

ANNEX-1

ECOSYSTEM EVALUATION

REPORT

HİLAL-2 WIND POWER PLANT PROJECT

ECOSYSTEM EVALUATION REPORT



JUNE, 2016

ANKARA

HİLAL-2 WIND POWER PLANT PROJECT**ECOSYSTEM EVALUATION REPORT**

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ANNEX:

Bat Assessment Report

1 INTRODUCTION

Hilal-2 Wind Power Plant (Hilal-2 WPP) Project which is at the stage of operation by Sanko Rüzgar Enerjisi Sanayi ve Ticaret A.Ş. The Project is located within the border of Karaman Province in middle-southern Turkey.

This Report presents an ecological assessment of the Hilal-2 WPP Site and its environs. Given the types of Project impacts, the Report focuses on flora and vegetation elements as well as fauna and ornithological evaluations. As another significant valued ecosystem component, possible impacts on bats are discussed separately in the Bat Assessment Report, attached as an annex of this Report (See Annex-A).

The Rapid Ecological Assessment has been conducted in accordance with the World Bank Operational Policy on Natural Habitats (OP 4.04) and IFC's Performance Standard 6 (Biodiversity Conservation and Sustainable Management of Living Natural Resources), which have been guided by the Convention on Biological Diversity.

2 METHODOLOGY

The methodology for the ecosystem assessment is comprised of literature surveys and site observations. A comprehensive search was carried out in order to determine the wildlife species in and around the Project site.

A series of literature sources have been reviewed for different types of species. The most significant sources referred are highlighted below:

Birds:

- Birds of Turkey and Europe: Guidebook (Heinzel et al., 1995),
- Songbirds of Turkey: Atlas of Biodiversity of Turkish Passerine Birds (Roselaar, 2000),
- Birds Data from Turkey's Important Nature Areas (Doğa Derneği, 2004).

Amphibians and Reptiles:

- IUCN redlist (www.redlist.org),
- Lists of Biltek, TÜBİTAK,
- Turkish Herpetofauna, Baranand Atatür, 1998
- Taxonomic Revision and Geographic Distribution of Turkish Snakes, Baran, İ. 1976.

In the scope of the terrestrial fauna study; butterflies, amphibians, reptiles, birds and mammals were identified within the Project site and its environs. In addition to that, the habitats of the fauna elements have been reviewed.

Mammals

- “Vertebrates of Turkey, Mammals, Demirsoy, 1996.
- Türkiye’nin Av ve Yaban Hayvanları, Memeliler (Turan, 1984),
- IUCN Redlist (2009) www.redlist.org,
- Mammals of Turkey and Cyprus : introduction, checklist, insectivora (Kryštufek B, Vohralik V. 2001),
- Mammals of Turkey and Cyprus, Rodentia I : Sciuridae, Dipodidae, Gliridae, Arvicolinae (Kryštufek B, Vohralik V. 2005)
- Mammals of Turkey and Cyprus, Rodentia II : Cricetinae, Muridae, Spalacidae, Calomyscidae, Capromyidae, Hystricidae, Castoridae. (Kryštufek B, Vohralik V. 2009)

During the field studies, EUNIS and Habitat Directive’s Codes have been taken into account when ranking the habitat types and ecosystem assessments.

Before the field assessments, availability of relevant data has been checked, in terms of published records of reasonably recent surveys, satellite images, etc. The methodology included the working topics below.

- Identification of Habitat and Vegetation Descriptions
- Identification of Major Ecological and Environmental Features
- Assessment of Major Threats
- Identification of Protection Status
- Identification of No-Go Areas

As a result of literature surveys and site observations, specific measures have been recommended to avoid/reduce/mitigate potential negative impacts on the (non-critical) natural habitats (e.g. recommendations for location or design of infrastructure, monitoring measures and thresholds for acceptable change, etc. to extent possible (at rapid assessment level). We used the ecological corridor approach for planning alternative measures.

Cumulative Impacts of the other projects (wind farm, energy, infrastructure, highways, transmission lines, railways etc.) have been taken into consideration as well.

3 RESULTS

3.1 Vegetation

In order to determine the flora elements, endemic and rare plant species and vegetation properties within the Project site and its vicinity, botanical surveys were coordinated by PhD Ecologist Okan Ürker (See **Photo 1**).



Photo 1. Site Surveys General for Plants Ecology and Vegetation

The results are supported by detailed literature survey. This section includes the ecological and botanical assessment, the flora inventory, characteristics of their vegetation and the conservation status.

The terrestrial ecosystem in the project area is represented mainly by steppe ecosystem. This ecosystem is formed under the effects Mediterranean and terrestrial climate.

Hilal-2 WPP Project area is located in the intersection of Irano-Turanian and Mediterranean Phytogeographical Zone. For that reason the endemism rate is very high. In the field surveys

a total of four vegetation types: forest, rocky shrub, frigana and steppe vegetations are observed in the Project area. These vegetation types are generally develops in these types of soils of which main source is lime.

Most of the Project area is used as pasture land. Since animal farming is quite common in the region, grazing pressure is high in the region. The dominant vegetation type in the Project area is steppe and the pastures that provide suitable conditions for grazing.

Steppe and forest vegetation communities exist in the Sertavul-Karaman region which is a mountain passage that connects Central Taurus to Central Anatolia. Sub-alpine mountain step vegetation is found in Sertavul passage at altitudes of 1600-1650 m. The forest vegetation which is dominated by *Juniperus excelsa* in the region of the Project site is mainly covered by rocky lime soils (See **Photo 2**).



Photo 2. Juniper Trees Around the Site

The second dominant forest vegetation which is represented by *Pinus nigra* subs. *pallasiana* and *Juniperus drupacea* in around the Project site as Elmadağ, Ağaçyurdu, Değirmenbaşı, Kozlubucak villages respectively to the Central Anatolia and at 1350-1550m heights follows this (See **Photo 3**).



Photo 3. Mixed Forest Vegetation

The passage areas where the forest vegetation is disturbed include shrubs textured grassy steppe vegetation which is sparsely distributed short *Juniperus oxycedrus* subsp. *oxycedrus* bushes. Finally, *Thymus spyleus*, *Astragalus sp.* dominated herbaceous step vegetation follows in Central Anatolia plateau plains in Karaman region (Vural, 1981).

The steppe vegetation is represented by dwarf bushes and herbaceous species dominated plains and low altitude mountains and dwarf shrubs, thorny cushions in subalpine and alpine areas.

The steppe vegetation with thorny cushions in subalpine and alpine areas is generally dominated by *Astragalus sp.* It is represented by *Sileno-Pteroccephaletum pinardii* alliance the north of Ermenek at 1500-1600m height. In addition to this, it is represented by *Sileno- Pteroccephaletum onobrychidetosum* suballiance from the same alliance at the stony ridges in the Sertavul Passage and between 1600-1700m heights (Akman *et al.* 1996). *Sileno- Pteroccephaletum onobrychidetosum* suballiance expands in the rocky and stony places in the Sertavul Pass at limestone bedrock in the 1630-1680 m height (See **Photo 4**).



Photo 4. Step Vegetation Dominant Around the Project Site

The indicator species in step vegetation are *Pterocephaletum pinardii*, *Silene ermenekensis*, *Onobrychis cornuta*, *Thymus cherlerioides* subs. *cherlerioides*, *Lamium garganicum*, *Ajuga chamaepitys*, *Saxifraga trachidactylites*, *Erodium amenum*, *Asphodeline taurica*, *Ebenus longipes* (Akman et al. 1996). The alliance has 25-35 cm long single layer vertical structure. In the south and southwest of the pass, the 0.50-1.5 m long bushes can be seen dispersedly. These shrubs are *Berberis crataegina*, *Juniperus oxycedrus* subs. *oxycedrus*, *Cotoneaster nummularia* and *Juniperus excelsa* (Vural, 1981).

The other vegetation, riverine vegetation was observed the small creeks that connect Han Dere which is the closest water resource to the Project site. The homogeneity of the vegetation changes according to the season: the drying out of these small creeks in summer. It is indicated that in the dry season where the water level decreases *Tamarix smyrnensis*, *Nerium oleander* and *Vitex agnus-castus* dominated plant communities occur, whereas the main riverbad there is a population dominated by *Populus euphratica* and *Salix alba* subsp. *coerulea* (Vural, 1981).

Although the Project area and surroundings are designated as forest lands, these areas do not have forest characteristics, but include solitary trees dispersed in the area.

Apart from thorny cushions subalpine mountain steppe in the project area, other areas that vegetations are present in riverine and semi-dry riverbeds which are also important for fauna species. The steppe vegetation in the project area holds many site specific endemics.

As a result of site visit and literature search, we can say that the region of the project area acts as a habitat for native plant and animal species. We can not rank the the region as Critical Natural Habitat as there are no legally protected areas officially proposed for protection, or unprotected but of known high conservation values.

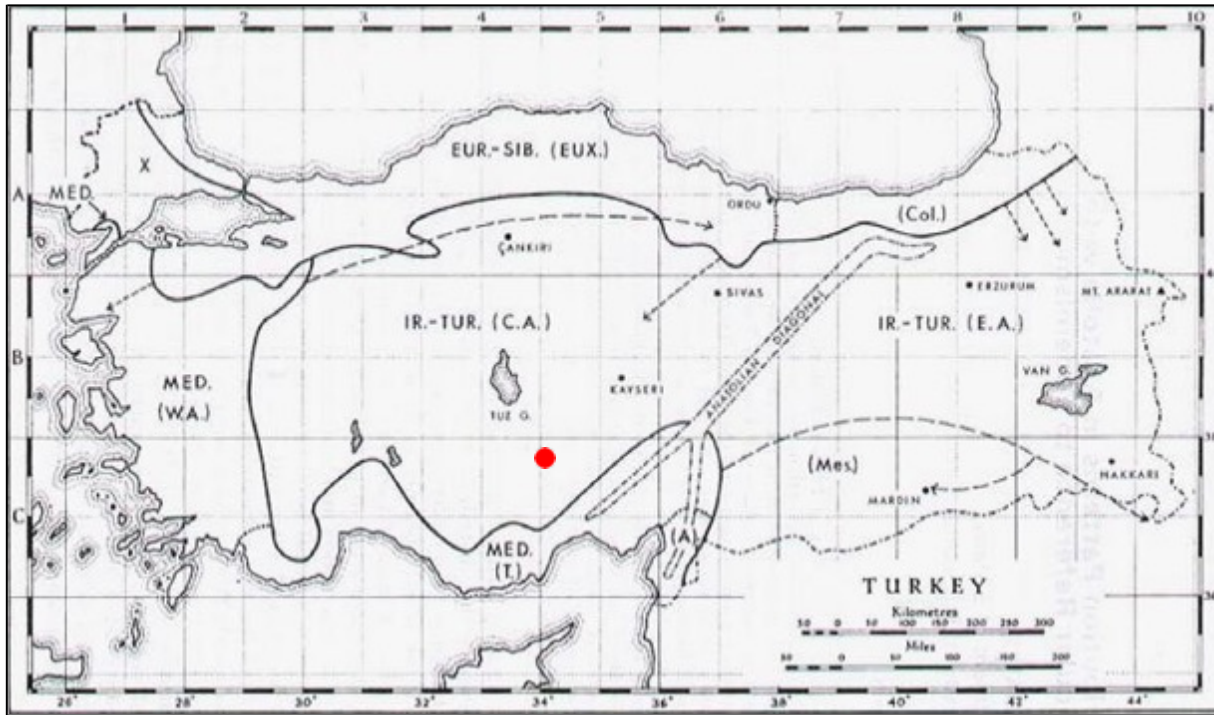


Photo 5. Gardens and Vineyards Around the Project Site

3.2 Floristic Analysis

Anatolia has been divided into three main phyto-geographical regions: The European- Siberian (Black Sea), Iran-Turan (Central, Eastern and Southeastern Anatolia Regions) and Mediterranean (Aegean and Mediterranean Regions) Phyto-geography (Atalay, 1994).

The borders of the Mediterranean Phyto-geographical Region extend through Sertavul Pass and hereafter, Iran-Turanian flora is observed. Therefore, Sertavul Pass is also a transition zone for flora. The Project area, represented with the red dot in **Figure 1** is located in the junction of Mediterranean Phyto-geographical Region and Iran Turanian Phyto-geographical Region.




