manual ID	348	256	716	453	56	608	337	2774

Table 4-56 Distribution of bat recordings across SPs by selected nights based on Manual-ID results in autumn

Night	Method	SP01	SP02	SP03	SP04	SP05	SP06	SP07	Total
2	Auto ID	0	0	0	0	0	0	632	632
3	Auto ID	0	0	0	0	0	0	428	428
7	Auto ID	167	154	249	266	42	393	0	1271
9	Auto ID	175	240	539	179	21	206	0	1360
Total	Auto ID	342	394	788	445	63	599	1060	3691

The Auto-ID results from the selected nights reveal that the most common species identified was the Common Pipistrelle (*Pipistrellus pipistrellus*), accounting for 29.14% of all recordings, or 51.64% when non-ID species are distributed evenly. The second most common species was Kuhl's Pipistrelle (*Pipistrellus kuhlii*), making up 11.82% of the recordings, or 20.95% with even distribution of non-ID species. Notably, the Vulnerable (VU) species Schreiber's Bent-winged Bat (*Miniopterus schreibersii*) represented 3.71% of the total recordings, or 6.57% when non-ID species are evenly distributed. The software failed to identify more than 43.57% of the recordings (Table 4-57)

Table 4-57 Bat groups and species recorded during selected nights at each SP based on Auto-ID in autumn

Group	Species	IUCN	SP01	SP02	SP03	SP04	SP05	SP06	SP07	Total	Percent	Percent_2
Pipistrelloid	PIPPIP	LC	447	382	2164	1656	199	1986	314	7148	29.14%	51.64%
Pipistrelloid	PIPKUH	LC	1917	56	331	357	23	156	60	2900	11.82%	20.95%
Pipistrelloid	MINSCH	VU	16	154	172	266	18	272	12	910	3.71%	6.57%

Group	Species	IUCN	SP01	SP02	SP03	SP04	SP05	SP06	SP07	Total	Percent	Percent_2
Pipistrelloid	HYPSAV	LC	52	19	9	12	4	108	18	222	0.91%	1.60%
Pipistrelloid	PIPNAT	LC	38	10	94	22	4	26	3	197	0.80%	1.42%
Pipistrelloid	PIPPYG	LC	1	7	25	12	0	25	1	71	0.29%	0.51%
Nyctaloid	NYCLAS	VU	6	10	30	57	6	113	9	231	0.94%	1.67%
Nyctaloid	NYCLEI	LC	22	20	41	39	25	41	19	207	0.84%	1.50%
Nyctaloid	NYCNOC	LC	1	42	51	11	11	29	10	155	0.63%	1.12%
Nyctaloid	EPTSER	LC	2	9	25	17	7	48	18	126	0.51%	0.91%
Nyctaloid	VESMUR	LC	4	7	13	21	8	20	10	83	0.34%	0.60%
Tadarida	TADTEN	LC	35	38	36	283	35	228	22	677	2.76%	4.89%
Plecotus	PLESPE	NA	16	33	473	55	34	79	5	695	2.83%	5.02%
Myotis	MYOSPE	NA	55	7	13	8	2	60	2	147	0.60%	1.06%
Rhinolophus	RHIHIP	NT(E,M)	0	3	3	0	0	1	2	9	0.04%	0.07%
Rhinolophus	RHIFER	NT(E,M)	0	2	0	0	0	0	0	2	0.01%	0.01%
Barbastella	BARBAR	VU (E)	7	3	17	7	2	14	11	61	0.25%	0.44%
-	NoID	-	345	1580	2771	1966	306	2026	1692	10686	43.57%	
Total	-	-	2964	2382	6268	4789	684	5232	2208	24527	-	-

When checking the manual ID species of a total of 2774 records, we can see the following differences in comparison with the Auto-ID results. Common Pipistrelle (Pipistrellus pipistrellus): In the manual ID, this species represents 63.01% of the total recordings (1748 recordings), which is a significantly higher proportion than the 29.14% observed in the Auto-ID results. This shows a clear difference, with manual ID identifying this species more frequently. Kuhl's Pipistrelle (*Pipistrellus kuhlii*): The manual ID data shows a much lower proportion of Kuhl's Pipistrelle, with only 14.49% (402 recordings), compared to the 11.82% recorded in the Auto-ID results. This indicates a slight overrepresentation of this species in the manual identification. Schreiber's Bent-winged Bat (*Miniopterus schreibersii*): The manual ID results show 8.00% (222 recordings) of Schreiber's Bent-winged Bat, which is a higher proportion than the 3.71% seen in the Auto-ID results. (Table 4-58).

Table 4-58 Bat groups and species recorded during selected nights at each SP based on Manual ID in autumn

Group	Species	IUCN	SP01	SP02	SP03	SP04	SP05	SP06	SP07	Total	Percent
Pipistrelloid	PIPPIP	LC	77	135	537	346	41	366	246	1748	63.01%
Pipistrelloid	PIPKUH/PIPNAT	-	245	18	85	19	3	24	8	402	14.49%
Pipistrelloid	MINSCH	VU	4	56	16	26	0	106	14	222	8.00%
Pipistrelloid	HYPSAV	LC	1	12	2	3	0	28	1	47	1.69%
Pipistrelloid	PIPPYG	LC	0	4	15	3	0	3	0	25	0.90%
Nyctaloid	NYCLEI	LC	4	11	37	31	8	45	42	178	6.42%
Nyctaloid	EPTSER	LC	3	4	10	9	2	12	4	44	1.58%
Nyctaloid	NYCLAS	VU	0	3	0	1	0	7	0	11	0.40%
Nyctaloid	NYCNOC	LC	0	2	1	2	1	2	1	9	0.32%

Group	Species	IUCN	SP01	SP02	SP03	SP04	SP05	SP06	SP07	Total	Percent
Tadarida	TADTEN	LC	5	8	3	7	1	7	18	49	1.77%
Plecotus	PLESPE	NA	0	0	2	3	0	1	0	6	0.22%
Myotis	MYOSPE	NA	8	2	4	2	0	6	3	25	0.90%
Rhinolophus	RHIEUR	VU(E,M)	0	1	2	0	0	1	0	4	0.14%
Rhinolophus	RHIFER	NT(E,M)	1	0	1	1	0	0	0	3	0.11%
Rhinolophus	RHIBLA	VU (E)	0	0	1	0	0	0	0	1	0.04%
Total	-	-	348	256	716	453	56	608	337	2774	-

The bat activity during the hours of the night was analyzed for Pipistrelloid, Nyctaloid, and Tadarida groups, as they are known to be high and middle altitude fliers (Rodrigues et al. 2014), making them potential subjects to possible curtailment planning. Figure 4-7 illustrates the activity patterns of these selected species throughout the night during the autumn season, spanning from 18:00 to 06:00.

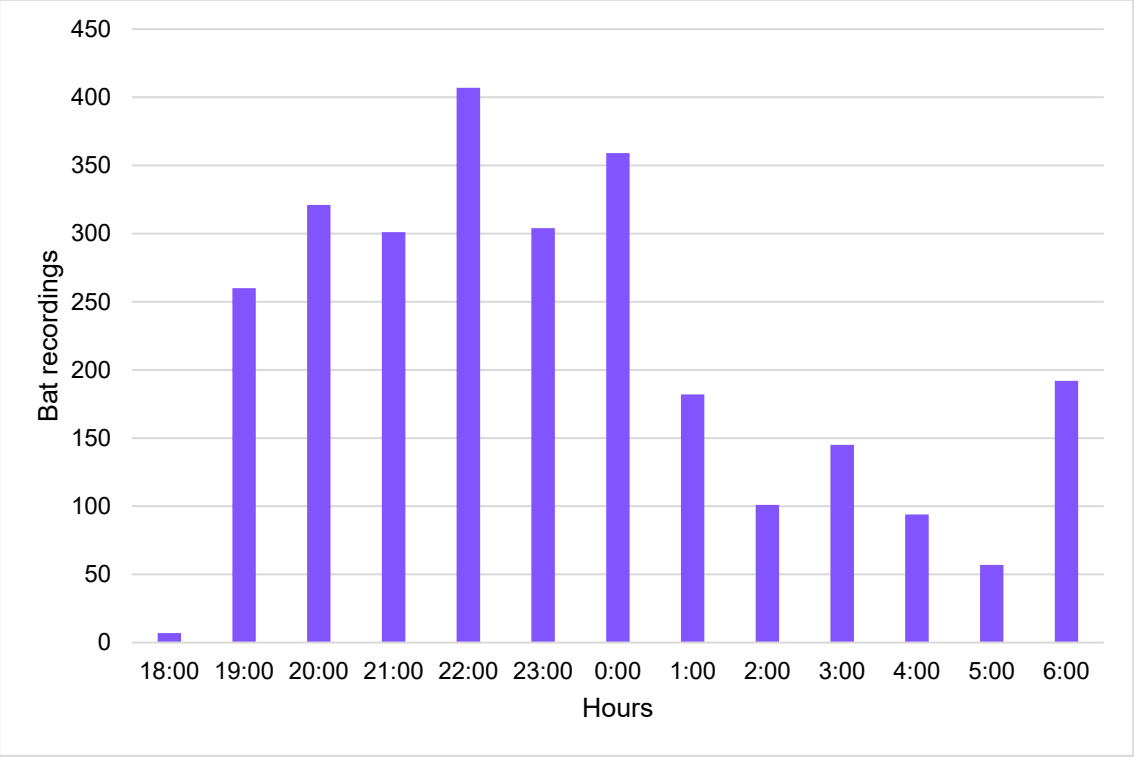


Figure 4-7 Bat groups and species recorded during the hours of the night in autumn

