



ACWA POWER ELECTRICITY OPERATION AND
MANAGEMENT INDUSTRY AND TRADE CO.

ACWA POWER KIRIKKALE OVERHEAD TRANSMISSION LINE PROJECT



ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT REPORT



MGS PROJECY CONSULTANCY ENGINEERING TRADE CO.

ANKARA – JUNE/2014

PROJECT NAME

ACWA POWER KIRIKKALE OVERHEAD TRANSMISSION LINE

PROJECT LOCATION

Kırıkkale Province, Yahşihan and Merkez Counties, Ankara Province Kalecik, Çubuk, Pursaklar, Keçiören and Yenimahalle Counties

PROJECT OWNER

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REPORT**

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ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT**DATE / REVISION****26.06.2014 / 01**

This report has been prepared as part of EBRD, IFC and KEXIM requirements.

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CONTENT

CONTENT	ii
TABLE LIST.....	vi
FIGURE LIST.....	vii
APPENDIXES.....	viii
ABBREVIATIONS.....	ix
SECTION I: EXECUTIVE SUMMARY	1
SECTION II: LEGISLATIVE FRAMEWORK.....	2
SECTION III: DEFINITION AND PURPOSE OF THE PROJECT	7
(Subject of the Project, definition, lifetime, service aims, market or service fields of the activity and within this field importance and requirements across the country, region and/or province in economic and social terms).....	7
SECTION IV: LOCATION OF THE PROJECT AREA	11
IV.1 Display of line route and substation on land classification map, distance to the settlements in the vicinity, display of agricultural, industrial and protection areas, health protection band on the map, specification of distances, panoramic photographing of the area/vicinity	11
IV.2. Line Route and Selection Location and Alternatives	8
IV.3. Location of Units within the Scope of the Project	9
SECTION V: ECONOMIC AND SOCIAL DIMENSIONS OF PROJECT	10
V.1. Project Realization – Related Financial Sources	10
V.2. Project Cost	10
V.3. Project Realization – Related Work Flow Chart or Time Table	10
V.4. Project Cost – Benefit Analysis.....	15
V.5. Other Economic, Social and Infrastructural Activities Not Covered by Project However Designed to Be Actualized by the Investor Company or Other Companies Depending on Realization of Project.....	15
V.6. Expropriation.....	15
V.7. Project – Related Permit Procedure (Measures to be taken after EIA process).....	16
V.8. Being Related to Project, Brief Explanation of Works and Procedures Realized up to Now and Time Table ...	16
SECTION VI: IDENTIFICATION OF AREA TO BE AFFECTED BY PROJECT AND EXPLANATION OF CURRENT ENVIRONMENTAL PROPERTIES INSIDE THIS AREA	18
VI.1. Identification of Area to Be Affected by Project (How and According to What Impact Area Was Identified Shall be Explained and Impact Area Shall Be Indicated on Map).....	18
VI.2. Characteristics of Physical and Biological Environment and Use of Natural Resources.....	19
VI.2.1. Geological Properties of Line Route (Tectonic movements, mineral resources, landslide, unique formations, avalanche, flood, rock fall etc.)	19
VI.2.2. Hydro-geological Characteristics of Underground Water Resources and Thermal Springs on the Line Route (Water levels, quantities, safe draw quantities, flow rates of sources, current and planned usage)	35
VI.2.3. Hydrologic Current and Planned Usage of Surface Water Resources (Usages like potable, domestic, irrigation water, electricity production, dam, lakes, ponds, aquatic products, water-way transportation facilities, tourism, sports and similar – purpose water and / or use of the coast, in addition, information regarding whether or not there are surface water sources in nature of wetland at the points where main poles shall be erected planted to be provided, if any, the measures to be taken to be mentioned and other uses)	36
VI.2.4. Soil Characteristics and Usage Status (Land Use Capability Classification of Soil, Erosion, Meadow, Pasture, Current Usage Status of Land, etc.), (Obtaining of necessary permissions according to Soil Protection and Land Usage Law no. 5403, obtaining of necessary permissions pursuant to the Meadow Law no 4342).....	37