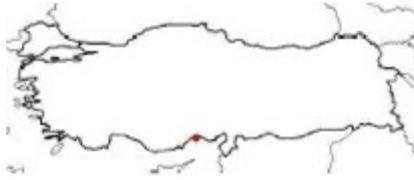




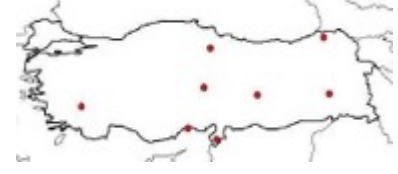
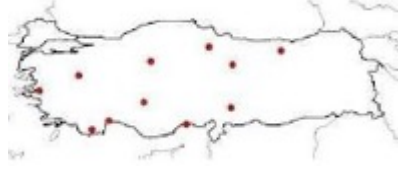

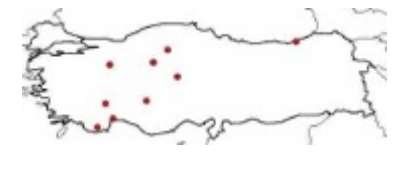
(Source: Davis P.H., Harper P.C. and Hege I.C. (eds.), 1971. Plant Life of South-West Asia. The Botanical Society of Edinburgh)






Figure 1. The Project Area and Phyto-geographical Regions of Turkey




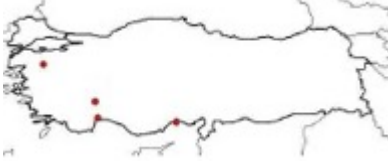

The Project area lies within the C4 square according to P. H. Davis Grid System. According to the field studies that were conducted in April 2016, 157 species which belong to 39 familia were identified, and 29 of these species are listed as endemic (Ecosystem Evaluation Report, 2016), as listed in Table 1. List of the plant species in the Project Site is given in Table 2.


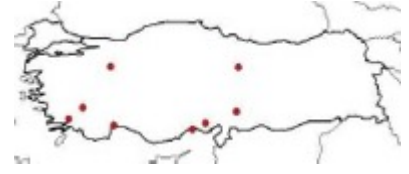
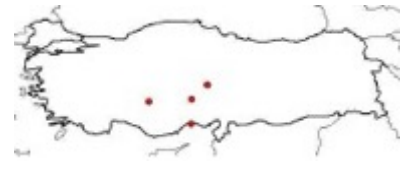


Table 1. List of the Endemic Flora Species in the Project Site

	Scientific name	Conservation status	General info
ACANTHACEAE			
1	<i>Acanthus dioscoridis</i> var. <i>perringii</i> IUCN:- BERN:- CITES:- Endemic		Life form : Perennial Structure : Herbaceous Flowering : May- August Altitude: 1300-2200m Phytogeographical zone: not known Habitat: Volcanic rocks, cliffs, limestone soil, hills, fallowing land Distribution: South Anatolia
APIACEAE			
2	<i>Eryngium polycephalum</i> IUCN:- BERN:- CITES:- Endemic		Life form : Perennial Structure : Herbaceous Flowering : July- August Altitude: 1450-1850m Phytogeographical zone: Iran-Turanian Habitat: steps Distribution: South Anatolia
3	<i>Ferulago pauciradiata</i> IUCN:- BERN:- CITES:- Endemic		Life form : Perennial Structure : Herbaceous Flowering : June- August Altitude: 200-1850m Phytogeographical zone: Iran-Turan Habitat: Mountain Steppe Distribution: Terrestrial and South Anatolia
ASTERACEAE			
4	<i>Anthemis pauciloba</i> var. <i>sieheana</i> IUCN:- BERN:- CITES:- Endemic		Life form : Perennial Structure : Herbaceous Flowering : April-july Altitude: 500-1700m Phytogeographical zone: E. Mediterranean Habitat: Limestone rifts and edges, marl shores, disturbed steppe Distribution: South Anatolia
5	<i>Hieracium leucothecum</i> IUCN:- BERN:- CITES:- Endemic		Life form : Perennial Structure : Herbaceous Flowering : June- July Altitude: 1340-1960m Phytogeographical zone: E. Mediterranean (mountain) Habitat: rocky cliffs, steppe Distribution: Western and South Anatolia
BORAGINACEAE			

6	<i>Paracaryum ancyritanum</i> IUCN:- BERN:- CITES:- Endemic		Life form : 2 years Structure : Herbaceous Flowering : June-July Altitude: 500-1500m Phytogeographical zone: Iran-Turanian Habitat: steppes, Serpentine, calcerous and slopes, following fields Distribution: Northern and Central Anatolia
BRASSICACEAE			
7	<i>Alyssum praecox</i> var. <i>praecox</i> IUCN:- BERN:- CITES:- Endemic		Life form : Perennial Structure : Herbaceous Flowering : June- July Altitude: 1500-2600m Phytogeographical zone: not known Habitat: rocky cliffs Distribution: Northern, Western,Southern and Eastern Anatolia
CAMPANULACEAE			
8	<i>Asyneuma limonifolium</i> subsp. <i>pestalozzae</i> IUCN:- BERN:- CITES:- Endemic		Life form : Perennial Structure : Herbaceous Flowering : June- July Altitude: 400-2400m Phytogeographical zone: not known Habitat: steppes, meadows, rocky cliffs Distribution: Southern, Western and Central Anatolia
CARYOPHYLLACEAE			
9	<i>Arenaria acerosa</i> IUCN:- BERN:- CITES:- Endemic		Life form : Perennial Structure : semi-shrub Flowering : June-August Altitude: 1350-2450m Phytogeographical zone: Iran-Turan Habitat: stony slopes Distribution: Eastern, Western, Central ans Southern Anatolia
10	<i>Minuartia anatolica</i> var. <i>arachnoidea</i> IUCN:- BERN:- CITES:- Endemic		Life form : Perennial Structure : Herbaceous Flowering : May-July Altitude: 500-1400m Phytogeographical zone: Iran-Turan Habitat: stony places in steppes Distribution: Central Anatolia

11	<p><i>Silene ermenekensis</i></p> <p>IUCN:- BERN:- CITES:- Endemic</p>		<p>Life form : Perennial Structure : Herbaceous Flowering : May-June Altitude: 1600-1700m Phytogeographical zone: E. Mediterranean Habitat: <i>Juniperus excelsa</i> forest openings, rocks and stony slopes Distribution: Southern Anatolia (Cilician)</p>
EUPHORBIACEAE			
12	<p><i>Euphorbia cardiophylla</i></p> <p>IUCN:- BERN:- CITES:- Endemic</p>		<p>Life form : Perennial Structure : Herbaceous Flowering : March-June Altitude: 0-2100m Phytogeographical zone: not known Habitat: <i>Pinus</i> forest openings, <i>Abies cilicica</i> forest, <i>Quercus</i> bushes, steppe and cliffs Distribution: Southern, Northern and Central Anatolia</p>
FABACEAE			
13	<p><i>Astragalus chrysochlorus</i></p> <p>IUCN:- BERN:- CITES:- Endemic</p>		<p>Life form : Perennial Structure : Herbaceous Flowering : May-June Altitude: 900-2530m Phytogeographical zone: not known Habitat: oak shrubs, mountain steppe, rocky Distribution: Southern Anatolia</p>
14	<p><i>Ebenus longipes</i></p> <p>IUCN:- BERN:- CITES:- Endemic</p>		<p>Life form : Perennial Structure : Woody Herbaceous Flowering : June-August Altitude: 1100-2000m Phytogeographical zone: Iran-Turan Habitat: stony slopes Distribution: Central and Southern Anatolia</p>
15	<p><i>Genista involucrate</i></p> <p>IUCN:- BERN:- CITES:- Endemic</p>		<p>Life form : Perennial Structure : Shrub Flowering : June-July Altitude: 600-1500m Phytogeographical zone: Iran-Turan Habitat: shrubs, coniferous forests, limestone rocks and grazed slopes Distribution: Central and Southern Anatolia</p>

16	<i>Astragalus acicularis</i> IUCN:- BERN:- CITES:- Endemic		Life form : Perennial Structure : Shrub Flowering : June-July Altitude: 1200-2200m Phytogeographical zone: Iran-Turanian Habitat: slopes Distribution: Central Anatolia
17	<i>Anthyllis vulneraria</i> subsp. <i>variegata</i> IUCN:- BERN:- CITES:- Endemic		Life form : anual-two year or Perennial Structure : Herbaceous Flowering : June-July Altitude: 1380-2000m Phytogeographical zone: E. Mediterranean (Mount) Habitat: rocky slopes Distribution: Southern Anatolia
LAMIACEAE			
18	<i>Phlomis capitata</i> IUCN:- BERN:- CITES:- Endemic		Life form : Perennial Structure : Herbaceous Flowering : June- August Altitude: 540-2400m Phytogeographical zone: Iran Turanian Habitat: steppes, oak shrubs, calcareous rocks, rocky cliffs Distribution: Southern Anatolia
19	<i>Thymus cherlerioides</i> var. <i>cherlerioides</i> IUCN:- BERN:- CITES:- Endemic		Life form : Perennial Structure : Shrub Flowering : June-August Altitude: 1600-2600m Phytogeographical zone: E. Mediterranean Habitat : open rocky and gravel Distribution: Western and Southern Anatolia
20	<i>Marrubium globosum</i> subsp. <i>globosum</i> IUCN:- BERN:- CITES:- Endemic		Life form : Perennial Structure : Herbaceous Flowering : April-August Altitude: 800-2500m Phytogeographical zone: Iran-Turanian Habitat: rocky slopes Distribution: Southern and Central Anatolia
IRIDACEAE			

21	Crocus biflorus subsp. isauricus IUCN:- BERN:- CITES:- Endemic		Life form : Perennial Structure : Herbaceous Flowering : February-June Altitude: 200-3000m Phytogeographical zone: E. Mediterranean Habitat: shrubs, coniferous woodland and rocky slopes Distribution: Southern Anatolia
LILIACEAE			
22	Ornithogalum alpinum IUCN:- BERN:- CITES:- Endemic		Life form : Perennial Structure : Herbaceous Flowering : July Altitude: 0-2300m Phytogeographical zone: E. Mediterranean Habitat: hills, steppes, forests Distribution: Southern and Southwestern Anatolia
RHAMNACEAE			
23	Rhamnus hirtellus IUCN:- BERN:- CITES:- Endemic		Life form : Perennial Structure : Shrub Flowering : March-May Altitude: 30-1300m Phytogeographical zone: Iran-Turan Habitat: dry slopes, shrubs Distribution: Central Anatolia
RUBIACEAE			
24	Galium cilicicum IUCN:- BERN:- CITES:- Endemic		Life form : Perennial Structure : Herbaceous Flowering : June- August Altitude: 1250-2700m Phytogeographical zone: E. Mediterranean (Mountain) Habitat: steppes, rocks, fractured rock Distribution: Southern and neighbouring Central Anatolia
RUTACEAE			
25	Haplophyllum myrtifolium IUCN:- BERN:- CITES:- Endemic		Life form : Perennial Structure : Herbaceous Flowering : May-June Altitude: 750-2150m Phytogeographical zone: Iran-Turanian Habitat: steppes, rocky Limestone or volcanic slopes Distribution: Western, Central, Southern and Eastern Anatolia
SCROPHULARIACEAE			





26	<p><i>Linaria corifolia</i></p> <p>IUCN:- BERN:- CITES:- Endemic</p>		<p>Life form : Perennial Structure : Herbaceous Flowering : May-August Altitude: 0-2200m Phytogeographical zone: Iran-Turanian Habitat: steppes, rocky Limestone slopes, following fields Distribution: Anatolia (apart from western, northeastern, extreme Eastern and Mezopotamia)</p>
27	<p><i>Verbascum tossiense</i></p> <p>IUCN:- BERN:- CITES:- Endemic</p>		<p>Life form : two years Structure : Herbaceous Flowering : May- July Altitude: 80-1700m Phytogeographical zone: Iran-Turanian Habitat: Quercus shrubs, steppes, vineyards Distribution: Northern and Central Anatolia</p>
PAPAVERACEAE			
28	<p><i>Corydalis wendelboi</i></p> <p>IUCN:- BERN:- CITES:- Endemic</p>		<p>Life form : perennial Structure : Herbaceous Flowering : April - June Altitude: 900-2000m Phytogeographical zone: Unknown Habitat: Shrubs, rocky slopes Distribution: Southern and Southwestern Anatolia</p>
GERANIACEAE			
29	<p><i>Erodium amenum</i></p> <p>IUCN:- BERN:- CITES:- Endemic</p>		<p>Life form : perennial Structure : Herbaceous Flowering : May - August Altitude: 1100-2900m Phytogeographical zone: Unknown Habitat: Rocky slopes Distribution: North, Central, East and Southern Anatolia</p>