Transect Surveys

Based on mobile surveys, a total of 1,824 recordings were made. Of these, 1,201 recordings, or 65.85%, were identified as bat recordings during spring, summer, and autumn. Noise accounted for the majority of the recordings, making up 34.16% of the total, with an average nightly noise percentage ranging from 14.40% to 59.29%. (Table 4-59)

Table 4-59 Number of bat recordings and noise recorded each night during transect surveys

Date	Bat	Noise	Total	Noise Ratio
2024-06-29	114	166	280	59.29%
2024-07-07	207	252	459	54.90%
2024-08-14	158	63	221	28.51%
2024-08-20	312	65	377	17.24%
2024-09-26	208	35	243	14.40%
2024-10-01	202	42	244	17.21%
Total	1201	623	1824	34.16%

The Auto ID analysis of the sounds recorded during all nights revealed that the most common species was Common Pipistrelle (*Pipistrellus pipistrellus*), accounting for 47.54% of the recordings and increasing to 57.85% when unidentified species were distributed evenly. Notably, the second most common species was Noctule (*Nyctalus noctule*), with 14.82% of the recordings, rising to 18.03% when unidentified species were distributed evenly. (Table 4-60)

Table 4-60 Bat groups and species recorded during mobile surveys based on Auto-ID results

Group	Species	IUCN	06_M1a	06_M1b	08_M1a	08_M1b	09_M1a	09_M1b	Total	Percent	Percent_2
Pipistrelloid	PIPPIP	LC	46	89	75	159	107	95	571	47.54%	57.85%
Pipistrelloid	PIPKUH	LC	18	24	22	56	6	1	127	10.57%	12.87%
Pipistrelloid	MINSCH	VU	3	5	7	19	6	3	43	3.58%	4.36%
Pipistrelloid	PIPNAT	LC	1	0	7	13	1	0	22	1.83%	2.23%
Pipistrelloid	HYPSAV	LC	0	0	1	2	1	2	6	0.50%	0.61%
Pipistrelloid	PIPPYG	LC	0	0	0	0	1	0	1	0.08%	0.10%
Nyctaloid	NYCNOC	LC	15	45	9	7	45	57	178	14.82%	18.03%
Nyctaloid	NYCLEI	LC	1	1	2	4	0	6	14	1.17%	1.42%
Nyctaloid	EPTSER	LC	2	3	1	0	0	0	6	0.50%	0.61%
Nyctaloid	VESMUR	LC	1	0	0	1	1	1	4	0.33%	0.41%
Nyctaloid	NYCLAS	VU	0	2	0	0	0	0	2	0.17%	0.20%
Tadarida	TADTEN	LC	0	5	0	2	0	2	9	0.75%	0.91%
Plecotus	PLESPE	NA	0	0	0	0	0	2	2	0.17%	0.20%
Myotis	MYOSPE	NA	0	0	0	0	1	0	1	0.08%	0.10%
Rhinolophus	RHIHIP	NT (E,M)	1	0	0	0	0	0	1	0.08%	0.10%
-	NoID	-	26	33	34	49	39	33	214	17.82%	
Total	-	-	114	207	158	312	208	202	1201	-	-

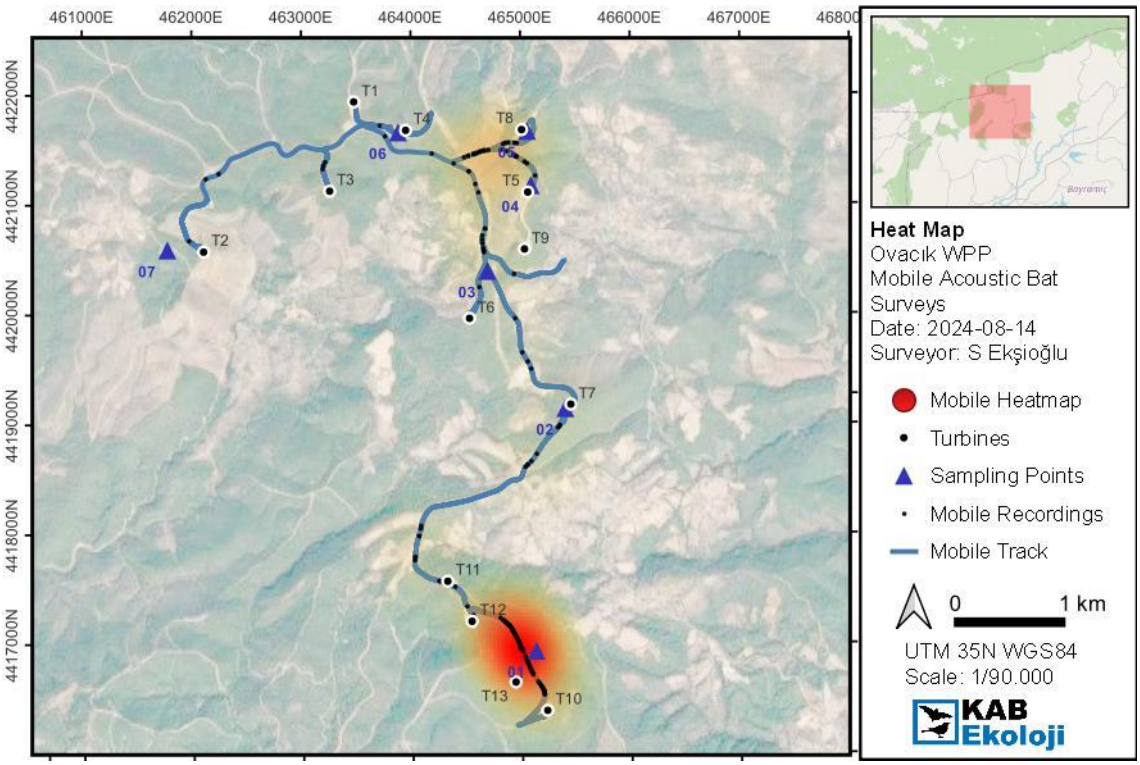
When examining the manually identified species of the of total records, several differences become evident when compared to the Auto-ID results. First, the percentage of Common Pipistrelle (*Pipistrellus pipistrellus*) recordings is slightly higher in the manual ID analysis, representing 61.15% of the total compared to 47.54% in the Auto-ID results. Second, recordings identified as *Pipistrellus kuhlii/nathusii* are grouped together in the manual analysis, contributing 21.08% of the total, while in the Auto-ID, *Pipistrellus kuhlii* and *Pipistrellus nathusii* are recorded separately, with much lower combined percentages. Third, the Noctule (*Nyctalus noctula*), the

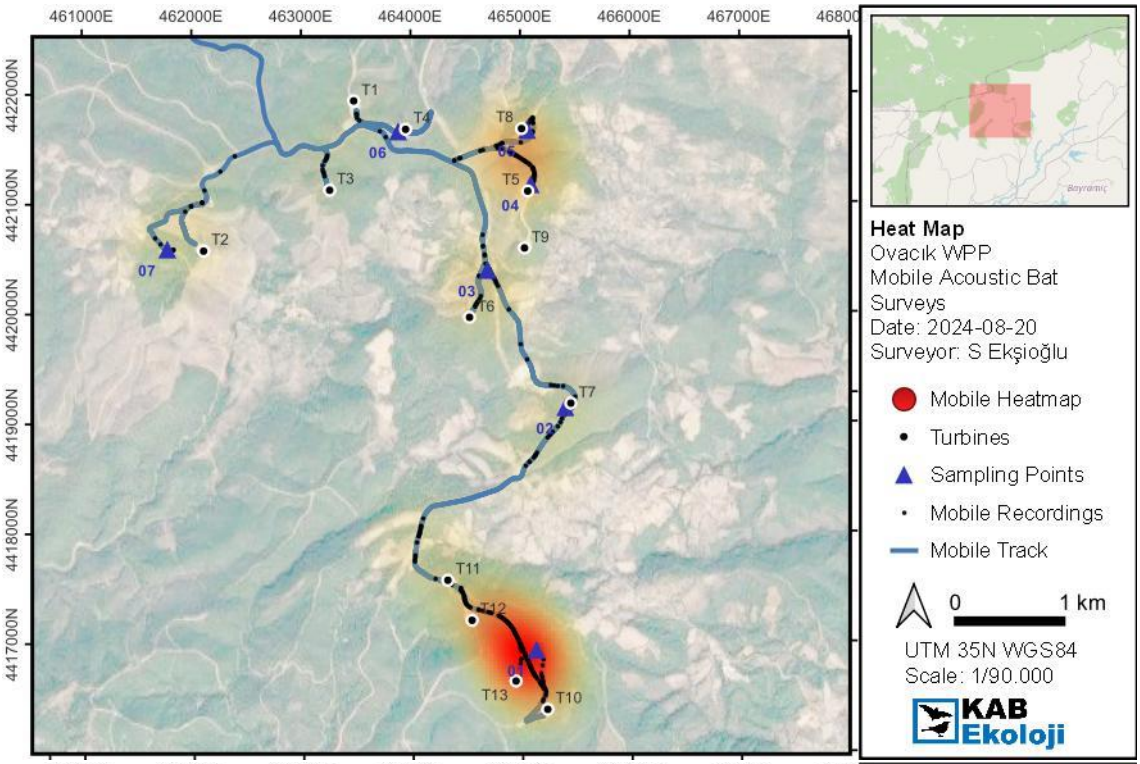
second most common species in Auto-ID with 14.82%, is much less prominent in the manual analysis, comprising only 0.38% of the total recordings. (Table 4-61)