VI.2.5. Existing Air Pollution Load of Project Area and Impact Area	38
VI.2.6. Agricultural Areas (Agricultural Development Project Areas, Areas of Special Crop Plantations, Size of Dry and Wet Agricultural Lands, Product Designs and Their Annual Production Quantities), ..	41
VI.2.6.1. Description of Land	47
VI.2.7. Forest Areas	48
VI.2.8. Protection areas (National Parks, Nature Parks, Wetlands), Nature Monuments, Nature Protection Areas, Wildlife Protection Areas, Biogenetic Reserve Areas, Biosphere Reserves, Natural Sit and Monuments, Archeological, Historical and Cultural Sits, Special Protection Areas, statement whether protection areas exist along the route and specification for the distance of nearest protection area	49
VI.2.9. Flora and Fauna (Species, particularly the local endemic species, animal species living in the area naturally, species taken under protection according to national and international legislation, rare species and those under the risk of extinction and their habitats, names, populations of the hunted animals and the decisions of the 2012-2013 Central Hunting Committee related to these animals and tables of these), showing the vegetation types in the project area on a map, the measures to be taken required for the living beings that will be affected from the project and works (in the construction and operation stages).	54
VI.2.10. Lands Under Judgment and Disposal of Competent Organs of State (Military Forbidden Zones, areas allocated to certain public institutions and organizations, and areas restricted by the Cabinet Decision numbered 7/16349 published in the Official Gazette numbered 16415 and dated 25 September 1978)	71
VI.2.11. Other Properties.....	71
VI.3. Properties of Socio-Economic Environment.....	72
VI.3.1. Economic Properties (Main Sectors Shaping Economic Structure of The Region The Energy Is Conducted)	72
VI.3.2. Population (Urban and Rural Population in the Area, Population Movements; Migrations, Population Growth Rate, Other Information)	75
VI.3.3. Social Infrastructure Services in the Area (Education, health, cultural services and the availability of these services).....	76
VI.3.4. Project Zone and Urban and Rural Land Utilization in its Vicinity (Distribution of Settlement Areas, current and planned utilization areas, and the industrial zones, houses, tourism areas, etc. in this context)	81
SECTION VII: IMPACT OF THE PROJECT ON THE ZONE DEFINED IN CHAPTER IV AND THE MEASURES TO BE TAKEN.....	90
VII.1. Land Preparation along the Line Route, Activities during the Construction and Erection Phase, Their Impacts on Physical and Biological Environment and the Measures to be Taken	90
VII.1.1. Places and Surface Area and Amount of Excavation to be made in the Scope of the Works to be Carried out for Land Preparation, Places to Transport and Deposit the Excavated Material, Aim of it Use, and Transportation, Storage and Use of Inflammable, Explosive, Dangerous and Toxic Materials among the Materials to be Used during Excavation	90
VII.1.2. Places to Transport or Aims of Use of the Excavated Refuse Soil, Stone, Sand and similar Materials, ...	91
VII.1.3. Processes Related Construction of Service Roads for Transmission Lines; Materials to be Used, ...	91
VII.1.4. Activities Regarding Construction of Transmission Lines, ...	92
VII.1.5. Processes of Dust Emission like Crushing, Grinding, Transportation and Storage during Construction,.....	93