Table 2. List of the Possible Plant Species at the Project Site

	Species	Common Name	Habitat	Endemism	Phyto-Geographical Region	IUCN TDB
	ACANTHACEAE					
1	<i>Acanthus dioscoridis</i> var. <i>perringii</i>	Bear's breeches	Volcanic rocks, cliffs, limestone soil, hills, fallowing land	+	-	VU
	ASPLENIACEAE					
	<i>Asplenium trichomanes</i>	Spleenwort	Between Rocks	-	E. Mediterranean	
	PINACEAE					
3	<i>Pinus nigra</i> Arn. ssp. <i>pallasiana</i> (Lamb.) Holmboe	Blackpine	Forest	-	-	LC
4	<i>Pinus brutia</i> Ten.	Redpine	Plantation	-	E. Mediterranean	LC
5	<i>Cedrus libani</i> A. Rich	Lebanon cedar	Plantation	-	Mediterranean (Mountain)	LC
	CUPRESSACEAE					
6	<i>Cupressus sempervirens</i> L.	Mediterranean-funeral- Italian Cypress	Slope, Limestone Reef	-	Mediterranean	LC
7	<i>Juniperus excelsa</i> M.Bieb.	Tall Juniper	Alpine shrubs, Pinewood, Oak Bushes, Maquis	-	-	
8	<i>Juniperus drupacea</i> Lab.	Juniper, Andız (Turkish name)	Slope, Bushes, Reefs, Forest	-	-	LC
9	<i>Juniperus oxycedrus</i> L. ssp. <i>oxycedrus</i>	Prickly juniper	Pinewood, Oak Bushes, Maquis	-	-	LC
	RANUNCULACEAE					
10	<i>Eranthis hyemalis</i> (L.) Salisb.	Winter aconite	Open (Bare) Area	-	-	
11	<i>Delphinium peregrinum</i> L.	Violet larkspure	Calcareous Slope, Cultivated Land, Vineyard	-	-	
12	<i>Anemone blanda</i> Schott et Kotschy	Eastern blue wood anemone	Rocky Slope, Bushes	-	-	
13	<i>Thalictrum orientale</i> Boiss.	Meadow-rue	Rocky Slope, Cracks	-	E. Mediterranean	
	PAPAVERACEAE					
14	<i>Glaucium corniculatum</i> (L.) Rud. Ssp. <i>Corniculatum</i>	Blackspot hornpoppy	Hill Slope	-	-	

	Species	Common Name	Habitat	Endemism	Phyto-Geographical Region	IUCN TDB
15	<i>Papaver persicum</i> Lindl. Ssp. <i>Persicum</i>		Debris, Rocky Slope	-	-	
16	<i>Fumaria cilicica</i> Hausskn.	White ramping-fumitory	Empty Area, Roadside	-	-	
17	<i>Corydalis wendelboi</i> LIDEN subsp. <i>Wendelboi</i>	Crested lark	Rocky slopes, bushes	+	-	-
	PRIMULACEAE					
18	<i>Anagallis arvensis</i> L.		Crop area, riverside, rocky slopes	-	-	
	BRASSICACEAE					
19	<i>Clypeola jonthlaspi</i>	Disc cress	Ruderal, roadside, empty area	-	-	
20	<i>Sinapis arvensis</i> L.	Wild mustard, charlock	Roadside, Empty Area	-	-	
21	<i>Alyssum praecox</i> var. <i>praecox</i>		Rocky cliffs	+	-	LR(lc)
22	<i>Iberis taurica</i> DC.	Candytuft	Rocky Slope, Debris	-	-	
23	<i>Fibigia eriocarpa</i> (DC.) Boiss.	Aspidion	Slope, Bushes, Forest	-	-	
24	<i>Alyssum strigosum</i> Banks et Sol. Ssp. <i>Strigosum</i>	Madworth sp., hairy alyssum	Degraded Area	-	-	
25	<i>Alyssum strigosum</i> Banks et Sol. Ssp. <i>Cedrorum</i> (Schott et Kotschy) Dudley	Madworth sp., hairy alyssum	Rocky Area	-	-	
26	<i>Alyssum repens</i> Baumg. Ssp. <i>Trichostachyum</i> (Rupr.) Hayek var. <i>trichostachyum</i> (Rupr.) Hayek		Bushes, Slope, Forest	-	-	
27	<i>Alyssum mouradicum</i> Boiss. Et Bal.		Rocky Slope, Open Forest	-	-	
28	<i>Arabis caucasica</i> Willd. ssp. <i>brevifolia</i> (Dc.) Cullen	Garden arabis	Reef, Debris	-	E. Mediterranean (Mountain)	
29	<i>Arabis nova</i> Vill.		Stony Area	-	-	
30	<i>Malcolmia chia</i> (L.) Dc.	Hairy rock-cress	Rocky Slope, away from the Sea	-	E. Mediterranean	

	Species	Common Name	Habitat	Endemism	Phyto-Geographical Region	IUCN TDB
31	<i>Erysimum repandum</i> L.	Spreading treacle mustard, bushy	Slope, Empty Area	-	-	
32	<i>Noccaea iberida</i>	-	Limestone, rocky areas	-	-	
	CISTACEAE					
33	<i>Helianthemum nummularium</i> (L.) Miller ssp. <i>tomentosum</i> (Scop.) Schinz et Thellung	Common rock-rose	Slope, Meadow, Rocky Area	-	-	
	VIOLACEAE					
34	<i>Viola modesta</i> Fenzl.	Violet	Stony Area, Slope	-	-	
35	<i>Viola heldreichiana</i> Boiss.	Violet	Rock Cracks, Debris, Slope	-	E. Mediterranean	
	POLYGALACEAE					
36	<i>Polygala anatolica</i> Boiss. et Heldr.	Sütotu (Turkish name)	Slope	-	-	
	CARYOPHYLLACEAE					
37	<i>Minuartia juniperina</i> (L.) Marie et Petitm.	Sandwort	Rocky Areas	-	-	
38	<i>Minuartia multinervis</i> (Boiss) Bornm.		Coppice Forests and Open Grounds	-	-	
39	<i>Minuartia anatolica</i> var. <i>arachnoidea</i>		stony places in steppes	+	Iran-Turan	LR(Ic)
40	<i>Telephium imperati</i> L. ssp. <i>orientale</i> (Boiss.) Nyman		Dry Stony Slopes, Rocky Water Springs, Pinewoods, Oak Bushes	-	-	
41	<i>Velezia rigida</i> L.	Velezia	Stony Areas, Open Fields	-	-	
42	<i>Silene italica</i> (L.) Pers.	Italian catchfly	Open Fields, mostly Pinus Nigra Open Fields	-	-	
43	<i>Silene macrodanta</i> Boiss.	Catchfly	Open Fields	-	-	
44	<i>Silene ermenekensis</i>		Juniperus 29ussia forest openings, rocks and stony slopes	+	E. Mediterranean	EN
	ILLECEBRACEAE					
45	<i>Herniaria incana</i> Lam.	Gray rupturewort	Dry and Stony Areas	-	-	
	POLYGONACEAE					

	Species	Common Name	Habitat	Endemism	Phyto-Geographical Region	IUCN TDB
46	<i>Rumex tuberosus</i> L. ssp. <i>Tuberosus</i>	Dock	Hillsides, Fields, Forests	-	-	
	RHAMNACEAE					
47	<i>Rhamnus hirtellus</i>		dry slopes, shrubs	+	Iran-Turan	LR(Ic)
	GUTTIFERAE					
48	<i>Hypericum lydium</i> Boiss.	Lydian St John's-wort	Rocky Slopes and Pinus Coppice Forests	-	-	
	MALVACEAE					
49	<i>Althaea 29ussian</i> L.	Rough marsh-mallow	Open Fields	-	-	
	GERANIACEAE					
50	<i>Geranium macrostylum</i> Boiss.	Cranesbill	Oak, Juniper and Cedar Forests, Mountain Slopes	-	E. Mediterranean	
51	<i>Geranium asphodeloides</i> Burm. Fil. Ssp. <i>Asphodeloides</i>	Hedgerow Geranium	Forests, Bushes	-	Euro-Siberian	
52	<i>Erodium amenum</i> BOISS. ET KOTSCHY	Storksbill	Rocky and stony slopes	+	-	LR(Ic)
	FABACEAE					
53	<i>Genista albida</i> Willd.	White Genista	Rocky, Generally Calcareous Slopes, Pinus <i>brutia</i> greenwoods	-	-	
54	<i>Genista involucrate</i>		shrubs, coniferous forests, limestone rocks and grazed slopes	+	Iran-Turanian	LR(Ic)
55	<i>Astragalus suberosus</i> Banks et Sol. Ssp. <i>Suberosus</i>	Corky milk-vetch	Coppice forests, Fields, Slopes	-	-	
56	<i>Astragalus chrysochlorus</i>		oak shrubs, mountain steppe, rocky	+	-	LR(nt)
57	<i>Astragalus acicularis</i>		slopes	+	Iran-Turanian	LR(Ic)

	Species	Common Name	Habitat	Endemism	Phyto-Geographical Region	IUCN TDB
58	<i>Cicer pinnatifidum</i> Jaub. Et Spach		Pinus brutia Forest, Volcanic or limestone Reefs, Active Reefs	-	-	
59	<i>Ebenus longipes</i>		stony slopes	+	Iran Turanian	LR(cd)
60	<i>Vicia villosa</i> Roth ssp. <i>Eriocarpa</i> (Hausskn.) P. W. Ball	Hairy/winter/sand/ 30ussian vetch	Pinewood	-	-	
61	<i>Lathyrus laxiflorus</i> (Desf.) O. Kuntze ssp. <i>Laxiflorus</i>		Forest, Bushes, Shady Coasts	-	-	
62	<i>Lathyrus cassius</i> Boiss.		Pinus brutia greenwoods	-	E. Mediterranean	
63	<i>Anthyllis vulneraria</i> subsp. <i>Variegata</i>		Rocky slopes	+	E. Mediterranean (mountain)	LR(Ic)
64	<i>Ononis pubescens</i> L.	Downy Rest-harrow	Pine coppice forests	-	Mediterranean	
65	<i>Trifolium caucasicum</i> Tausch	Caucasian clover	Grassy Areas and Shady Areas on the Mountains	-	-	
66	<i>Trifolium leucanthum</i> Bieb.		Grassy Areas, Mountainous Slopes, Open Forest Fields	-	-	
67	<i>Trigonella brachycarpa</i> (Fisch.) Morris	Fenugreek	Pine Coppice Forests	-	Iran-Turan	
68	<i>Medicago rigidula</i> (L.) All. Var. <i>rigidula</i>	Tifton bur-clover, Tifton medic	Pine Coppice Forests	-	-	
69	<i>Dorycnium pentaphyllum</i> Scop. ssp. <i>anatolicum</i> (Boiss.) Gams	Prostrate canary clover, scarillo	Pinus brutia, Pinus Nigra Forest	-	-	
70	<i>Onobrychis cornuta</i>	Rest harrow	Roadsides, Cedrus-Pinus Coppice Forests	-	-	
ROSACEAE						
71	<i>Prunus x domestica</i> L.	Mirabelle plum	Hills, Mountain Slopes, Roadsides	-	-	
72	<i>Cerasus prostrata</i> (Lab.) Ser.var. <i>prostrata</i>	Mountain cherry	Rocky Areas	-	Mediterranean	

	Species	Common Name	Habitat	Endemism	Phyto-Geographical Region	IUCN TDB
73	<i>Rubus canescens</i> Dc. var. <i>canescens</i>	Blackberry	Loose Forests, Bushes	-	Euro-Siberian	
74	<i>Potentilla micrantha</i> Ramond ex Dc.	Pink Barren Strawberry	Forests	-	-	
75	<i>Orthurus heterocarpus</i> (Boiss) Juz.		Shady Limestone Rocky Forests, Sub-Juniperus	-	-	
76	<i>Crataegus orientalis</i> Pallas ex Bieb. var. <i>orientalis</i>	Quick, Hawthorn, Black thorn	Rocky Areas, Forests	-	-	
77	<i>Crataegus monogyna</i> Jacq. ssp. <i>monogyna</i>	Medlar, hawthorn, Mary's mayflower, common hawthorn	Hillsides, Roadsides	-	-	
78	<i>Sorbus persica</i> Hedl.		Juniperus Forest, Rocky Open Slopes, Bushes, Forests, Individual	-	Iran-Turan	LC
APIACEAE						
79	<i>Eryngium polycephalum</i>	Slime Mold	steps	+	Iran Turanian	LR(lc)
80	<i>Ferulago pauciradiata</i>		Mountain steppe	+	Iran Turanian	LR(lc)
81	<i>Scandix iberica</i> Bieb.	Hepherd's needle, venus comb	Juniper Bushes	-		
82	<i>Scandix pecten-veneris</i> L.	Shepherd's/venus'needle, venus-comb	Pinus Plantations	-	-	
83	<i>Ferula elaeochytris</i> Korovin	-	Rocky Slopes	-	E. Mediterranean	
ASTERACEAE						
84	<i>Inula oculus-christi</i> L.	-	Slope, Forest Open Fields	-	Euro-Siberian	
85	<i>Filago eriocephala</i> Guss.	Cudweed	Forest Open Fields, Roadsides	-	E. Mediterranean	
86	<i>Senecio vernalis</i> Waldst. et Kit.	Eastern groundsel, spring groundsel	Empty Areas, Slope	-	-	
87	<i>Anthemis cretica</i> L. ssp. <i>cassia</i> (Boiss.) Grierson	Mountain dog-daisy	Limestone Spring Areas, between Juniperus or Cedrus	-	-	
88	<i>Anthemis pauciloba</i> var. <i>sieheana</i>		Limestone rifts and edges, marl shores, disturbed steppe	+	E. Mediterranean	LR(cd)