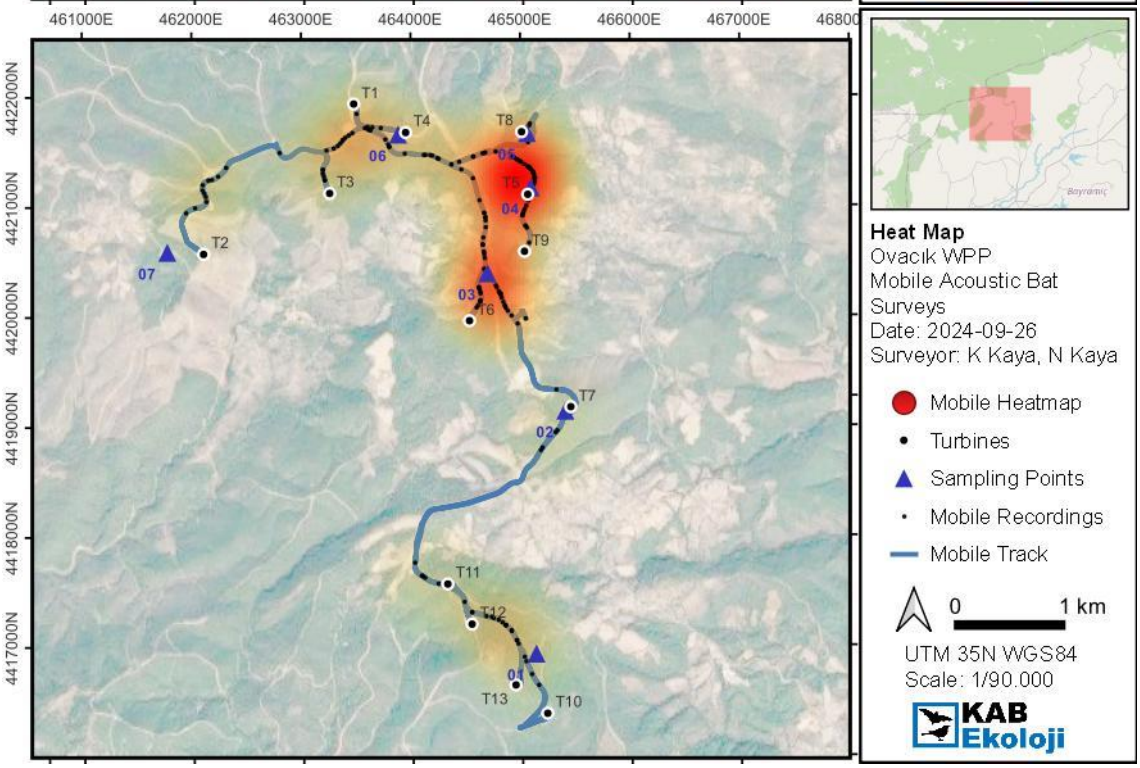
Table 4-61 Bat groups and species recorded during mobile surveys based on Manual ID results

Group	Species	IUCN	06_M1a	06_M1b	08_M1a	08_M1b	09_M1a	09_M1b	Total	Percent
Pipistrelloid	PIPPIP	LC	45	87	85	194	125	111	647	61.15%
Pipistrelloid	PIPKUH/PIPNAT	-	21	23	57	106	9	7	223	21.08%
Pipistrelloid	MINSCH	VU	7	10	19	33	28	10	107	10.11%
Pipistrelloid	HYPSAV	LC	0	0	0	2	1	1	4	0.38%
Nyctaloid	NYCLEI	LC	2	3	0	4	2	1	12	1.13%
Nyctaloid	EPTSER	LC	0	4	6	0	0	0	10	0.95%
Nyctaloid	NYCNOC	LC	0	2	2	0	0	0	4	0.38%
Nyctaloid	NYCLAS	VU	0	0	0	0	3	0	3	0.28%
Tadarida	TADTEN	LC	0	0	1	1	0	1	3	0.28%
Plecotus	PLESPE	NA	0	0	0	0	9	31	40	3.78%
Myotis	MYOSPE	NA	0	0	0	1	1	0	2	0.19%
Barbastella	BARBAR	VU (E)	0	0	0	3	0	0	3	0.28%
Total	-	-	75	129	170	344	178	162	1058	-

Heat maps for summer and autumn are shown on Figure 4-8.




461000E
462000E
463000E
464000E
465000E
466000E
467000E
4422000N
4421000N
4420000N
4419000N
4418000N
4417000N
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
T13
01
02
03
04
05
06
07
Heat Map
Ovacık WPP
Mobile Acoustic Bat Surveys
Date: 2024-08-20
Surveyor: S Ekşioğlu
Mobile Heatmap
Turbines
Sampling Points
Mobile Recordings
Mobile Track
0
1 km
UTM 35N WGS84
Scale: 1/90.000
KAB Ekoloji


461000E
462000E
463000E
464000E
465000E
466000E
467000E
4422000N
4421000N
4420000N
4419000N
4418000N
4417000N
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
T13
01
02
03
04
05
06
07
Heat Map
Ovacık WPP
Mobile Acoustic Bat Surveys
Date: 2024-09-26
Surveyor: K Kaya, N Kaya
Mobile Heatmap
Turbines
Sampling Points
Mobile Recordings
Mobile Track
0
1 km
UTM 35N WGS84
Scale: 1/90.000
KAB Ekoloji

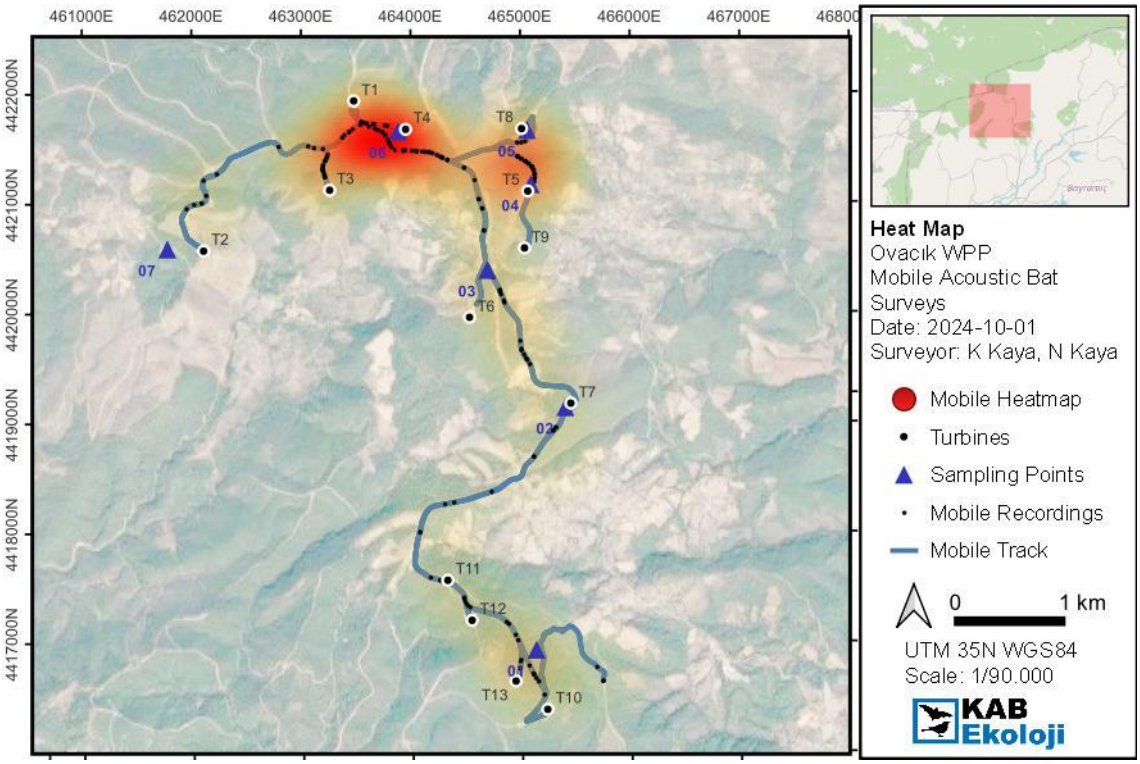


Figure 4-8 Heat maps from transect surveys.

5 Discussion

5.1 Flora

- The field study identified a total of 1 potential regional endemic plant species.
- *Crocus candidus* is a regional endemic species, occurring in the provinces of Çanakkale and Balıkesir within Türkiye. The species is classified under the TRDB Threatened category as "VU: Vulnerable." The location specified for the studies prior to 2024 is not impacted by the project footprint. Therefore, it was concluded that there will be no direct loss of individuals due to the project. Suitable habitats for the species are extensive in the region. It is likely that the species will be detected in other areas within the project impact zone in the coming years. Hence, it is recommended to continue population monitoring within the impact area, particularly concerning dust impact and the risk of invasive species.
- There is no data different for other flora species from which was identified in the local EIA process for the ETL and access road, and no endangered plant species are present in these locations.