	Species	Common Name	Habitat	Endemism	Phyto-Geographical Region	IUCN TDB
89	<i>Hieracium leucothecum</i>		rocky cliffs, steppe	+	E. Mediterranean (mountain)	LR(Ic)
90	<i>Achillea falcata</i> L.	Silk-leaved milfoil	Rocky Slope, Pinus Forest	-	Iran-Turan	
91	<i>Tanacetum cadmeum</i> (Boiss) Heywood ssp. <i>cadmeum</i>	Feverfew	Juniperus-Cedrus Forest, Grassland Calcareous Slope, Field Sides	+	-	LR(Ic)
92	<i>Serratula cerinthifolia</i> (Sm.) Boiss.		Pinus brutia Forest, Bushes	-	-	
93	<i>Centaurea triumfettii</i> All.	Spreading Thistle, Squarrose Knapweed	Pinus Forest	-	-	
94	<i>Crupina crupinastrum</i> (Moris) Vis.	False Saw-wort, Southern Crupina	Pinus brutia Forest Open Fields	-	-	
95	<i>Xeranthemum inapertum</i> (L.) Miller	Immortelle	Pinus Forest Open Fields	-	-	
96	<i>Lapsana communis</i> L. ssp. <i>pisidica</i> (Boiss. et Heldr.) Rech. Fil.	Nipplewort	Forest Open Fields	-	-	
97	<i>Lapsana communis</i> L. ssp. <i>intermedia</i> (Bieb.) Hayek	Nipplewort	Pinus Forest Open Fields	-	-	
98	<i>Crepis reuterana</i> Boiss. ssp. <i>reuterana</i>		Quercus Forest, Pinus Forest, Slope	-	E. Mediterranean	
CAMPANULACEAE						
99	<i>Campanula rapunculus</i> L. var. <i>rapunculus</i>	Rampion bellflower	Forests, Bushes	-	-	
100	<i>Asyneuma rigidum</i> (Willd.) Grossh. ssp. <i>rigidum</i>		Forests	-	Iran-Turan	
101	<i>Asyneuma limonifolium</i> subsp. <i>pestalozzae</i>		steppes, meadows, rocky cliffs			
OLEACEAE						
102	<i>Phillyrea latifolia</i> L.	Broad-Leaved Phillyrea	Pinus brutia Forest	-	Mediterranean	
THYMELAEACEAE						
103	<i>Daphne sericea</i> Vahl.	Fake Daphne	Maquies, red pine forests	-	E.Mediterranean	
BORAGINACEAE						





	Species	Common Name	Habitat	Endemism	Phyto-Geographical Region	IUCN TDB
104	<i>Alkanna orientalis</i>		Steppe, rocky areas	-	Iran-Turanian	
105	<i>Rochelia disperma</i> (L. Fil.) C. Koch var. <i>disperma</i>	-	Juniperus Bushes	-	-	
106	<i>Buglossoides arvensis</i>	Field Gromwell	calcerous and slopes, following fields	-	-	
107	<i>Paracaryum ancyritanum</i> Boiss.		steppes, Serpentine, calcerous and slopes, following fields	+	Iran-Turanian	LR(Ic)
108	<i>Cynoglossum montanum</i> L.	Dog's-tongue	Juniperus Bushes	-	Euro-Siberian	
109	<i>Onosma tauricum</i> Pallas ex Willd. var. <i>tauricum</i>	Longtube golddrop onosma	Limestone Active Reefs, Pinus and Cedrus Forests	-	-	
SCROPHULARIACEAE						
110	<i>Scrophularia catariifolia</i> Boiss. et Heldr.	Figwort	Pinus Nigra greenwoods	-	Iran-Turan	
111	<i>Scrophularia libanotica</i> Boiss. ssp. <i>libanotica</i> * var. <i>libanotica</i>	Figwort	Rocky Slopes and Rifts	-	E. Mediterranean	
112	<i>Linaria simplex</i> (Willd.) Dc.	Toadflax	Stony Areas, Fallow Fields	-	Mediterranean	
113	<i>Veronica orientalis</i>	Fingered speedwell	Pinus forests	-	-	
114	<i>Linaria corifolia</i>		steppes, rocky Limestone slopes, following fields	+	Iran-Turanian	LR(Ic)
115	<i>Verbascum tossiense</i>		Quercus shrubs, steppes, vineyards	+	Iran-Turanian	LR(Ic)
LAMIACEAE						
116	<i>Ajuga orientalis</i> L.	Oriental Bugle, Eastern Bugle	Bushes	-	-	
117	<i>Ajuga chamaepitys</i> (L.) Schreber ssp. <i>chia</i> (Schreber) Arcangeli var. <i>chia</i>	Ground-pine, yellow bugle	Stony Slopes	-	-	
118	<i>Scutellaria diffusa</i> Benth	Turkish Skullcap	Pinus Forests	-	E. Mediterranean	
119	<i>Lamium gargaricum</i>	Large red dead-nettle	Shadowy lime rocky slopes	-	-	







	Species	Common Name	Habitat	Endemism	Phyto-Geographical Region	IUCN TDB
120	<i>Phlomis samia</i> L.	Greek Jerusalem Sage	Pinus and Cedar greenwoods	-	E. Mediterranean	
121	<i>Phlomis capitata</i> Boiss.		Steppes, oak shrubs, calcerous rocks, rocky cliffs	+	Iran Turan	LR(lc)
122	<i>Phlomis pungens</i> Willd. Var. <i>pungens</i>	Prickly 34ontana34m sage	Roadsides, Dry Stony Slopes, Pinus greenwoods	-	-	
123	<i>Phlomis monocephala</i> P. H. Davis	Jerusalem sage	Cedar, Rocky Calcareous Woods	+	E. Mediterranean	LR(lc)
124	<i>Marrubium globosum</i> subsp. <i>Globosum</i>		Rocky slopes		Iran Turanian	
125	<i>Sideritis 34ontana</i> L. ssp. <i>Remota</i> (D'urv.) P. W. Ball ex Heywood	Mountain ironwort	Pinus greenwoods	-	Mediterranean	
126	<i>Stachys woronowii</i> (Schischkin ex Grossh.) R. Mill	-	Juniperus Bushes	-	Iran-Turan	
127	<i>Calamintha nepeta</i> (L.) Savi ssp. <i>nepeta</i>	White cloud, lesser calamint	Open Regions	-	Mediterranean	
128	<i>Thymus cilicicus</i> Boiss. et Bal.	Sicily Thyme	Open Rocky and Gravely Areas	-	E. Mediterranean	
129	<i>Thymus cherlerioides</i> var. <i>cherlerioides</i>		open rocky and gravel	+	E. Mediterranean	LR(nt)
130	<i>Salvia frigida</i> Boiss.	Sage sp.	Pinus nigra, Juniperus	-	Iran-Turan	
131	<i>Salvia viridis</i> L.	Green Salvia	Maquies, frigana, rocky slopes	-	Mediterranean	
SAXIFRAGACEAE						
132	<i>Saxifraga trachidactylites</i>	Saxifrage	Rocky and stony areas	-	-	
EUPHORBIACEAE						
133	<i>Euphorbia kotschyana</i> Fenzl	Spurge sp.	Cedrus Or Juniperus Excelsa Forest Open Fields	-	E. Mediterranean (Mountain)	



	Species	Common Name	Habitat	Endemism	Phyto-Geographical Region	IUCN TDB
134	<i>Euphorbia cardiophylla</i>	Spurge sp.	Pinus forest openings, Abies cilicica forest, Quercus bushes, steppe and cliffs	+	-	LR(lc)
RUBIACEAE						
135	<i>Sherardia arvensis</i> L.	Field madder	Forest Open Fields	-	Mediterranean	
136	<i>Asperula stricta</i> Boiss. ssp. <i>stricta</i>	Woodruff sp.	Slopes	-	E. Mediterranean	
137	<i>Galium verum</i> L. ssp. <i>glabrescens</i> Ehrend.	Lady's bedstraw, yellow bedstraw	Rocky Slopes, Bushes, Cultivated Fields	-	Iran-Turan	
138	<i>Galium cilicicum</i>		steppes, rocks, fractured rock	+	E. Mediterranean (Mountain)	LR(lc)
RUTACEAE						
139	<i>Haplophyllum myrtifolium</i>		steppes, rocky Limestone or volcanic slopes	+	Iran-Turanian	LR(lc)
ARACEAE						
140	<i>Arum det truncatum</i> C. A. Meyer <i>virescens</i> (Stapf) K. Alpinar et R. Mill	-	Juniperus Bushes	-	Iran-Turan	
ASPARAGACEAE						
141	<i>Asparagus acutifolius</i> L.	Narrow-leaved asparagus	Pine Coppice Forests, Degraded Fields, Roadsides	-	Mediterranean	
142	<i>Hyacinthella</i> sp.	Mountain hyacinth	Rocky slopes, mountains	-	-	
LILIACEAE						
143	<i>Allium cupani</i> Rafin. ssp. <i>hirtovaginat um</i> (Kunth) Stearn	Onion	Pinus Nigra Forests	-	Mediterranean	
144	<i>Allium flavum</i> L. ssp. <i>tauricum</i> (Besser ex Reichb.) Stearn <i>tauricum</i>	Small yellow onion	Pinus brutia, Juniperus, Cedrus greenwoods	-	Mediterranean	
145	<i>Muscari tenuiflorum</i> Tausch	Forget me not sp.	Pinus Nigra and P.Brutia Forests, Juniper Bushes	-	-	







	Species	Common Name	Habitat	Endemism	Phyto-Geographical Region	IUCN TDB
146	Gagea sp.	Spiked ornithogalum	Roadsides, meadows, dry steppes	-	-	
147	Asphodeline taurica (PALLAS) KUNTH	Asphodel	Open forests, Stony meadows	-	E.Mediterranean	
148	Ornithogalum alpigenum	Ornithogalum	hills, steppes, forests	+	E. Mediterranean	LR(nt)
ORCHIDACEAE						
149	Limodorum abortivum	Wild orchid	Mixed foreststs, Maquies	-	-	
IRIDACEAE						
150	<i>Crocus biflorus</i> Miller ssp. <i>tauri</i> (Maw) Mathew	Miss vain	Rocky Slopes, Bushes, Dispersed Coniferous Coppice Forests	-	Iran-Turan	
151	<i>Crocus biflorus</i> subsp. <i>isaurensis</i>		shrubs, coniferous woodland and rocky slopes		E. Mediterranean	
CYPERACEAE						
152	<i>Carex otrubae</i> Podp.	False fox-sedge	within the Forest	-	Euro-Siberian	
153	<i>Carex divulsa</i> Stokes ssp. <i>divulsa</i>	Grey sedge	Forests, Shady and Open Fields	-	Euro-Siberian	
POACEAE						
154	<i>Brachypodium pinnatum</i> (L.) P. Beauv.	Tor-grass	Non-Shady Habitats	-	Euro-Siberian	
155	<i>Elymus hispidus</i> (Opiz) Melderis ssp. <i>Barbulatus</i> (Schur) Melderis	Intermediate Wheatgrass	Black Pine Forest	-	-	
156	<i>Milium pedicellare</i> (Bornm.) Roshev. ex Melderis Apud Rech. Fil.	-	Mountain Slopes, with Juniperus	-	Iran-Turan	
157	<i>Stipa bromoides</i> (L.) Dörfler	Achnatherum bromoides	Bush Open Fields, Stony Areas, on Limestone	-	Mediterranean	

Photos of some of the floristic elements captured at the Project Site and its environs are presented in Photo 6 below.

	
Clypeola jonthlaspi	Asphodeline taurica
	
Limodorum abortivum	Onobrychis cornuta
	
Alkanna orientalis	Centaurea triumphettii

	
Daphne sericea	Noccaea iberidea
	
Anagallis arvensis	Asplenium trichomanes
	
Veronica orientalis	Juniperus excelsa

	
Corydalis wendelboi	Lamium garganicum
	
Buglossoides arvensis	Ajuga chamaepitys
	
Hyacinthella sp.	Saxifraga trachidactylites

	
Gagea sp.	Viola heldreichiana
	
Anemone blanda	Juniperus oxycedrus
	
Erodium amenum	Ornithogalum alpigenum



	
Salvia viridis L.	Astragalus sp.