5.2 Terrestrial Mammal

- The sensitivity of the terrestrial fauna within the project area, as assessed in the ESIA, has been categorized as low. Given the mitigation measures outlined in the ESIA, no significant impacts are expected on terrestrial fauna due to the project operational activities. Additionally, the monitoring schedule proposed in BMP will enable the assessment of long-term effects on terrestrial fauna during the operational phase. This monitoring framework will allow for the identification and addressing of any potential ecological disturbances over time. Based on the current evaluation and mitigation strategies, the project is not expected to cause any lasting or significant impact on the terrestrial mammal.
- Two mammal species that may potentially be found in the area and are classified as VU (Vulnerable) by the IUCN, namely *Myomimus roachi*, *Vormela peregusna*. . *Capreolus capreolus,* is one of the important mammal species. Although its status is Least Concern, this species is considered to have national importance. *Ursus arctos* is Least Concern (LC) globally and in Europe, but Vulnerable in the Mediterranean. All these species have been recorded as literature.
- The monitoring period and frequency for the mammal species: should be conducted annually during the operational phase, specifically for 10 days each in April, May, and June.

5.3 Herpetofauna

- The sensitivity of the herpetofauna, as determined in the ESIA, has been classified as low. With the implementation of the impact mitigation measures outlined in the ESIA, the significance of potential impacts on herpetofauna is considered negligible. Monitoring schedule provided in the BMP will facilitate the assessment of long-term effects on herpetofauna during the operational phase. Based on the available data and the mitigation measures in place, no significant or lasting impacts on herpetofauna are anticipated because of the project.
- Among the reptiles identified in the project area and its surroundings, ıt is recommended to relocate the species Testudo graeca, which was detected in the field,

Additionally, if the species is identified within the project area, translocation (relocation) efforts should be carried out.

- The ESIA demonstrates that the impacts on herpetofauna are expected to be minor. Moreover, the implementation of the BMP actions will be sufficient to address and mitigate any potential effects.

5.4 Bird

For spring VP surveys, an average of 37 hours has been spent at three vantage points for bird surveys. A total of 60 birds were counted during the observations, comprising 4 migrant birds and 52 resident birds. Among these observed birds, only 36 passed through the risk zone of the wind farm. The collision risk modelling for spring indicated a low rate of 0.03 and 0.08 for migrant and resident birds, respectively.

For summer VP surveys, an average of 38 hours has been spent at three vantage points for bird surveys. A total of 44 birds were counted during the observations, comprising 5 migrant birds and 38 resident birds. Among these observed birds, only 28 passed through the risk zone of the wind farm. The collision risk modelling for summer indicated a low rate of 0.03 and 0.06 for migrants and resident birds, respectively.

For autumn VP surveys, an average of 38 hours has been spent at three vantage points for bird surveys. A total of 44 birds were counted during the observations, comprising 22 migrant birds and 18 resident birds. Among these observed birds, only 15 passed through the risk zone of the wind farm. The collision risk modelling for autumn indicated a low rate of 0.01 and 0.02 collisions for migrant and resident birds, respectively.

The bird survey conducted at the Project indicates minimal migration movement, with only limited activity observed. Calculated collision risk for migrating birds for 2024 study period was low as well. The project is also known to be sufficiently distanced from known major flyways for migratory soaring birds and is likely sufficiently distanced from the Dardanelles route as well.

The collision risk modelling for all seasons indicated a relatively low rate for migrant and resident species. Resident Common Buzzard had the highest overall annual collision risk at a rate of 1 bird per 10 years at the project level.

The most frequently observed species were the Common Buzzard (*Buteo buteo*), Short-toed Snake-Eagle (*Circaetus gallicus*), and Eurasian Sparrowhawk (*Accipiter nisus*). The collision risk for all birds was calculated at 0.22 birds over three seasons, potentially increasing to 0.3 to 0.4 birds annually based on activity fluctuations and potential winter activity.

The survey did not record any globally threatened species; only common birds were noted. The verbal communication with national experts (Biol. Özmen Yeltekin and Biol. Cansu Özcan) indicates that there are no globally threatened Eastern Imperial Eagle breeding near the site.

During VP ETL surveys, all the observed species are classified as Least Concern (LC). Bird observations along the electric transmission line indicate that bird passages are low. Given the current data, there are no additional mitigation recommendations for the ETL.

During the breeding bird surveys, the majority of observed species are classified as Least Concern (LC) and are both common and widespread. The only globally threatened species recorded was the European Turtle Dove (*Streptopelia turtur*). Despite its status, this species is common and widespread in Türkiye and is known for its fast and low flight, which reduces its susceptibility to turbine collisions, as supported by carcass search data in Türkiye. This species will be discussed in further detail at the final report.

Additive Collision Risk Assessment (Project Galeforce)

Additive collision risk evaluation for Project Galeforce established from the 2024 baseline collection estimated the yearly total target species collision risk at 14 birds for the study period (spring, summer, autumn). The results indicate that about 11% of the collision risk was driven by migrant activity, while 80% of migrant collision risk was attributed to autumn period movement as opposed to spring migration. This finding is congruent with literature information regarding spring and autumn movement across Anatolia. Whereas spring movement occurs in a more concentrated manner spatially and temporally, autumn movement is usually more dispersed both over autumn period and geographically.

Interestingly, due to the correlation with autumn migrant activity, the project which accounted for the most estimated migrant risk was Uygar, followed by a three-way tie between Armutçuk, Ihlamur and Kestanederesi. Due to the massive area that over which Uygar spreads, its higher proportion in total migrant risk makes sense. Harmancık receiving little migratory activity and accounting for low risk this year was the least expected result, however Harmancık is indeed distinct in the sense that it is the only project where the percentage of migrant risk overall is approximately 50%, while others are lower, meaning risk at Harmancık is more so driven by migrants than any other project. This is significant due to the year-on-year variations in migratory rates over minor routes, which are not as consistently active each year as the major routes are, however can exhibit bursts of activity over some years. This is one of the reasons long-term monitoring datasets are crucial.

For residents, approximately half of the collision risk is attributed to summer season while spring and autumn are more or less equivalent. In terms of species, Common Buzzard, Short-toed Snake Eagle and Eurasian Kestrel, which are common, abundant, breeding raptors, topped the collision risk estimations and accounted for approximately 65% of the estimated risk for residents. These species are expected to continue to be active post-construction due to the habituation effect, and many of the projects providing adequate habitat for feeding and opportunities for perching. Additionally, Eleanora’s Falcon activity will continue to be associated with late-summer and autumn passerine migration movement, since their breeding activity is reliant on the food source represented by migrant passerines in autumn. The species is also an indirect indicator of passerine migration at each project and wherever they are active can be assumed to be significant fly-over and/or rest habitats for songbirds.

Two further considerations are pertinent for the additive collision risk evaluation. (1) Regarding substitution of data for Hacıhıdırlar, if summer and autumn are assumed homogenous with spring, the overall results are not altered much. However, if resident bird species are relatively more active over the summer, or if autumn migratory movement is similarly moderate like with some other projects, this has the potential to have a medium level of influence on the overall picture, which is the more likely case. Operation phase monitoring and management may require a more pro-active approach due to baseline data gaps. Scheduling additional baseline collection study, while ensuring its smooth implementation ahead of construction is another option.

The second consideration is that (2) the baseline does not account for winter activity. As previously mentioned, target species activity in the WPP airspaces are generally expected to be diminished, though not non-existent. For some projects near important wetlands, such as Akköy and Ihlamur, wintering waterbird and wetland associating raptor activity might be a concern and these are discussed in respective final baseline reports. If winter activity is factored in as about the same as overall spring collision risk (which would indicate the maximum expected risk level), overall target species mortality for Project Galeforce would be contained within the range of 14-17 birds annually.

5.5 Bat

The methodology was applied effectively, and the results appear reliable. The survey confirmed that the equipment was deployed successfully, and recordings were completed across all seasons. The NatureScot methodology demonstrated that the 10-day monitoring period is effective. Drastic changes in bat call recordings across days highlighted significant fluctuations in bat activity.

During the spring survey, only 3 out of 7 detectors were functional during the final days of the study. In the summer survey, all were operational, while in the autumn survey, 6 out of 7 detectors functioned properly until the end of the monitoring period.

During the analyses, it was observed that some recorders have failed and that they stopped recording on some nights. For instance, while the detector may have failed on nights 3 or 4, it successfully recorded on night 5, indicating that the problem is not consistent or related to external factors such as battery life or fieldwork mishandling.

The timing of the surveys did not fully align with the actual spring period. The project site, located in the northern half of Türkiye, experiences a delayed arrival of spring, particularly at higher elevations. In most cases, surveys could not begin before mid-June in this region. However, collecting additional data during April and May would offer a more understanding of bat populations and their activity levels in the area.

The highest bat activity was recorded in specific areas of the wind farm, particularly at SP4 and SP7.

In spring and summer seasons, activity peaks were noted for early morning, with spring peak being closer to dawn than the summer peak. In autumn no clear peak in activity was discerned from 2024 results.

Transect surveys conducted during summer and autumn confirmed extremely similar findings, with high bat activity recorded at SP1 and SP4 with some additional activity zone near at SP2. This is the area near the bat roost at the cave surveyed. The cave has important populations of Schreiber's Bent-winged Bat (*Miniopterus schreibersii*).

In Türkiye, assessing the risk level of a wind turbine is challenging due to the lack of datasets and analytical ecological studies on bat population sizes. Based on ground static acoustic monitoring methodology, an indirect measure of activity levels is obtained in terms of recording numbers per unit time, which is not equivalent to number of individuals, yet is still a useful measure for gauging relative activity. The activity level, on average, is in the range of 100-200 recordings / night / turbine for the Project in the spring season, 200-300 recordings / night / turbine in summer, and 200-300 recordings / night / turbine in autumn.