Photo 5. Some Floristic Elements of the Project Area and Its Vicinity

3.3 Faunistic Analysis

3.3.1 Butterflies

The Project area is very rich in terms of butterflies. The Sertavul Pass is located in C4 grid according to Koçak (Koçak, 2012), where 77 species are recorded. 1 species from IUCN, 11 species from Turkey Red List and 3 endemics from Red Book of Butterflies in Turkey are evaluated as DD (Data Deficient) and the others are found to be LC (Least Concern). *Polyommatus cilicius*, *Polyommatus sertavulensis* and *Polyommatus wagneri* are the 3 endemics of the region (Karataş, 2012). The main threats for Turkish butterflies are determined in the publication Conservation Strategy for Butterflies in Turkey (2011), Nature Conservation Centre. Wind farms in general may have low risk level for butterflies. The Project area is in the Sertavul Pass Prime Butterfly Area, and conservation measures are given (See Table 3).

Table 3. Important Butterfly Species of the Region and the Project Area

Scientific name	Conservation status								Habitat
	Endemic	Near endemic	CR	EN	VU	NT	DD	Natura 2000	
Papilionidae									
<i>Papilio alexanor</i>								+	Prefers warm and slopes with intense flowers A spring butterfly, spends winter as pupa Flight: May-July
Lycaenidae									
<i>Glaucopsyche Astraea</i>	+								Prefers wet meadows, wetlands, riverine vegetation and pine forest openings. Observed till May-June If hgh altitude than 1700 m. till July.
<i>Pseudophilotes bavius</i>								+	Prefers rocky areas. Flight: April-July
<i>Polyommatus ossmar</i>	+								Prefers shrubby, stony, dry and semi-dry regions, open habitats. Flight: June-August
<i>Polyommatus cornelia</i>	+								Observed in rocky slopes and steppes. Flight: May-August
<i>Polyommatus sertavulensis</i>	+						+		Prefers dry, mountain slopes with low densty vegetations Flight: July.
<i>Polyommatus menalcas</i>	+								Prefers bushes, meadows, dry and semi-dry regions Observed from the beginning of June till the end of August
<i>Polyommatus mithridates</i>	+						+		Prefers warm and dry regions. Stony, rocky slopes. Flight is between July and August
<i>Polyommatus hopfferi</i>	+								Dry stony meadows, males observed in watersheds, flight is between Juy-August
<i>Polyommatus poseidon</i>	+								Prefers meadows and water edges Flight is between June and August
<i>Polyommatus wagneri</i>	+						+		Rocky steppes and meadows. Flight time is July

Scientific name	Conservation status								Habitat
	Endemic	Near endemic	CR	EN	VU	NT	DD	Natura 2000	
<i>Polyommatus cilicius</i>	+						+		Eastern Mediterranean Observed between altitudes 1400-1900 m. Flight time: July
Satyridae									
<i>Hipparchia mersina</i>		+							Sunny meadows higher than 500 m altitude and edges of pine forests. Flies sunny planted openings in pine forests. Flight: End of May-October. In the southern Turkey, April-end of June; above 500 m altitude observed 1 month later.
<i>Hipparchia mersina</i>		+							Sunny meadows higher than 500 m altitude and edges of pine forests. Flies sunny planted openings in pine forests. Flight: End of May-October. In the southern Turkey, April-end of June; above 500 m altitude observed 1 month later.
<i>Pseudochazara Lydia</i>	+								Prefers rocky, dry, relatively low vegetation. Also observed in meadows near the mixed forests Flight: June-August

3.3.2 Amphibians

Amphibians include terrestrial and aquatic salamanders and frogs. Reptilians include tortoises, lizards and snakes. Amphibians and reptiles are poikilothermic animals and it is hard to observe these animals in winter period. The most important elements of amphibians are tailed amphibians (Urodela) which are salamanders and frogs (Anura) which are tailless amphibians. These species need wetlands at least during breeding. Therefore, habitats of amphibians within the Project site were searched in the first hand in the scope of this study. The amphibian species listed in the Project site and its vicinity, their national and international conservation status and information on their population are presented in Table 4 below.

Table 4. Amphibians in the Project Area and its Impact Zone

Species name	Turkish name	Common name	Habitat	Habitat Directive	Bern
<i>Bufo bufo</i>	Siğilli Kurbağa	Common toad	Nocturnal-moist meadows and forest underlayer	-	Annex-III
<i>Bufo viridis</i> (<i>Pseudepidalea viridis</i>)	Gece Kurbağası	European green toad	Nocturnal- moist meadows and forest underlayer	Annex-IV	Annex-II
<i>Pseudepidalea variabilis</i>	Değişken Desenli Gece Kurbağası				Annex-III
<i>Hyla arborea</i>	Ağaç Kurbağası	Tree frog	Diurnal-riperian zone, moist environment, on bush and weed	Annex-IV	Annex-II
<i>Rana ridibunda</i> (<i>Pelophylax ridibundus</i>)	Ova Kurbağası	Marsh frog	Diurnal- densely vegetated ponds, lakes and slow flowing waters	-	Annex-III
<i>Rana macrocnemis</i>	Uludağ Kurbağası	The long-legged wood frog	It is mainly found in humid areas included broadleaved, mixed and coniferous forests, swamps, steppes, sub alpine and alpine meadows.		

Bufo bufo is a widespread and adaptable species present in coniferous, mixed and deciduous forests, groves, bushlands, meadows, arid areas, parks and gardens. It is usually in damp areas with dense vegetation, and large open areas are generally avoided. The species spawns and larval development takes place in still waters and slow-moving parts of rivers and streams. It is present in many modified habitats (IUCN, 2013).

Bufo viridis species lives in a wide range of forests, forest steppe, scrubland, grassland and alpine habitats. Animals may be present in modified areas including urban centers (e.g. Bucharest), city parks and gardens - and often benefits from disturbed habitats. Spawning and larval development occurs in a diverse range of temporary and permanent water bodies including swamps, ponds, lakes, pools in streams and rivers, reservoirs, ditches and puddles (IUCN, 2013).

Hyla arborea is generally associated with open, well-illuminated broad-leaved and mixed forests, bush and shrublands, meadows, gardens, vineyards, orchards, parks, lake shores and low riparian vegetation. Dark and dense forests are avoided. Populations can tolerate periods of dryness and can be encountered in dry habitats. Spawning and larval development takes place in stagnant waters such as lakes, ponds, swamps and reservoirs, and sometimes in ditches and puddles. The species has been reported from anthropogenic landscapes, including large cities.

Pelophylax ridibundus is a highly opportunistic amphibian, living in mixed and deciduous forests, forest steppe, and steppe and other grasslands, semi-desert and desert zones. Arid areas are largely colonized through river valleys and channels. The frog prefers open, well-warmed areas with abundant herbaceous vegetation. It is a semi-aquatic species, inhabiting (and breeding in) a wide variety of flowing and stagnant water habitats, from shallow puddles and ponds to large lakes, reservoirs, rivers and brooks.

Rana macrocnemis is mainly found in humid areas included broadleaved, mixed and coniferous forests, swamps, steppes, sub alpine and alpine meadows. In dry areas this species is generally limited to areas close to permanent lakes, rivers, brooks and springs that are often surrounded by dense herbaceous and shrubby vegetation. It breeds in various stagnant and slow-flowing waterbodies.

3.3.3 Reptiles

27 reptile species are identified in the region. Among these reptilian species, Spur headed tortoise (*Testudo graeca*) is a protected species in Europe its conservation status according to RDB is VU "Vulnerable". There is one endemic reptile species: *Lacerta danfordi* listed in the Project area. This species is not protected and the conservation status is Least Concern.

Both steppic and riverine species are present in the Project area in accordance with the vegetation variances. Considering the region's herpetofauna; 14 species are in the Strictly Protected Species (Annex II) according to the Bern Convention, and 12 species are in the category of Protected Species (Appendix III). These species are widespread; except *Lacerta danfordi*.

Table 5. Reptilians in the Project Area and its Impact Zone

SCIENTIFIC NAME	TURKISH NAME	HABİTAT	BERN	IUCN
TESTUDINES				
<i>Testudo graeca</i>	Yaygın Kara Kaplumbağası	The forests and forest openings around WFP area	Annex-II	VU
AGAMIDAE				
<i>Agama stellio</i>	Dikenli keler Sling-Tailed Agama	Reefs, stony areas and stone walls	Annex-II	NE
<i>Trapelus lessonae</i>	Bozkır Keleri	close to rocky areas in semi-arid and steppe habitats	Annex III	LC
SQUAMATA				
GEKKONIDAE				
<i>Cyrtopodion kotschy</i>	İnce parmaklı keler	Rocky places and walls of buildings	Annex-II	LC
<i>Mediodactylus kotschy</i>	İnce Parmaklı Keler	found climbing or on the ground in dry, rocky or stony places. It can be found in scrubland, under the bark of old juniper trees, on cliffs, on stone walls and on the outside and inside of buildings	ANNEX II	LC
<i>Hemidactylus turcicus</i>	Geniş Parmaklı Keler	shrubland, rocky areas, salt marshes, coastal areas, cliffs, caves, on stone walls in agricultural areas and it is common in urban environments, including inside buildings	Annex III	LC
LACERTIDAE				
<i>Lacerta viridis</i>	Küçük yeşilkertenkele	Weeds and bushes in the forests	Annex-II	LC

SCIENTIFIC NAME	TURKISH NAME	HABİTAT	BERN	IUCN
<i>Lacerta danfordi</i>	Toros kertenkelesi Danford's Lizard	Creek banks, forest and bushes, reefs and stony areas	Annex-III	LC
<i>Lacerta laevis</i>	Hatay kertenkelesi Lebanon Lizard	Loose or dense grassy stony areas and reefs		LC
<i>Lacerta media</i>	Ortanca Yeşil Kertenkele	Woodland with a scrub or grassy understory, with stony and rocky areas. Cultivated land, plantations and rural gardens. It is restricted to humid or moist areas in the south of its range. It is often found in trees.	Annex III	LC
<i>Ophisops elegans</i>	Tarla Kertenkelesi	The forest openings around WFP area	Annex-II	NE
<i>Parvilacerta parva</i>	Cüce Kertenkele	pland steppe areas with sparse vegetation and stony substrates	ANNEX II	LC
SCINCIDAE				
<i>Ablepharus kitaibeli</i>	İnce kertenkele Snake-eyed Skink	short planted open fields, loose greenwoods The forest openingsand moist places	Annex-II	LC
<i>Trachylepis aurata</i>	Tıknaç Kertenkele	In rocky and well vegetated areas that are often close to water. It can be found in cultivated land, among ruins and in rural gardens	Annex III	LC
<i>Trachylepis vittata</i>	Şeritli Kertenkele	Open areas of sandy or stony soil with sparse grass or bushy vegetation. Animals may also be found at the edge of fields, on the banks of irrigation canals, or in rural gardens	Annex III	LC
<i>Mabuya aurata</i>	Tıknaç kertenkele Levant Skink	stony parts of open fields with little plants	Annex-III	LC
<i>Mabuya vittata</i>	Şeritli kertenkele Bridled Skink	Bushes and stony areas in open and forest lands	Annex-III	LC
AMPHISBAENIDAE				
<i>Blanus strauchi</i>	Kör kertenkele Anatolian Worm-lizard	Stony parts in forest and open fields	Annex-III	LC
COLUBRIDAE				
<i>Malpolon insignitus</i>	Çukurbaşı Yılan		Annex III	LC
<i>Elaphe longissima</i> (<i>Zamenis longissimus</i>)	Eskülap yılanı	Under soil in the forest	Annex-II	LC
<i>Elaphe quatuorlineata</i>	Sarı yılan	Under soil in the forest, Loose forest and bushes, stony parts, between the gardens	Annex-II	NT
<i>Natrix natrix</i>	Yarısucul yılan	Meadows close to water	Annex- III	LC
<i>Natrix tessellata</i>	Su yılanı	In waters and watersides	Annex-II	-
<i>Coluber najadum</i>	İnce yılan Dahl's Whip Snake	Stony areas, bushes, dry places	Annex-II	LC

SCIENTIFIC NAME	TURKISH NAME	HABİTAT	BERN	IUCN
<i>Eirenis aurolineatus</i>	-	Loose greenwoods and stony parts	Annex- III	E
<i>Dolichophis jugularis</i>	Kara Yılan	lowland mountain areas in a wide variety of habitats including arid open areas, meadows, rocky and stony regions, swampy areas, open woodland, beaches, vineyards, agricultural land and ruins.	ANNEX II	LC
VIPERIDAE (ENGEREKLER)				
<i>Montivipera xanthina</i>	Şeritli Engerek, Osmanlı Engereği	in Mediterranean scrubland and mountain steppe habitats. It can be found in rural gardens, cultivated land, olive groves and among ruins.	ANNEX II	LC

3.3.4 Mammals

In the scope of the fauna survey, mammals such as insectivores, bats, rodentia, predators, and ungulates and characteristics of their habitats have been investigated. The inventory of mammals formed as a result of site survey and habitat inspections are presented in Table 7. 25 mammal species (except for Bat species) are distributed in and around the Project area. No endemic species are observed (Karataş, 2012). Red Fox (*Vulpes vulpes*), Golden Jackal (*Canis aureus*), Beech Marten (*Martes foina*), Least Weasel (*Mustela nivalis*) and Wild Boar (*Sus scrofa*) naturally occur in the region covering the Project area. The mammal species in the impact zone of the Project area and close vicinity are identified either from the trace, droppings and observations and interviews with local people.