During spring, the Common Pipistrelle (*Pipistrellus pipistrellus*) accounted for 45% of the total recordings, making it the most frequently observed species. The Schreiber's Bent-winged Bat (*Miniopterus schreibersii*), a globally vulnerable species, was the second most abundant, contributing 19% of the total activity. The Lesser Noctule (*Nyctalus leisleri*) also represented 19%, highlighting its significant presence during this season. Other species were recorded in smaller proportions, demonstrating the area's diverse bat population.

During summer, the Common Pipistrelle (*Pipistrellus pipistrellus*) dominated the bat activity, accounting for 58% of the total recordings. Kuhl’s Pipistrelle (*Pipistrellus kuhli*) and Nathusius' Pipistrelle (*Pipistrellus nathusii*) together made up 27%, showing significant activity during this season. The Schreiber's Bent-winged Bat (*Miniopterus schreibersii*), a globally vulnerable species, contributed 6%, while the Lesser Noctule (*Nyctalus leisleri*) represented 4%.

During autumn, the Common Pipistrelle (Pipistrellus pipistrellus) was the most abundant species, accounting for 63% of the total recordings. Kuhl's Pipistrelle (*Pipistrellus kuhli*) and Nathusius' Pipistrelle (*Pipistrellus nathusii*) collectively contributed 14%, while the Schreiber's Bent-winged Bat (*Miniopterus schreibersii*), a globally vulnerable species, made up 8% of the activity. The Lesser Noctule (*Nyctalus leisleri*) represented 6%, showing a moderate presence.

Two globally threatened species, the Schreiber's Bent-winged Bat (*Miniopterus schreibersii*), classified as Vulnerable and requiring conservation attention, comprised approximately 6–18% of the recorded bats, representing a notably high proportion. Additionally, the Giant Noctule (*Nyctalus lasiopterus*) was detected in noteworthy numbers. The presence of *Miniopterus schreibersii* suggests the existence of caves in the Project AoI, while *Nyctalus lasiopterus* is tied to presence of old-growth forest habitats with cavity-bearing trees. Both features are critical for bat conservation in the region, underscoring the ecological importance of these habitats.

5.6 Monitoring and Mitigation Implications

- Flora: The monitoring actions outlined in the BMP should be implemented, and the current status should be presented and evaluated in progress reports.
- Habitats: All natural habitats, including access roads and ETL areas should be monitored for disturbances, with BMP actions implemented and progress evaluated in reports.
- Birds: No additional monitoring and mitigation implications than for which commitments have already been established are indicated for bird species based on baseline results.
    - Operation phase VP and breeding bird / raptor monitoring, collision risk estimates, post-construction fatality monitoring will further inform adaptive management.
- Bats:
    - If additional bat roosts are discovered during operation phase monitoring within the AoI, these will need to be included in bat surveys, and CHA and BMP should be revised based on survey results, if needed.
    - Since the AoI is utilized by woodland bat species, and since it is uncertain how much functional bat habitat was lost during the tree cutting phase for the project, the Project Company should consider compensating for habitat loss impact on bats. The Project Company should identify suitable areas away from collision risk, potentially within the license area, to install bat boxes. This effort should be coordinated with DKMP and General Directorate of Forestry (OGM).
- Fauna: The monitoring actions outlined in the BMP should be implemented, with progress reports evaluating the status vulnerable mammal species and national importance.
- Herpetofauna: The monitoring actions outlined in the BMP should be implemented, with progress reports evaluating the status of *Testudo graeca*, a potentially present vulnerable reptile species.

6 Appendix

6.1 Literature for Flora Surveys

Akman, Y. 1995. Turkiye Orman Vejetasyonu (Forest Vegetation of Turkey). Ankara Univ. Fen Fak. Yayınları: Ankara.

Atalay İ. 1990. Vejetasyon Çoğrafyasınını Esasları. Dokuz Eylül Ü. Basımevi. İzmir

Davis, P.H. (ed.). (1965-1988). Flora of Turkey and the East Aegean Islands, vol. 1-10, Edinburgh Univ. Press: Edinburgh.

Ekim, T. et al. (2000). Turkiye Bitkileri Kirmizi Kitabi (Red Data Book of Turkish Plants). Turkiye Tabiatını Koruma Dernegi. Yayın No:18.

Güner, A., Aslan, S., Ekim, T., Vural, M., Babaç, M.T., (edlr.), (2012). Türkiye Bitkileri Listesi (Damarlı Bitkiler). Nezahat Gökyiğit Botanik Bahçesi ve Flora Araştırmaları Derneği Yayını. İstanbul.

Güner, A., Özhatay, N., Ekim, T., Başer, K.H.C (eds.), Flora of Turkey and The East Aegean Islands, Vol. 11, at the Universty Press, 2000, (Edinburgh).

Özhatay, N., Byfield, A., Atay, S. (2003). Türkiye'nin Önemli Bitki Alanları. WWF Türkiye (Doğal Hayatı Koruma Vakfı), İstanbul.

https://www.iucnredlist.org/

http://www.theplantlist.org/

https://powo.science.kew.org/

https://www.ipni.org/

https://www.keybiodiversityareas.org

https://bizimbitkiler.org.tr/list.html

6.2 Literature for Terrestrial Mammal Surveys

Demirsoy, A. (1996). Türkiye Omurgalıları. Memeliler. Türkiye Omurgalı Faunasının Sistematik ve Biyolojik Özelliklerinin Araştırılması ve Koruma Önlemlerinin Saptanması. (1-292). Ankara.

Hotker, H., Thomsen, K.M. And Koster, H. 2005. İmpacts on biodiversity of exploitation of renewable energy sources: the example of birds and bats-facts, gaps in knowledge, demands for further research, and ornithological guidelines for the development of renewable energy exploitation. Michael Otto Institut im NABU, Bergenhusen.

IUCN Species Survival Commission (2019). Guidelines for using the IUCN Red List Categories and Criteria. Ver. 19.2. Prepared by the Standards and Petitions Working Group of the IUCN SSC Biodiversity Assessment Sub-Committee in 2019.

Yiğit, N., Çolak, E., Sözen, M., Karataş, A. (2006a). Rodents of Türkiye (Türkiye Kemiricileri). (Ed. Ali Demirsoy). Meteksan Co. Ankara. 1-154.

İlemin, Y., & Gürkan, B. (2010). Status and activity patterns of the Caracal, *Caracal caracal* (Schreber, 1776), in Datça and Bozburun Peninsulas, Southwestern Turkey: (Mammalia: Felidae). *Zoology in the Middle East*, *50*(1), 3–10. https://doi.org/10.1080/09397140.2010.10638405

İlemin, Y. (2014). A camera trapping survey reveals a melanistic Grey Wolf (*Canis lupus*) in an unusual habitat in Turkey (Mammalia: Carnivora). *Zoology in the Middle East*, *60*(1), 1–5. https://doi.org/10.1080/09397140.2014.892299

Selçuk, A. Y., & Kefelioğlu, H. (2024). Anomalous fur colouration in eight small mammal species from Türkiye. *Zoology in the Middle East*, *70*(3), 192–199. https://doi.org/10.1080/09397140.2024.2392384

Y. İlemin, “Muğla İli Memeli Faunasına Katkılar”, *Bitlis Eren Üniversitesi Fen Bilimleri Dergisi*, vol. 9, no. 3, pp. 1153–1165, 2020, doi: 10.17798/bitlisfen.688504.

Schöll, E. M., & Nopp-Mayr, U. (2021). Impact of wind power plants on mammalian and avian wildlife species in shrub- and woodlands. *Biological Conservation*, *256*, 109037.

Gasparatos, A., Doll, C. N., Esteban, M., Ahmed, A., & Olang, T. A. (2017). Renewable energy and biodiversity: Implications for transitioning to a Green Economy. *Renewable and Sustainable Energy Reviews*, *70*, 161-184.

https://www.tarimorman.gov.tr/DKMP/Belgeler/MEVZUAT/Uluslararas%C4%B1%20S%C3%B6zle%C5%9Fmeler/2%20BERN%20S%C3%96ZLE%C5%9EMES%C4%B0.pdf

https://www.tarimorman.gov.tr/DKMP/Belgeler/MEVZUAT/Uluslararas%C4%B1%20S%C3%B6zle%C5%9Fmeler/5%20C%C4%B0TES%20S%C3%96ZLE%C5%9EMES%C4%B0.pdf

https://www.iucnredlist.org/

https://www.keybiodiversityareas.org

https://www.tramem.org/

6.3 Literature For Herpetofauna Surveys

Baran İ, Atatür, MK 1998. Türkiye Herpetofaunası, 214 s. ISBN 975-7347-37-X, Çevre Bakanlığı, Ankara, Türkiye.

Baran, İ, 2005. Türkiye Ampfibi ve Sürüngenleri, 165 s. ISBN 975-403-356-0, Tübitak Popüler Bilim Kitapları 207 Başvuru Kitaplığı 21, Ankara, Türkiye

Baran, İ. & Gruber, U. (1982). Taxonomische Untersuchungen An Türkischen Gekkoniden. Spixiana, 5 (2): 109-138.

Baran, İ. (1976). Türkiye Yılanlarının Taksonomik Revizyonu ve Coğrafi Dağılışları, 177 s., Tübitak Yayınları No: 309, Ankara, Türkiye

Baran, İ. (1982). Batı ve Güney Anadolu Ophisops elegans populasyonlarının taksonomik durumu. Tr j Zoology, 6 (2) 19-26

Baran, İ., 2005. Amphibians and Reptilians of Türkiye, Tübitak Popular Science Books, 1-165.

Baran, İ., Atatür, M.K., 1998. Herpetofauna of Türkiye, (Frog and Reptiles). Ministry of Environment, 1-214.

Baran, İ., Ilgaz, Ç., Avcı, A., Kumlutaş, Y., Olgun, K., 2012. Amphibians and Reptilians of Türkiye, Tübitak, 1-204.

Başoğlu M, Özeti N., Yılmaz, İ. 1994. Türkiye Amfibileri Genişletilmiş 2. Baskı 212s. Ege Üniversitesi Fen Fakültesi Kitaplar Serisi,no: 151, İzmir, Türkiye

Başoğlu, M. & Baran, İ. (1998). Türkiye Sürüngenleri Kısım II. Yılanlar. 218 s., ISBN 975-483-335-4, Ege Üniversitesi Fen Fakültesi Kitaplar Serisi No: 81, İzmir, Türkiye.

Başoğlu, M. & Baran, İ., 1977. Reptiles of Türkiye, I, Turtles and Lizards, Faculty of Science Books Series, İzmir, No 76, S. 1-260.

Başoğlu, M. & Baran, İ., 1980. Reptiles of Türkiye Part II, Snakes, Faculty of Science Books Series, İzmir, No 81, S. 1-218.

Başoğlu, M. & Özeti, N., 1973. Amphibians of Türkiye, Ege University, Faculty of Science Books Series, İzmir, No 50: 1-155.

Başoğlu, M., Özeti, N., Yılmaz, İ., 1994. Amphibians of Türkiye, Ege University, Faculty of Science Books Series, İzmir, No 151: 1-221.

https://www.iucnredlist.org/

https://www.keybiodiversityareas.org

http://www.turkherptil.org/Default.asp

6.4 Literature for Bird Surveys

Atienza J.C., Fierro I.M., Infante O., Valls J. and Domínguez J. (2014). Directrices para la evaluacíon del impacto de los parques eólicus e naves y murciélagos (v. 3, in Spanish) *SEO/BirdLife Madrid* (translated into English as Guidelines for Assessing the Impact of the Wind Farms on Birds and Bats (v. 4)).

BirdLife International (2018). Pelecanus crispus (amended version of 2017 assessment). The IUCN Red List of Threatened Species 2018. Accessed on 30 June 2024: dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T22697599A122838534.en.

Boyla, K. A., Sinav, L., & Dizdaroğlu, D. E. (2019). Türkiye üreyen kuş atlası. WWF-Türkiye, Doğal Hayatı Koruma Vakfı, İstanbul, 86.

European Bank for Reconstruction and Development (2022). EBRD Performance Requirement 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources Guidance Note. (Downloaded on 11 July 2023).

Eken G., Bozdoğan M., İsfendiyaroğlu S., Kılıç D.T., Lise Y. (2006). Key biodiversity areas of Turkey. Kitap Yayınevi, Ankara

International Finance Corporation (2012). Performance Standard 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources. (ifc.org/wps/wcm/connect/topics ext content/ifc external corporate site/sustainability-at-ifc/policies-standards/performance-standards/ps6). (Downloaded on 11 July 2023)

Kılıç D.T., Eken G. (2004). Türkiye'nin Önemli Kuş Alanları-2004 Güncellemesi. Doğa Derneği, Ankara, Türkiye.

NatureScot (2000). Wind Farm Impacts on Birds - Calculating a Theoretical Collision Risk Assuming No Avoiding Action. (www.nature.scot/wind-farm-impacts-birds-calculating-theoretical-collision-risk-assuming-no-avoiding-action)

NatureScot (2009). Guidance Note – Guidance on Methods for Monitoring Bird Populations at Onshore Windfarms. (www.nature.scot/guidance-note-methods-monitoring-bird-populations-onshore-windfarms)

NatureScot (2017). Guidance Note - Recommended Bird Survey Methods to Inform Impact Assessment of Onshore Wind Farms (v. 2). (www.nature.scot/recommended-bird-survey-methods-inform-impact-assessment-onshore-windfarms)

NatureScot (2018). Avoidance Rates for the onshore NatureScot Wind Farm Collision Risk Model (v.2). (www.nature.scot/wind-farm-impacts-birds-use-avoidance-rates-snh-wind-farm-collision-risk-model)

R Core Team (2023). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. (available at: R-project.org/)

World Bank Group (2015). Environmental, Health, And Safety Guidelines for Wind Energy. (www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_policy_ehs-wind_energy)

References of the Software:

Garrett Grolemund, Hadley Wickham (2011). Dates and Times Made Easy with lubridate. Journal of Statistical Software, 40(3), 1-25. URL https://www.jstatsoft.org/v40/i03/.

H. Wickham. ggplot2: Elegant Graphics for Data Analysis. Springer-Verlag New York, 2016.

Pebesma, E., & Bivand, R. (2023). Spatial Data Science: With Applications in R. Chapman and Hall/CRC. https://doi.org/10.1201/9780429459016

Pebesma, E., 2018. Simple Features for R: Standardized Support for Spatial Vector Data. The R Journal 10 (1), 439-446, https://doi.org/10.32614/RJ-2018-009

R Core Team (2024). _R: A Language and Environment for Statistical Computing_. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org.

Wickham H (2023). *stringr: Simple, Consistent Wrappers for Common String Operations*. R package version 1.5.1, https://CRAN.R-project.org/package=stringr.

Wickham H, François R, Henry L, Müller K, Vaughan D (2023). *dplyr: A Grammar of Data Manipulation*. R package version 1.1.4, https://CRAN.R-project.org/package=dplyr.

Wickham H, Vaughan D, Girlich M (2024). *tidyr: Tidy Messy Data*. R package version 1.3.1, https://CRAN.R-project.org/package=tidyr.

6.5 Literature for Bat Surveys

Atienza J.C., Fierro I.M., Infante O., Valls J. and Domínguez J. (2014). Directrices para la evaluacíon del impacto de los parques eólicus e naves y murciélagos (v. 3, in Spanish) SEO/BirdLife Madrid (translated into English as Guidelines for Assessing the Impact of the Wind Farms on Birds and Bats (v. 4)).

Barataud M. (2015). Acoustic ecology of European bats. Species identification and studies of their habitats and foraging behaviour. Biotope Editions, Mèze.

Dietz C., and Kiefer A. (2014). Die Fledermäuse Europas: kennen, bestimmen, schützen. Kosmos.

European Bank for Reconstruction and Development (2022). EBRD Performance Requirement 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources Guidance Note. (Downloaded on 11 July 2023).

Eken G., Bozdoğan M., İsfendiyaroğlu S., Kılıç D.T., Lise Y. (2006). Key biodiversity areas of Turkey. Kitap Yayınevi, Ankara

International Finance Corporation (2012). Performance Standard 6 Biodiversity Conservation and Sustainable Management of Living Natural Resources. (ifc.org/wps/wcm/connect/topics ext content/ifc external corporate site/sustainability-at-ifc/policies-standards/performance-standards/ps6). (Downloaded on 11 July 2023)

IUCN Red List of Threatened Species (2008). Digital Distribution Maps of Bat (Chiroptera) in Turkey.

Kılıç D.T., Eken G. (2004). Türkiye'nin Önemli Kuş Alanları-2004 Güncellemesi. Doğa Derneği, Ankara, Türkiye.

NatureScot (2021). Bats and onshore wind turbines - survey, assessment and mitigation.v August 2021.

R Core Team (2023). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. (available at: R-project.org/)

Rodrigues L., Bach L., Dubourg-Savage M.J., Karapandža B., Kovač D., Kervyn T., ... and Mindermann J. (2014). Guidelines for consideration of bats in wind farm projects, Revision 2014. EUROBATS Publication Series No. 6. Bonn: UNEP/EUROBATS Secretariat.

Russ J. (1999). The bats of Britain and Ireland. Echolocation calls, sound analysis and species identification. Newtown: Alana Books, 102.

World Bank Group (2015). Environmental, Health, And Safety Guidelines for Wind Energy. (www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_policy_ehs-wind_energy)

6.6 Bird Survey Conditions

Spring

Date	Surveyor	VP	Cloud %	WindDir	WindSp (m/s)	Prec (mm)	Temp (°)	Vis (km)
29/03	MÜ	VP1	0	W	1	02:10	22	8
30/03	MÜ	VP2	0	SW	2	02:10	21	8
30/03	YÖG	VP1	20	SW	2	0	29	8
02/05	YÖG	VP2	70	N	3	04:00	18	0,5
02/05	NY	VP3	70	N	3	-	18	15
03/05	YÖG	VP2	70	SW	6	00:05	17	0,5
03/05	NY	VP3	60	SW	4	-	18	20
05/05	YÖG, MÜ	VP1	50	NE	8	00:25	16	0,5
06/06	YÖG	VP2	10	NE	3	00:03	31	12
06/06	NY	VP3	10	NE	2	-	31	15
07/06	YÖG, MÜ	VP2	60	NE	7	-	27	15
07/06	MÜ	VP1	20	NE	6	-	29	20
07/06	NY	VP3	40	NE	5	-	28	20
08/06	YÖG, MÜ	VP1	0	NE	7	-	28	20
08/06	NY	VP3	40	NE	5	-	28	20
09/06	MÜ & YÖG	VP1	10	NE	6	-	29	20
09/06	NY	VP3	40	NE	4	-	28	20