Table 6. Mammals (except bats) in and around the Project Area

Scientific name	Turkish name	CHC	IUCN	BERN	CITES
ERINACEOMORPHA					
Erinaceidae					
<i>Erinaceus concolor</i>	Kirpi	Annex I	LC	-	-
SORICOMORPHA					
SORICIDAE					
<i>Crocidura suaveolens</i>	Sivriburunlu Bahçefaresi	-	LC	Annex III	
LAGOMORPHA					
LEPORIDAE					
<i>Lepus europaeus</i>	Yabani Tavşan	ANNEX III	LC	Annex III	-
RODENTIA					
SCIURIDAE					
<i>Sciurus anomalus</i>	Sincap	ANNEX I	LC	Annex II	-

Scientific name	Turkish name	CHC	IUCN	BERN	CITES
<i>Spermophilus xanthopyrnus</i>	Anadolu Yersincabı	ANNEX I	NT	-	-
CRICETIDAE					
<i>Cricetulus migratorius</i>	Cüce Avurtlak		LC	-	-
<i>Mesocricetus brandti</i>	Türk Avurtlağı		NT	-	-
<i>Meriones tristrami</i>	Anadolu Çölfaresi		LC	-	-
<i>Microtus levis</i>	Tarlafaresi		LC	-	-
<i>Microtus guentheri</i>	Akdeniz Tarlafaresi		LC	-	-
MURIDAE					
<i>Apodemus mystacinus</i>	Kaya Faresi		LC	-	-
<i>Apodemus flavicollis</i>	Sarıboyunlu Ormanfaresi		LC	-	-
<i>Apodemus witherbyi</i>	Ormanfaresi		LC	-	-
<i>Mus domesticus</i>	Evfaresi		LC	-	-
<i>Mus macedonicus</i>	Sarı Evfaresi		LC	-	-
SPALACIDAE					
<i>Nannospalax nehringi</i>	Anadolu Körfaresi		DD	-	-
GLIRIDAE					
<i>Dryomys nitedula</i>	Hasancık, Ağaç Yediuyuru		LC	Annex III	-
DIPODIDAE					
<i>Allactaga williamsi</i>	Araptavşanı		LC	-	-
HYSTRICIDAE					
<i>Hystrix indica</i>	Oklukirpi		NE	-	-
CANIDAE					
<i>Canis lupus</i>	Kurt	ANNEX III	LC	Annex II	Annex II
<i>Vulpes vulpes</i>	Tilki	ANNEX III	LC	-	-
MUSTELIDAE					
<i>Mustela nivalis</i>	Gelincik	ANNEX III	LC	Annex III	
<i>Martes foina</i>	Kaya Sansarı	ANNEX III	LC	Annex III	-
<i>Meles meles</i>	Porsuk	ANNEX III	LC	Annex III	-
ARTIODACTYLA					
SUIDAE					
<i>Sus scrofa</i>	Yabandomuzu	ANNEX III	LC	-	-

No endemic or endangered mammal species were found in the Project area in accordance with the IUCN Red List of Threatened Species and Bern Convention.

3.4 Birds

In order to determine the bird species within the Project site and its vicinity, ornithological surveys were conducted. The results are supported by detailed literature survey. This section includes the ecological and ornithological assessment, the fauna inventory, characteristics of their habitats and the conservation status.

When the interactions with other habitats evaluated, the springs, wet and dry riverbeds form the ecologically important and sensitive areas in the project area. For this reason protection of these habitats during the operation activities is important. The turbines and the other structures are distant from Çokum Spring, Sariali Spring and the Sayharman Riverbed.

The altitude of the Project site is 1650 m and the Project area include dense rocky habitats covered by *Juniperus excelsa* (Greek juniper). The region is suitable for *Alectoris chukar* and *Oenanthe oenanthe*.

In the 2016 field survey, an intense use of passerine birds such as *Petronia petronia*, *Passer domesticus*, *Oenanthe oenanthe*, *Galerida cristata* and *Carduelis carduelis* was reported to be observed. Frequently recorded species during the field surveys were from Alaudidae, Turdidae, Passeridae ve Fringillidae families.

In order to determine avifauna, create a bird inventory and define the ecologic status of bird populations in the Project area an ornithologic survey was conducted in spring migration period in 2016 (April). The relationship between the birds, migration routes and important areas evaluated.

In scope of ornithological and ecological assessment there are additional field observations, interviews that have been performed with the local people and the literature surveys.

In both assessment reports, the site and the species are evaluated using national and international databases and according to national and international requirements. The habitat information of the target species are indicated particularly (See **Table 8**).

The species forming the avian fauna of the Project site and the conservation status of the bird species were evaluated according to the updated lists of the Bern Convention Annexes, the European Red List (ERL) prepared by the IUCN (International Union for the Conservation of Nature) and the national RED DATA BOOK categories, "Turkish Birds Red List" (Kiziroglu, 2008).

Birds and Turkey and Europe: Guidebook (Heinzel et al., 1995), Songbirds of Turkey: Atlas of Biodiversity of Turkish Passerine Birds (Roselaar, 2000), Birds Data from Turkey's Important Nature Areas (Doğa Derneği, 2004), TRAKUŞ 2016. (www.trakus.org), State of World's Birds: Indicators for Our Changing World (Birdlife International, 2008) are the important sources that are used in bird research.

Most of the bird species were recorded according to visual methods. During the field surveys direct observations, point counts and transect counts were performed and the records are evaluated (See Photo 6).



Photo 6. Bird Observations During the Field Study

The remaining species are identified from their calls. Not only the Project area, but the basin of the Project area is also evaluated. Equipment such as binoculars, telescope and camera are used in the identification. Moreover, interviews were conducted with local people and shepherds.

Table 7. Major Bird Species in and around the Project Area

Scientific name	Turkish name	Habitat	RDB	IUCN	BIE	BERN	CHC	CITES	STATUS REGIONAL
CICONIIFORMES									
CICONIIDAE									
<i>Ciconia nigra</i>	Kara Leylek	inhabits old, undisturbed, open from sea-level up to mountainous regions. It forages in shallow streams, pools, marshes swampy patches, damp meadows flood-plains, pools in dry riverbeds and occasionally grasslands especially where there are stands of reeds or long grass. It generally avoids large bodies of water and dense forest.	A.3	LC	II	Annex II	Annex I	Annex-II	YZ
<i>Ciconia ciconia</i>	Leylek	inhabits open areas, generally avoiding regions with persistent cold, wet weather or large tracts of tall, dense vegetation such as reedbeds or forests, shallow marshes, lakesides, lagoons, flood-plains, rice-fields and arable and especially where there are scattered trees for roosting.	A.3.1	LC	II	Annex II	Annex I	--	YZ
GRUIFORMES									
GRUIDAE									
<i>Grus grus</i>	Turna	Wetlands	A.3	LC	II	Annex II	Annex I	Annex II	Y,T
FALCONIFORMES									
ACCIPITRIDAE									
<i>Milvus migrans</i>	Kara çaylak	found ubiquitously throughout habitats, although avoiding	A.3	LC	III	Annex II	Annex I	Annex-II	T

Scientific name	Turkish name	Habitat	RDB	IUCN	BIE	BERN	CHC	CITES	STATUS REGIONAL
		dense woodland							
<i>Circaetus gallicus</i>	Yılan kartalı	a variety of habitats within warm temperate and tropical environments, and is recorded up to 2,300 m	A.4	LC	III	Annex II	Annex I	Annex-II	YZ
<i>Accipiter nisus</i>	Atmaca	Loose greenwoods, agricultural lands with trees	A.3	LC	IV	Annex II	Annex I	Annex-II	KZ
<i>Buteo buteo</i>	Şahin	a wide variety of habitats but requires at least some tree cover for nesting and roosting; ideal habitat appears to be forest edge, or mosaics of forest and open areas	A.3	LC	IV	Annex II	Annex I	Annex-II	Y
<i>Buteo rufinus</i>	Kızıl şahin	open areas, particularly steppe and semi-desert, and has been recorded up to 3,500 m	A.3	LC	III	Annex II	Annex I	Annex-II	KZ
<i>Pernis apivorus</i>	Arı Şahini	a wide variety of habitats but requires at least some tree cover for nesting and roosting; ideal habitat appears to be forest edge, or mosaics of forest and open areas	A.3	LC	III	Annex III	Annex I	Annex-II	Y
<i>Circus cyaneus</i>	Gökçe delice	Mainly marshland, wet, low density grazed meadows, old fields, wetlands with saline and alkaline peat bogs, highland prairieland, grazing land, agricultural areas, cold desert shrub steppes and the plains of riverine woodlands. Escapes from dense forest.	A.1.2	LC		Annex II	Annex I	Annex II	KZ
<i>Circus aeruginosus</i>	Saz delicesi	extensive areas of dense marsh vegetation, in fresh or brackish water, generally in lowlands but up to 2,000-300m	A.3	LC	IV	Annex II	Annex I	Annex-II	Y

Scientific name	Turkish name	Habitat	RDB	IUCN	BIE	BERN	CHC	CITES	STATUS REGIONAL
Circus macrourus	Bozkır delicesi	Lives in infrequent herbaceous or dry steppes. The valleys with steppe vegetation and semi deserts. They form huge groups during the migration and wintering areas	A.1.2	NT		Annex II	Annex I	Annex II	Y
Circus pygargus	Çayır delicesi	Fields, plants, meadows and around marshlands. Depends on wetland and riverine areas	A.1.2	LC		Annex II	Annex I	Annex II	T
Accipiter brevipes	Yaz atmacası	woody plains, often near water, and usually ranges up to 1,000 m	A.2	LC		Annex II	Annex I	Annex II	T
Hieraaetus pennatus	Küçük kartal	open woodland, preferring patches of forest interspersed with open areas; it is recorded up to 3,000 m	A.3	LC	III	Annex II	Annex I	Annex-II	Y
Accipiter gentilis	Çakır	Deciduous and coniferous forests	A.1.2	LC	IV	Annex II	Annex I	Annex II	Y
Neophron percnopterus	Küçük akbaba	These vultures are very elastic. They can adapt various habitat types. Can be observed feeding around garbage. The natural distribution includes plains, wetlands, pastures and mountains.	A.3	EN		Annex II	Annex I	Annex II	Y
Aquila pomarina	Küçük orman kartalı	High mountains, rocks, forests. Nest in the rocky cliffs. If the topography is not suitable sometimes nest on pine trees	A.3	LC		Annex II	Annex III		G,T
Aquila pennatus	Küçük kartal	High mountains, rocks, forests. Nest in the rocky cliffs. if the topography is not	A.3	LC		Annex III	Annex III	Annex II	Y

Scientific name	Turkish name	Habitat	RDB	IUCN	BIE	BERN	CHC	CITES	STATUS REGIONAL
		suitable sometimes nest on pine trees							
<i>Aquila chrysaetos</i>	Kaya kartalı	High mountains, rocks, forests. Nest in the rocky cliffs. if the topography is not suitable sometimes nest on pine trees	A.1.2	LC		Annex II	Annex I	Annex II	Y
FALCONIDAE									
<i>Falco naumanni</i>	Küçük kerkenez	a colonial breeder, often in the vicinity of human settlements. It forages in steppe-like habitats, natural and managed grasslands, and non-intensive cultivation.	A.2	VU	I	Annex II	Annex I	Annex-II	T
<i>Falco tinnunculus</i>	Kerkenez	Reefs, buildings	A.2	LC	III	Annex II	Annex I	Annex-II	Y
<i>Falco subbuteo</i>	Delicedoğan	occurs in open wooded areas, and has been recorded up to 4,000 m	A.3.1	LC	IV	Annex II	Annex I	Annex-II	YZ
<i>Falco peregrinus</i>	Gökdoğan	No main habitat, Generally they prefer hollows in the long rocky place for the formation of nest.	A.1.2	LC					
GALLIFORMES									
PHASIANIDAE									
<i>Coturnix coturnix</i>	Bıldırcın		A.3	LC		Annex III	Annex III	Annex II	T
<i>Alectoris chukar</i>	Kıvalı keklik		A.2	LC	III	Annex II	Annex I	Annex II	Y
CORACIIFORMES									
CORACIIDAE									
<i>Coracias garrulus</i>	Gök Kuzgun	sparse forests, open areas with woodland or shrub, forest edges	A.2	NT	--	Annex II	Annex I		T