Summer

Date	Surveyor	VP	Cloud %	WindDir	WindSp (m/s)	Prec (mm)	Temp (°)	Vis (km)
27/06	NY	VP3	0	NE	5	-	28	15
28/06	NY	VP3	50	NE	6	-	26	15
29/06	YÖG, MÜ	VP2	40	NE	8	-	26	20
29/06	NY	VP1	40	NE	6	-	28	20
30/06	YÖG, MÜ	VP2	10	NE	7	-	27	20
30/06	NY	VP1	20	NE	8	-	28	20
30/07	YÖG, MÜ	VP3	40	NE	6	-	29	20
31/07	NY	VP3	10	NE	6	-	29	20
01/08	YÖG, MÜ	VP2	0	NE	5	-	28	20
01/08	NY	VP1	0	NE	5	-	28	20
02/08	MÜ, YÖG	VP1	0	NE	4	-	30	20
02/08	NY	VP2	0	NE	4	-	30	20
20/08	Sİ	VP3	0	SE	8	-	34	20
21/08	Sİ	VP3	80	ENE	11	-	29	20
22/08	Sİ	VP1	10	NE	10	-	31	20
22/08	MÜ, CÖ	VP2	0	NE	4	-	31	20
23/08	MÜ, CÖ	VP1	10	NE	6	-	30	20
23/08	Sİ	VP2	10	NW	14	-	30	20

Autumn

Date	Surveyor	VP	Cloud %	WindDir	WindSp (m/s)	Prec (mm)	Temp (°)	Vis (km)
20/09	NY	VP3	70	NE	4	-	23	15
21/09	MÜ, YÖG	VP3	90	NE	5	2	20	15
22/09	MÜ, YÖG	VP1	60	NE	6	-	24	15
22/09	NY	VP2	30	NE	6	-	24	20
23/09	MÜ, YÖG	VP1	30	N	3	-	24	15
23/09	NY	VP2	40	N	3	-	24	20
14/10	NY	VP3	80	NE	3	-	21	20
15/10	YÖG, MÜ	VP3	20	NE	4	-	20	20
16/10	NY	VP1	50	NE	7	-	23	20
16/10	MÜ	VP2	10	NE	6	-	21	20
17/10	NY	VP1	80	NE	6	-	17	20
17/10	MÜ	VP2	80	NE	6	-	16	20
09/11	NY	VP3	50	NE	6	-	15	20
10/11	MÜ, YÖG	VP3	100	NE	5	-	10	10
11/11	NY	VP1	80	E	4	-	13	20
11/11	YÖG, MÜ	VP2	100	NE	4	-	12	10
12/11	NY	VP1	90	NE	3	-	14	20
12/11	MÜ, YÖG	VP2	90	NE	3	-	14	10

6.7 Bird Observation Data

Sample rows from the Project bird data table is provided. Total duration of flight is noted as Dur. The height intervals are below the rotor height (a), at rotor height (b) and above the rotor height (c). Spec* abbreviations follow first three letters of genus name and first two letters of species name convention (for example, *Cirga denotes* and *Circaetus gallicus*).

Spring

Date	VP	Time	Spec*	Number	Dur (sec)	Flight_Height	Behaviour	Status
29/03	VP1	15:32	Butbu	2	45	ccc----------	soaring	Resident
29/03	VP1	15:54	Butbu	1	120	bccccccc----------	soaring	Resident
30/03	VP2	11:49	Butbu	1	75	ccccc----------	soaring	Resident
30/03	VP2	12:45	Butbu	1	60	babb----------	soaring	Resident
30/03	VP1	11:47	Accni	1	75	ccccc----------	migrating	Migrant
30/03	VP1	12:57	Accni	1	45	cbc----------	migrating	Migrant
30/03	VP1	13:24	Accni	1	120	ccbbbbcc----------	migrating	Migrant
30/03	VP1	15:01	Cirga	1	180	ccccccccccc--------	hunting/foraging	Resident
30/03	VP1	17:11	Cirga	1	30	cb----------	hunting/foraging	Resident
02/05	VP2	10:33	Hiepe	1	120	bbbccccc----------	migrating	Migrant
02/05	VP2	11:59	Butbu	1	75	aaaba----------	soaring	Resident
02/05	VP2	12:17	Butbu	2	120	bbccccc----------	soaring	Resident
02/05	VP2	12:17	Accxx	1	15	c----------	soaring	U
02/05	VP2	12:48	Accxx	1	15	a----------	patrolling	U
03/05	VP2	11:22	Butbu	1	15	a----------	patrolling	Resident
03/05	VP2	12:35	Cirga	1	150	cbabccccca----------	other	Resident
03/05	VP2	13:33	Butbu	1	15	a----------	patrolling	Resident
03/05	VP2	14:35	Falsp	1	30	cc----------	soaring	U
05/05	VP1	13:36	Butbu	1	150	ccccccccc----------	soaring	Resident
05/05	VP1	13:38	Butbu	1	60	cccc----------	soaring	Resident
05/05	VP1	15:33	Falsp	1	30	bc----------	soaring	U
…								

Summer

Date	VP	Time	Spec*	Number	Dur (sec)	Flight_Height	Behaviour	Status
29/06	VP2	09:57	Cirga	1	75	bcccc----------	patrolling	Resident
29/06	VP2	10:51	Accxx	1	15	a----------	other	U
29/06	VP2	13:06	Cirga	1	30	cc----------	other	Resident
29/06	VP2	13:48	Butbu	1	30	ca----------	other	Resident
29/06	VP2	15:23	Cirga	1	120	abbbcccc----------	other	Resident
30/06	VP2	10:24	Butbu	1	15	a----------	other	Resident
30/06	VP2	11:49	Butbu	1	15	a----------	other	Resident
27/06	VP3	14:23	Butbu	1	90	cccccc----------	patrolling	Resident
27/06	VP3	16:44	Butbu	1	90	cccccc----------	patrolling	Resident
28/06	VP3	11:43	Butbu	1	90	cccccc----------	patrolling	Resident
28/06	VP3	14:02	Butbu	1	120	bbbbbbbb----------	patrolling	Resident
28/06	VP3	16:11	Butbu	1	90	bbbbbb----------	patrolling	Resident
29/06	VP1	10:51	Butbu	1	120	bbbbbbbb----------	other	Resident

29/06	VP1	11:12	Cirga	1	180	ccccccccccc--------	other	Resident
29/06	VP1	14:48	Cirga	1	120	cccccccc----------	other	Resident
29/06	VP1	16:02	Butbu	1	90	cccbbb----------	patrolling	Resident
29/06	VP1	16:13	Falti	1	75	bbbbb----------	other	Resident
30/06	VP1	13:28	Butbu	1	90	cccccc----------	patrolling	Resident
30/06	VP1	14:51	Cirga	1	120	cccccccc----------	other	Resident
30/07	VP3	10:14	Falti	1	390	abcccbcccaaabcccbccb	other	Resident
30/07	VP3	12:08	Cirga	1	270	bbbcccbbbccccbbcc--	patrolling	Resident
…..								

Autumn

Date	VP	Time	Spec*	Number	Dur (sec)	Flight_Height	Behaviour	Status
21/09	VP3	12:38	Accxx	1	15	b----------	patrolling	U
21/09	VP3	12:45	Butbu	1	30	ba----------	patrolling	Resident
21/09	VP3	15:28	Accni	1	15	c----------	migrating	Migrant
22/09	VP1	12:26	Accni	1	45	bca----------	other	Resident
22/09	VP2	10:21	Accni	1	90	cccccc----------	patrolling	U
22/09	VP2	11:58	Cirga	1	90	cccccc----------	patrolling	U
22/09	VP2	13:19	Accni	1	90	cccccc----------	migrating	Migrant
23/09	VP1	11:47	Cirga	2	120	cccccccc----------	migrating	Migrant
23/09	VP1	13:07	Perap	4	90	cccccc----------	migrating	Migrant
23/09	VP2	10:43	Accni	1	45	ccc----------	migrating	Migrant
23/09	VP2	11:45	Cirga	2	120	cbbbbccc----------	migrating	Migrant
23/09	VP2	12:28	Cirga	1	90	cccccc----------	patrolling	U
23/09	VP2	15:12	Butbu	1	60	cccc----------	patrolling	Resident
14/10	VP3	11:58	Butbu	1	120	cccccccc----------	patrolling	Resident
14/10	VP3	14:17	Accni	1	45	ccc----------	migrating	Migrant
15/10	VP3	12:41	Butbu	4	60	cccc----------	migrating	Migrant
15/10	VP3	14:43	Perap	3	75	ccccc----------	migrating	Migrant
15/10	VP3	15:07	Butbu	1	60	cccb----------	patrolling	Resident
15/10	VP3	15:49	Accxx	1	30	cc----------	migrating	Migrant
16/10	VP1	13:09	Accni	1	45	ccc----------	migrating	Migrant
…..								Resident

6.8 Collision Probability Calculation

Calculation of collision risk for bird passing through rotor area as in NatureScot (2010),

Only enter input parameters in blue

Parameters	Value	Unit
K: [1D or [3D] (0 or 1)	1	
NoBlades	3	
MaxChord	4,2	m
Pitch (degrees)	30	
Species	Common Buzzard	
BirdLength	0,58	m
Wingspan	1,37	m
F: Flapping (0) or gliding (+1)	1	
Bird speed	11,6	m/sec
RotorDiam	138	m
RotationPeriod	5,00	sec