Scientific name	Turkish name	Habitat	RDB	IUCN	BIE	BERN	CHC	CITES	STATUS REGIONAL
PICIFORMES									
PICIDAE									
Dendrocopos syriacus	Alaca ağaçkakan	Pinewoods	A.2	LC	--	Annex II	Annex I		Y
Picus viridis	Yeşil Ağaçkakan Green Woodpecker	Pinewoods	A.2		1	II	-		Y
Dendrocopos minor	Küçük ağaçkakan	Pinewoods	A.1.2	LC	--	Annex II	Annex I		Y
COLUMBIFORMES									
COLUMBIDAE									
Columba livia	Kaya güvercini		A.5	LC	IV	Annex III	Annex III	--	Y
Streptopelia decaocto	Kumru		A.5	LC	IV	Annex III	Annex II	--	Y
Streptopelia turtur	Üveyik		A.3.1	LC	III	Annex III	Annex III	--	T
Columba palumbus	Tahtalı güvercin		A.4	LC	--	Annex III	Annex III		KZ
CUCULIFORMES									
Cuculus canorus	Guguk	Forests, open fields with trees and fences	A.2	LC	IV	Annex II	Annex I	--	G
STRIGIFORMES									
STRIGIDAE									
Athene noctua	Kukumav		A.2	LC	III	Annex II	Annex I	Annex II	Y
Bubo bubo	Puhu	Widespread reefs and rifts, and sometimes in forests	A.1.2						Y
CAPRIMULGIFORMES									
CAPRIMULGIDAE									
Caprimulgus europaeus	Çobanaldatan		A.1.2	LC	II	Annex II	Annex I	--	YZ
APODIFORMES									
APODIDAE									

Scientific name	Turkish name	Habitat	RDB	IUCN	BIE	BERN	CHC	CITES	STATUS REGIONAL
<i>Apus apus</i>	Ebabil		A.3.1	LC	IV	Annex III	Annex I	--	T
<i>Tachymarptis melba</i>	Akkarınlı ebabil		A.3.1	LC	--	Annex II	Annex I		T
CORACIIFORMES									
MEROPIDAE									
<i>Merops apiaster</i>	Arıkuşu		A.3.1	LC	III	Annex II	Annex I	--	T
UPUPIDAE									
<i>Upupa epops</i>	İbibik		A.2	LC	III	Annex II	Annex I	--	YZ
PASSERIFORMES									
ALAUDIDAE									
<i>Galerida cristata</i>	Tepeli toygâr		A.3	LC	III	Annex III	Annex II	--	Y
<i>Melanocorypha calandra</i>	Boğmaklı toygâr		A.5	LC		Annex II	Annex I	--	Y
<i>Calandrella brachydactyla</i>	Bozkır toygârı		A.3	LC		Annex II	Annex I	--	YZ
<i>Lullula arborea</i>	Orman toygârı		A.3	LC	II	Annex III	Annex II	--	KZ
<i>Alauda arvensis</i>	Tarlakuşu		A.4	LC	III	Annex III	Annex II	--	KZ
HIRUNDINIDAE									
<i>Hirundo rustica</i>	Kır kırlangıcı		A.5	LC	III	Annex II	Annex I	--	YZ
<i>Ptyonoprogne rupestris</i>	Kaya kırlangıcı		A.5	LC	IV	Annex II	Annex I		G
<i>Hirundo daurica</i>	Kızıl kırlangıç		A.3	LC	--	Annex II	Annex I		T
<i>Delichon urbicum</i>	Ev kırlangıcı		A.3	LC	--	Annex II	Annex I		T
MOTACILLIDAE									
<i>Anthus campestris</i>	Kır incirkuşu		A.2	LC	III	Annex II	Annex I	--	T
<i>Anthus trivialis</i>	Ağaç incirkuşu		A.3	LC	IV	Annex II	Annex I	--	T
<i>Anthus pratensis</i>	Çayır incirkuşu		A.3	LC	IV	Annex II	Annex I	--	KZ

Scientific name	Turkish name	Habitat	RDB	IUCN	BIE	BERN	CHC	CITES	STATUS REGIONAL
Motacilla alba	Akkuyruksallayan		A.3.1	LC	IV	Annex II	Annex I	--	Y
Motacilla flava	Sarı kuyruksallayan		A.3.1	LC	--	Annex II	Annex I		YZ
TROGLODYTIDAE									
Troglodytes troglodytes	Çit kuşu		A.1.2	LC	IV	Annex II	Annex I		Y
PRUNELLIDAE									
Prunella modularis	Dağ bülbülü		A.1.2	LC	IV	Annex II	Annex I		Y
MUSCICAPIDAE									
Muscicapa striata	Benekli sinekkapan		A.3	LC	III	Annex II	Annex I	--	T
Ficedula semitorquata	Alaca sinekkapan		A.3	LC	--	Annex II	Annex I		T
Ficedula hypoleuca	Kara sinekkapan		A.1.2	LC	--	Annex II	Annex I		T
Luscinia megarhynchos	Bülbül		A.2	LC	--	Annex II	Annex I		YZ
Saxicola torquatus	Taşkuşu		A.3	LC	--	Annex II	Annex I		YZ
Erithacus rubecula	Kızılgerdan		A.3	LC	IV	Annex II	Annex I	--	KZ
Phoenicurus ochruros	Karakızılkuşuk		A.2	LC	IV	Annex II	Annex I	--	KZ
Phoenicurus phoenicurus	Kızılkuşuk		A.3	LC	II	Annex II	Annex I	--	T
Saxicola torquata	Karagerdanlı taşkuşu		A.3	LC	IV	Annex II	Annex I	--	KZ
Oenanthe isabellina	Boz kuyrukkakan		A.3	LC	IV	Annex II	Annex I	--	YZ
Oenanthe oenanthe	Kuyrukkakan		A.3	LC	III	Annex II	Annex I	--	YZ
Phoenicurus ochruros	Kara kızılkuşuk		A.2	LC		Annex II	Annex I	--	KZ
Saxicola rubetra	Çayır taşkuşu		A.3	LC	IV	Annex II	Annex I	--	T
TURDIDAE									
Turdus merula	Karatavuk		A.3	LC	IV	Annex III	Annex III	--	Y
Turdus philomelos	Öter ardıç		A.2	LC	IV	Annex III	Annex II	--	KZ

Scientific name	Turkish name	Habitat	RDB	IUCN	BIE	BERN	CHC	CITES	STATUS REGIONAL
<i>Turdus viscivorus</i>	Ökseotu ardıcı		A.2	LC	IV	Annex III	Annex II	--	KZ
<i>Turdus pilaris</i>	Tarla ardıcı		B.2	LC	--	Annex III	Annex II		KZ
<i>Turdus iliacus</i>	Kızıldıç		B.2	LC	--	Annex III	Annex II		KZ
SYLVIIDAE									
<i>Sylvia curruca</i>	Küçük akgerdanlı ötleğen		A.2	LC		Annex II	Annex I		YZ
<i>Sylvia atricapilla</i>	Karabaşlı ötleğen		A.2	LC	IV	Annex II	Annex I	--	T
<i>Sylvia communis</i>	Çalı ötleğeni		A.3	LC	IV	Annex III	Annex III		G
<i>Phylloscopus collybita</i>	Çıvgın		A.3.1	LC	IV	Annex II	Annex I	--	KZ
<i>Phylloscopus trochilus</i>	Söğüt bülbülü		A.3.1	LC	IV	Annex II	Annex I	--	T
<i>Regulus regulus</i>	Çalıkuşu Goldcrest		A.1.2	LC					Y,KZ
AEGITHALIDAE									
<i>Aegithalos caudatus</i>	Uzun kuyruklu baştankara		A.2	LC	IV	Annex III	Annex II	--	KZ
SITTIDAE									
<i>Sitta krueperi</i>	Küçük Sıvacıkuşu Krüper's Nuthatch	Pinewoods				Annex II	Annex I		Y
<i>Sitta neumayer</i>	Kaya sıvacısı		A.2	LC		Annex II	Annex I	--	Y
PARIDAE									
<i>Parus major</i>	Büyük baştankara		A.3.1	LC	IV	Annex II	Annex I	--	Y
<i>Parus caeruleus</i>	Mavi baştankara		A.2	LC	--	Annex II	Annex I		Y
<i>Parus ater</i>	Çam baştankarası		A.3	LC	IV	Annex III	Annex I		Y
ORIOIDAE									
<i>Oriolus oriolus</i>	Sarı asma		A.2	LC	IV	Annex III	Annex I	--	YZ
LANIIDAE									

Scientific name	Turkish name	Habitat	RDB	IUCN	BIE	BERN	CHC	CITES	STATUS REGIONAL
<i>Lanius collurio</i>	Kızıl sırtlı örümcek kuşu		A.3	LC	III	Annex II	Annex I	--	YZ
<i>Lanius minor</i>	Kara alınlı örümcek kuşu		A.3	LC	II	Annex II	Annex I	--	T
<i>Lanius senator</i>	Kızıl başlı örümcek kuşu		A.2	LC	II	Annex II	Annex I	--	YZ
CORVIDAE									
<i>Garrulus glandarius</i>	Ala karga		A.3.1	LC	IV	Annex III	Annex III	--	Y
<i>Pica pica</i>	Saksağan		A.5	LC	IV	Annex III	Annex III	--	Y
<i>Corvus monedula</i>	Cüce karga		A.5	LC	IV	Annex III	Annex III	--	Y
<i>Corvus corone</i>	Leş kargası		A.5	LC		Annex III	Annex III		Y
<i>Corvus corax</i>	Kuzgun		A.5	LC	IV	Annex III	Annex II		Y
STURNIDAE									
<i>Sturnus vulgaris</i>	Sığırcık		A.5	LC	III	Annex III	Annex II	--	KZ
PASSERIDAE									
<i>Passer domesticus</i>	Ev serçesi		A.5	LC	III	Annex III	Annex III	--	Y
<i>Passer hispaniolensis</i>	Bataklık serçesi		A.3	LC	IV	Annex III	Annex I		Y
<i>Petronia petronia</i>	Kaya serçesi		A.3	LC		Annex II	Annex I	--	Y
<i>Montifringilla nivalis</i>	Kar serçesi		A.2	LC		Annex II	Annex I	--	Y
FRINGILLIDAE									
<i>Fringilla coelebs</i>	İspinoz		A.4	LC	IV	Annex III	Annex II	--	KZ
<i>Serinus serinus</i>	Küçük İskete		A.3	LC	IV	Annex II	Annex I	--	KZ
<i>Serinus pusillus</i>	Kara İskete		A.3	LC		Annex II	Annex I	--	KZ
<i>Carduelis chloris</i>	Florya		A.3	LC	IV	Annex II	Annex I	--	Y
<i>Carduelis carduelis</i>	Saka		A.3.1	LC	IV	Annex II	Annex I	--	Y
<i>Carduelis cannabina</i>	Keten kuşu		A.3	LC	II	Annex II	Annex I	--	KZ

Scientific name	Turkish name	Habitat	RDB	IUCN	BIE	BERN	CHC	CITES	STATUS REGIONAL
<i>Fringilla montifringilla</i>	Dağ ispinozu		A.3	LC		Annex III	Annex II	--	KZ
<i>Carduelis spinus</i>	Karabaşlı iskete		A.3	LC		Annex II	Annex I		KZ
<i>Coccothraustes coccothraustes</i>	Kocabaş		A.3	LC		Annex II	Annex I		KZ
EMBERIZIDAE									
<i>Emberiza hortulana</i>	Kirazkuşu		A.3	LC	II	Annex III	Annex II	--	YZ
<i>Emberiza cia</i>	Kaya kirazkuşu		A.2	LC		Annex II	Annex I		Y
<i>Emberiza citrinella</i>	Sarı kirazkuşu		A.2	LC	--	Annex II	Annex I		KZ
<i>Emberiza caesia</i>	Kızıl kirazkuşu		A.2	LC		Annex II	Annex I		YZ
<i>Emberiza melanocephala</i>	Kara başlı kirazkuşu		A.4	LC		Annex II	Annex I	--	YZ
<i>Miliaria calandra</i>	Tarla kirazkuşu		A.4	LC		Annex III	Annex II	--	Y