Calculation of alpha and p(collision) as a function of radius

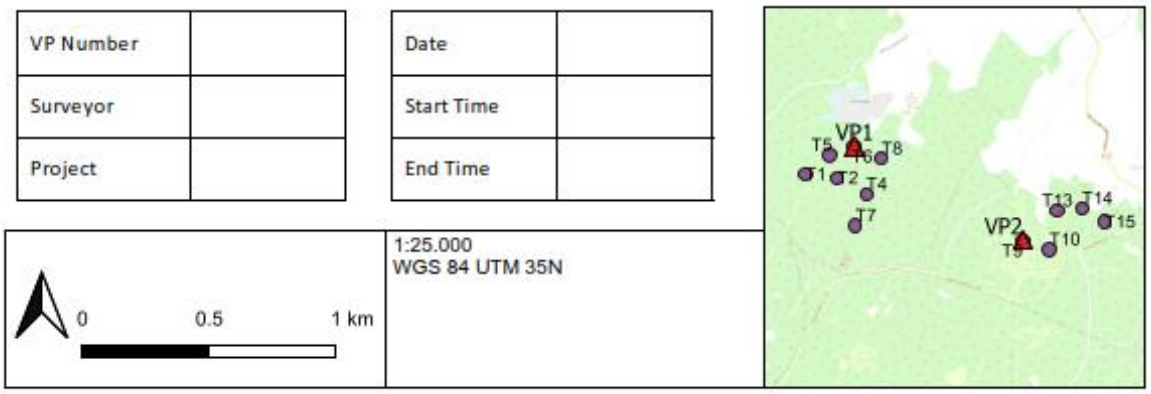
			Upwind:			Downwind:		
r/R	c/C	a	collide		contribution	collide		contribution
radius	chord	alpha	length	p(collision)	from radius r	length	p(collision)	from radius r
0,025	0,575	5,35	17,07	0,88	0,00110	14,65	0,76	0,00095
0,075	0,575	1,78	6,49	0,34	0,00252	4,08	0,21	0,00158
0,125	0,702	1,07	5,14	0,27	0,00332	2,19	0,11	0,00142
0,175	0,860	0,76	4,86	0,25	0,00440	1,25	0,06	0,00113
0,225	0,994	0,59	4,76	0,25	0,00554	0,58	0,03	0,00068
0,275	0,947	0,49	4,09	0,21	0,00581	0,74	0,04	0,00105
0,325	0,899	0,41	3,81	0,20	0,00640	1,12	0,06	0,00188
0,375	0,851	0,36	3,47	0,18	0,00673	1,26	0,07	0,00244
0,425	0,804	0,31	3,18	0,16	0,00700	1,34	0,07	0,00295
0,475	0,756	0,28	2,94	0,15	0,00721	1,39	0,07	0,00341
0,525	0,708	0,25	2,72	0,14	0,00738	1,41	0,07	0,00382
0,575	0,660	0,23	2,52	0,13	0,00750	1,40	0,07	0,00417
0,625	0,613	0,21	2,34	0,12	0,00756	1,38	0,07	0,00448
0,675	0,565	0,20	2,17	0,11	0,00757	1,35	0,07	0,00473
0,725	0,517	0,18	2,01	0,10	0,00753	1,31	0,07	0,00493
0,775	0,470	0,17	1,86	0,10	0,00744	1,27	0,07	0,00508
0,825	0,422	0,16	1,71	0,09	0,00730	1,21	0,06	0,00517
0,875	0,374	0,15	1,57	0,08	0,00710	1,15	0,06	0,00522
0,925	0,327	0,14	1,43	0,07	0,00685	1,09	0,06	0,00521
0,975	0,279	0,14	1,30	0,07	0,00655	1,02	0,05	0,00515
Overall p(collision) =				Up-wind	12,3%		Downwind	6,5%
				Average	9,4%			

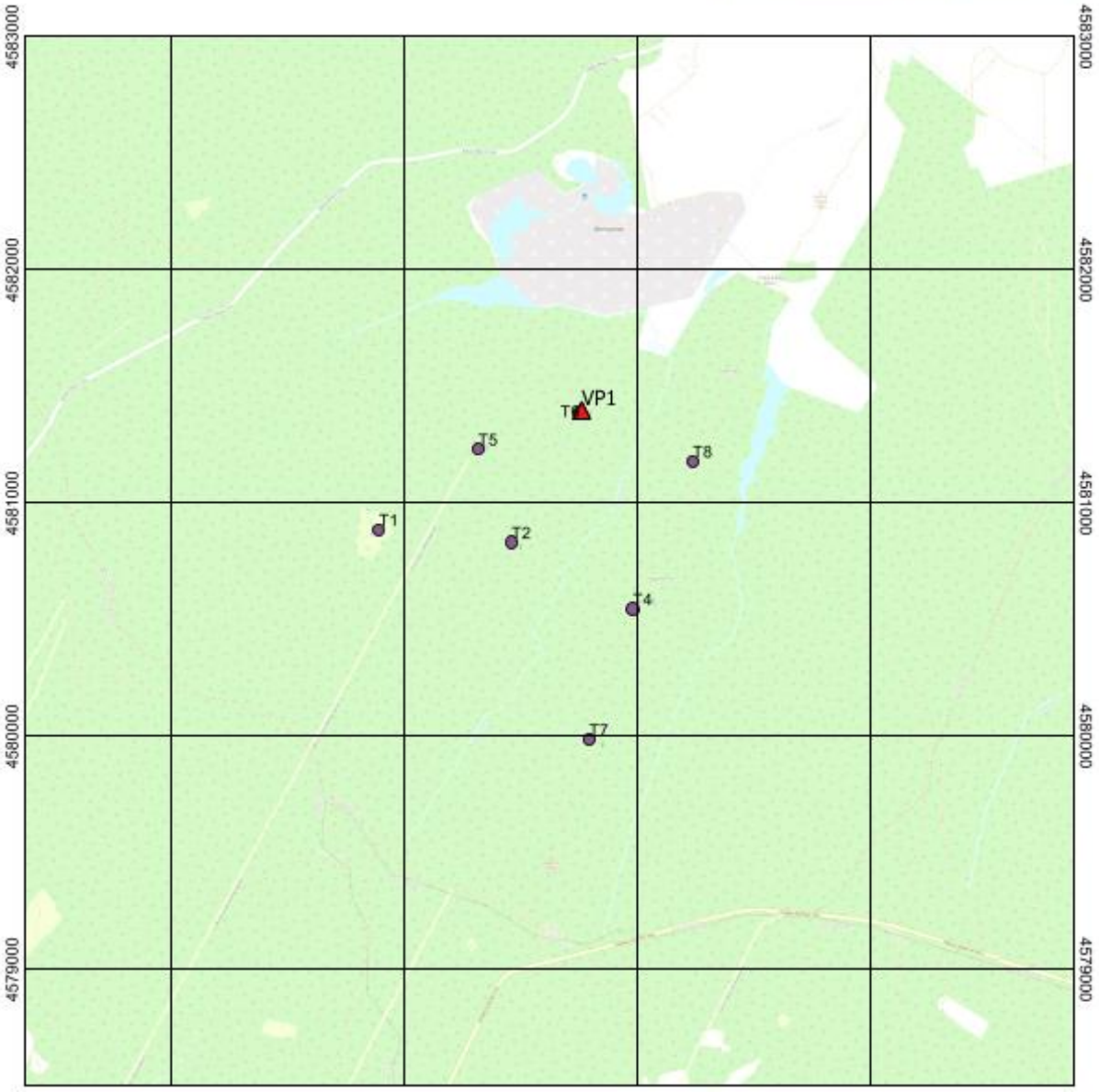
6.9 Sample Field Recording Sheets

6.9.1 VP Map and Sheet

VP Number	
Surveyor	
Project	

Date	
Start Time	
End Time	





Project		VP		Cloud cover	%	Precipitation	mm
Date		Start1-Finish1-		Wind Direction		Temp. (max)	°C
Surveyor		Start2-Finish2		Wind Speed	m/s	Visibility	km
Comments							

Height: A (below rotor height), B (at rotor height), C (above rotor height)

	Time	Species	Count	Behaviour	Resident/Migrant/Unclear	Duration (sec)	Height	60	120	180	240	300
1							C					
							B					
							A					
2							C					
							B					
							A					
3							C					
							B					
							A					
4							C					
							B					
							A					
5							C					
							B					
							A					
6							C					
							B					
							A					
7							C					
							B					
							A					
8							C					
							B					
							A					
9							C					
							B					
							A					

6.9.2 Breeding Bird

Project		Point		Start time		Temperature (Celsius)	
Date		North (UTM)		Finish time		Wind direction	
Surveyor		East (UTM)		Duration (min)		Wind speed (m/s)	
Notes						Precipitation (mm)	
						Visibility (km)	

Species	Min. count	Max. count	Breeding code	Species	Min. count	Max. count	Breeding code

6.9.3 Acoustic Bat

Project		Coordinates (Utm-Wgs84)	
Surveyor		Folder Name	
Location		4 Directional Photo	☐
Detector Serial#		Notes	

Start	Control	Finish	Date	Hour	# Recording	Temp (C°)	Cloud (%)	Wind (M/S)	Precipitation?	Fog?	Notes
☐	☐	☐	__/__/__	__:__					☐	☐	
☐	☐	☐	__/__/__	__:__					☐	☐	
☐	☐	☐	__/__/__	__:__					☐	☐	
☐	☐	☐	__/__/__	__:__					☐	☐	
☐	☐	☐	__/__/__	__:__					☐	☐	

6.10 Flight Line Maps

[Maps were provided in a separate document.]