Abbreviations in the Table

RDB: Red Data Book for Birds of Turkey**A.1.0=** Species that are extinct and no more observed in the nature.**A.1.1=** Domestic species that are extinct in the wild or cannot be observed in the nature at least last 15-25 years time, however, they live in cages and other artificial environment.**A.1.2=** Population of these species has decreased throughout Turkey. They are found to be 1 individual-10 pairs (=1-20 individuals) where they are observed. They are considered to be facing a high risk of extinction; therefore, these species should be protected in Turkey.**A.2=** Population of these species varies around 11-25 pairs (22-50 individuals). They are considered to be facing risk of extinction.**A.3=** Population of these species varies around 26-250 pairs (52-500 individuals). They are also considered to be facing a high risk of extinction.**A.3.1=** Population of these species has decreased in recent years. Population of these species varies around 251-500 pairs (502-1000 individuals) and has decreased comparing to the previous records.**A.4=** According to the criteria of IUCN, these species are not considered yet to be facing a high risk of extinction, but their populations have decreased locally and have potential of facing risk of extinction in time. Population of these species varies around 501-5000 pairs (1002-10000 individuals).**A.5=** There is no risk of extinction for these species and their populations have not decreased yet.**A.6=** There is inadequate information to make an assessment of its risk of extinction based on its distribution and/or population status. Since they are based on one or two observations, there is no chance to make a reliable assessment on these species. Therefore, they have to be well studied.**A.7=** It is not possible to make an assessment on these species, because the records of these species in Turkey are not reliable.**(ERL) IUCN:** European Red List, IUCN**LC=**(Least Concern): A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

Scientific name	Turkish name	Habitat	RDB	IUCN	BIE	BERN	CHC	CITES	STATUS REGIONAL
<p>BIE: Evaluation in Birds in Europe BERN: Bern Convention Appendix II: List of strictly protected fauna species Appendix III: List of protected fauna species CHC: 2013-2014 Decisions of Central Hunting Commission Appendix -I (species protected by the MoFWA) Appendix -II (species protected by the CHC) Appendix -III (species allowed to be hunted for a time period) Status of the Bird: G: Breeding species-only summer birds; breeds regularly or irregularly Y: Breeding species- year birds-breeds regularly T: Invasion species; occurs irregularly but usually in great numbers KZ: Winter visitors</p>									

4 PROTECTED AREAS

In accordance with the national environmental legislation, there are no national parks, nature park, nature reserves, natural monuments, wildlife protection areas and wildlife improvement areas within the Project site and its close vicinity. Special types of protected areas described below are fairly far from the Project Site, yet they still carry significance particularly in terms of bird migrations over the Site.

4.1 Key Biodiversity Areas (KBAs)

4.1.1 Ermenek Valley Key Biodiversity Habitat

Ermenek valley is formed by splitting of Taurus Mountain via Ermenek River which is an important branch of Göksu River. The valley is in the north of Taşeli Plateau. The KBA is located in the Ermenek district and Ermenek River and the plateaus surrounded by its branches. The geological structure of the KBA is formed by limestone rocks and caves. The Ermenek valley is rich in terms of endemic and rare plants. 13 species which exist only in this region are present in here (Eken *et al.*, 2006). The valley is at about 27 km to the Project Site.

4.1.2 Gökdere Key Biodiversity Area

Gökdere KBA is located in the northwest of the project area at about 1 km distance. It is between Karaman-Mut and Karaman-Ermenek highways. It includes the upper part of Göksu valley and the surrounding slopes. Gökdere KBA is important in terms of plant biodiversity. There are 4 plant species of which distribution is restricted to this area (Eken *et al.*, 2006). Gökdere KBA is at about 1 km to the Project Site.

4.1.3 Göksu Valley Key Biodiversity area

The Göksu river forms a wide and steep-sided valley which trends south-east to north-west from the Göksu delta in the south towards the Taurus Mountains in the north. This major valley is likely to function as a migratory corridor for raptors, storks and cranes migrating from the Göksu delta IBA in southern Turkey towards the Anatolian plateau, through the Taurus Mountains, during the spring migration period. Thermal updrafts associated the south/south- west facing slopes of the valley would provide favorable conditions for large migratory soaring birds. The valley is at about 34 km to the Project Site.

4.1.4 Göksu Delta Important Bird Area/Göksu Delta Ramsar Area/ Göksu Delta Wetland

Göksu delta Ramsar Site and IBA is a delta formed where the Göksu River flows into the Mediterranean Sea. Most of the delta is intensively used by man and consists of irrigated and non-irrigated agricultural land, settlements, dunes and beaches (Magnin *et al.* 1997). The valley is at about 90 km to the Project Site.

The IBA (total 14,480 ha) is located approximately 85 km to the south-east of the Project Site, near Silifke Parts of the IBA also have a high level of national protection: 4.3 ha are covered by Permanent Wildlife Reserve, 14.4 ha are covered by conservation areas and 14.4 ha is covered by Mediterranean Specially Protected Area (Magnin *et al.* 2000).

A total of 332 bird species have been recorded, of which 70 are proven to breed (Magnin *et al.* 1997). The site is of major importance for a range of breeding water birds, including the largest numbers of Marbled Duck (*Marmaronetta angustirostris*) known in Turkey. It is also important for wintering raptors and waterbirds, and as a stop-over site for large numbers of Great White Pelican (*Pelecanus onocrotalus*) and White Stork (*Ciconia ciconia*) (Magnin *et al.* 2000). There is a small wintering population (max 400) of Crane (*Grus grus*) (Magnin *et al.* 1997).

4.1.5 Sertavul Pass Prime Butterfly Area

The region encompassing the project area is rich in terms of butterfly biodiversity. Conservation Strategy for Butterflies in Turkey was published in 2011, defining 65 Prime Butterfly Areas (PBA).

Glaucopsyche astraea, *Turanana taygetica*, *Polyommatus ossmar*, *Polyommatus cornelia*, *Polyommatus cilius*, *Polyommatus sertavulensis*, *Polyommatus menalcas*, *Polyommatus wagneri*, *Hipparchia mersina* and *Pseudochazara lydia* are the priority species in Sertavul Pass PBA.

Sertavul pass is at about 2 km to the Project Site.

4.2 Wetlands

According to the list of wetlands presented in the Official Website of Ministry of Forestry and Water Affairs, General Directorate of Nature Conservation and National Parks, the Project site does not lie within any wetland area.

The Project is located in the north of Göksu Delta Wetland (also one of the 13 RAMSAR sites of Turkey). Göksu Delta is a wetland that covers important feeding, sheltering and reproduction habitats. Many winter visitor species, mainly ducks and geese species use this area. Thus, even though the Project area does not have proximity to a wetland, wetlands in the broader region of the Project area are important in terms of bird migration.

4.3 Ramsar Areas

Göksu Delta is a Ramsar site at about 90 km to the Project area. Despite the long distance, its location in the primary bird migration route is significant to account for bird migrations over the Project Site, underlining the need for ornithological monitorings.

5 IMPACTS

No negative impacts of the Project were observed during the site surveys, as related with flora, vegetation and fauna elements (except for birds and bats). The Report focuses on birds and bats for possible impacts.

During the spring 2016 field surveys, big flocks of migration were not observed. However, literature survey and the interviews with local people indicate that it is highly likely that migration takes place in the Project area. During the field surveys, some raptors have been observed in migration such as Black Kite, Egyptian Vulture and Honey Buzzard in small numbers.

In order to understand the magnitude of the impact of the wind farm development in the Project area, further monitoring of migration is required. After these monitoring surveys, a reliable evaluation can be made about the wind farm development and the impacts on the bird species which are particularly vulnerable to wind farm development, such as migratory soaring birds and water-birds.

The rotor swept height (35-135 m) should be considered in these bird monitoring courses. It is known that the collision rates of the raptor species are very low due to their high sighting ability to avoid the rotor swept area of the turbine.

During the field surveys which were conducted in 14-15 April 2016, crane migration was not observed. Whereas, during the interviews with the local people, it was stated that cranes fly over the Project area at very high altitudes in spring and autumn migration periods. The Project site is located at the main migration route of whitestork, blackstork, sparrowhawk, lesser spotted eagle, greater spotted eagle, black kite, and buzzard species; and the secondary route of Egyptian vulture. Moreover, the Project area is the possible breeding site of White-tailed eagle (*Haliaeetus albicilla*), Merlin (*Falco columbarius*), Saker falcon (*Falco cherrug*), Northern harrier (*Circus cyaneus*). Buzzard, long legged buzzard, kestrel, Golden eagle, Goshawk and sparrowhawk are observed in the region throughout the year. Therefore, a 2-years monitoring which covers only the migration periods is recommended for the operation period of the Project. The monitoring report is expected to include list of birds which cover the conservation status of birds detected, habitat and behavior information, status of species (whether local or migratory) together with the height of flight, distance to the migration corridors, thermal air flows, climatic data of the region, agglomeration points, population status and the change in population. Furthermore, breeding bird surveys in the Project area should be conducted as well.

During monitoring, in case that the wind farm operation is noticed to endanger the breeding population of Egyptian vulture and other possible breeding species and migratory species, temporary or permanent shutdown orders (including partial orders relating to the turbines which have been identified as being of the greatest risk to birds) should be committed.

Göksu Delta and Göksu Valley are located in the south of the Project area and many waterfawls use the delta for wintering purposes. Although Göksu Delta has approximately a long distance of 90 km distance to the Project area, it is significant in terms of bird migration route crossing the Site. This may raise the risk for waterfowl species (ducks, geese, etc.) to use the Project area during migration period. Therefore, the collision risk for not only birds of prey or the gliding birds but also the waterfowls should be considered. If any increase in the number of turbines is planned in the future, a new and a more detailed evaluation with a broader scope of ornithological monitoring should be performed.

6 CUMULATIVE IMPACTS

A cumulative impact assessment has been performed by taking the other projects into consideration in order to predict whether there will be any additional impacts at the close settlements associated with other wind farm projects located around Hilal-2 WPP Project.

There are two licensed wind farm projects other than Hilal-2 WPP within the borders of Karaman Province: Yellibel Wind Farm and Akyel-1 Wind Farm, both at planning stage. In addition, there are three licensed wind farms situated in Mut District of Mersin Province: Mut Wind Farm, Mersin Wind Farm and Dağpazarı Wind Farm.

Given the close proximity of the Mut Wind Farm of Borusan, cumulative impacts can be of concern in terms of birds and bats, which is to be controlled with a well-coordinated monitoring plan with the joint efforts of Sanko and Borusan.

7 SUGGESTIONS FOR MITIGATION

Steppe and forest vegetation communities exist in the Sertavul-Karaman region is a mountain passage which connects Central Taurus to Central Anatolia. Sub-alpine mountain step vegetation whereas is found in Sertavul pass, 1600-1650 m. The forest vegetation which is dominated by *Juniperus excelsa* in the Project site and its vicinity where is mainly covered by rocky lime soils. According to the field studies that were conducted in April 2016, 157 species which belong to 39 familia were identified, and 29 of these species are listed as endemic.

Briefly, we can not rank the area as a critical natural habitat. And when we consider the project's operational 3 turbines, they are not so influential ecologically on the Project site and its vicinity. If we consider the fauna elements (except of birds & bats) around the Project site, there is not any critical or endemic species. The projects ecological effects on terrestrial fauna can be said to be temporary.

The project's effect may increase in the context of cumulative impacts especially when combined with Mut WF (Borusan Co.) which is the closest Wind Power Project to the Hilal-2 WPP. That's why two companies must work in cooperation for monitoring the cumulative impacts.

Apart from ornithological monitoring to be conducted, one particular mitigation measure is to paint the blades in appropriate colors. The most appropriate color is orange/red colour which is easily seen by the birds. The birds are able to see this color from the long distances especially during high visibility days. As a common practice, instead of painting the whole blade, the tips of the blades are painted with orange/red color in one or two bands. In this way, the colored blades will draw the attention of the birds during both migrating and daily flights. Therefore, birds will be able to notice the turbines from a distant location and adjust their routes accordingly. Because of 3 operational turbines belong to the Project have orange colour on their wings, they draw the attention of the birds already.

Hilal-2 WPP, with 3 operational turbines is not expected to form an appreciable risk in terms of the location and number of turbines on wildlife, native and migratory bird species, provided that the recommendations mentioned above are implemented. Moreover, additional detailed migratory bird monitoring surveys are required.

The most important potential concern of the wind farms during operation is the risk of collision of birds and bats with the wind turbines. The tips of the turbine blades that are used in the Project have already painted and lighting properly to minimize bird collision risk. The ornithological surveys were conducted in 2016. The area is quite important in terms of bird migration and bird passage. Therefore, the possible effects of the wind farm on bird fauna should be detailed via further surveys. According to the results of these surveys the need of further surveys should be reevaluated.

Due to the presence of sensitive sites, IBA and wetlands around the area and regular migration of waterfowl species, an expert (ornithologist) is suggested to temporarily be employed and monitor the area while operation period. Additional measures can be taken considering the results of this monitoring in case needed.

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