VII.1.6. Quantity and Properties of the Solid Waste to be Generated in the Scope of the Project and Its Disposal,.....	95
VII.1.7. Quantities of Water to be Used in the Scope of the Project, Places and Ways to Obtain It, Treatments and Receiving Environments for the Waste Water to be Generated by Using These Waters and How to Deliver them To these Receiving Environments and Properties of these Waters, 97	
VII.1.8. Procedures Regarding Grounding to be Made on Overhead transmission Lines, ...	98
VII.1.9. The Sources And The Level of the Noise to be Generated by the Works in the Course of Land Preparation and Plant Construction, ...	99
VII.1.10. Natural Vegetation Species to Be Eliminated for the Purpose of Providing Necessary Land for Land Preparation and Construction Site and on How Much Area These Works Will Be Performed...107	
VII.1.11. Agricultural Land Size to Be Disposed for the Purpose of Acquisition of Land Required for the Land Preparation and Construction Area, Their Land Use Capabilities, Agriculture Product Types and Agricultural – Purpose Land Use Permit.....	108
VII.1.12. Types and Numbers of Trees Which Shall Be Cut During Preparation of Land Required for Construction, Precaution to Be Taken for Forest Areas, Measures to Be Taken Against Forest Fires108	
VII.1.13. Starting from Land Preparation, Where and How the Construction Site and Other Technical/Social/Infrastructural Requirements Would Be Installed For Personnel Who Shall Work in the Tasks to Be Performed Until Opening of the Units for Activity	109
VII.1.14. Determining the Effect of Intensity and Propagation Effects of Material on Cultural and Natural Assets Found Beneath and Above the Ground (Traditional Provincial Texture, Archeological Remnants, Natural Values Required To Be Preserved) On Line Route and Its Immediate Vicinity and Precautions That Will Be Taken	110
VII.1.15. Harmful and Risky Operations to Human Health and Environment Among the Works To Be Maintained Starting From Land Preparation Up To Commissioning the Units for Activity.....	110
VII.1.16. Flood Prevention and Drainage Related Procedures (Streams Shall Not Be Covered, Commitment of Not Dumping Excavation, Rubbles and All Kinds of Waste Materials into Stream Beds and Dam Lakes)	114
VII.2. Project Operating Phase Activities, Their Impacts on Physical and Biological Environments and Measures to Be Taken	114
VII.2.1. Characteristics of Basic Structures across Line Route (Poles, Isolators, Conductors, Towers etc.), Features, Dimensions and Capacities of Other Units	114
VII.2.2. What Kind of Operations Shall Be Carried Out for Line Route Maintenance, Materials to Be Used, Types and Amounts, Characteristics, Dimensions of Wastes to Come Out, and How They Shall Be Disposed	115
VII.2.3. Electric and Magnetic Field Intensities Generated From the Line, Impacts, Comparison with National and International Standards, Evaluation of Possible Impacts on Human Health and Environment, Specification of Precautions That Shall Be Taken, Evaluation According to the Nearest Residential Area	115
VII.2.4. Impacts of Energy and Electromagnetic Field and Corona Noise Which Might Develop Across Transmission Line on Ecosystem	120
VII.2.5. Impacts of Line to Communication – Related Facilities (Lines of Communication, Radio, TV Transmitters etc.).....	121
VII.2.6. Impacts of Line on Water lands Within Zone (The beds available in within Project area must be maintained and commitment regarding in no ways intervention would take place to these stream beds)121	
VII.3. Project Environmental Cost – Benefit Analysis	122
SECTION VIII: POSSIBLE AND ONGOING EFFECTS IN DECOMMISSIONING (POST-OPERATION) PHASE AND THE MEASURES TO BE TAKEN AGAINST THESE IMPACTS.....	124

SECTION IX: ALTERNATIVES OF THE PROJECT (In this Section, Site Selection and Comparison of Technology and Measures to be Taken Shall be Performed and Order of Preference shall be Made)	125
SECTION X: MONITORING PROGRAM.....	126
X.1. Monitoring Program Recommended for Construction of the Activity, Monitoring Program Recommended for Operating the Activity and Post-Operation and Emergency Response Plan.....	126
SECTION XI: PARTICIPATION OF THE PUBLIC.....	136
SECTION XIII: NON-TECHNICAL SUMMARY OF THE INFORMATION PROVIDED UNDER THE ABOVE HEADINGS.....	137
SECTION XIV: REFERENCES	138

TABLE LIST

Table 1. Project Characteristics and Activity Owners	7
Table 2. Annual Development of Overhead Transmission Line Lengths (Unit km).....	9
Table 3. Annual/Monthly Development of the Energy Transmitted By Transmission System (Unit: Gwh)10	
Table 4. Coordinates of Some Poles	11
Table 5. Residential Area Centers In the Vicinity of OHTL Route and Their Distances to the Route	3
Table 6. The Nearest Sensitive Structures to Some Points and Their Distances to Some Points.....	5
Table 7. Timing Chart.....	14
Table 8. Turkey Earthquake Zones.....	29
Table 9. Underground Water Basins-Reserves.....	35
Table 10. Kırıkkale Air Quality Monitoring Station Data	39
Table 11. Ankara-Dikmen Air Quality Monitoring Station Data	40
Table 12. Land Classes Distribution by Towns of Kırıkkale Province (Reference: 2005 - Kırıkkale Province Environmental Status Report)	41
Table 13. Land Classes Distribution by Towns of Ankara Province (Reference: 2011 - Ankara Province Environmental Status Report)	41
Table 14. Agricultural Lands Distribution (TUIK, 2011).....	42
Table 15. Kırıkkale Province - Grown Agricultural Crops and Production Quantities Grown (Reference: TUIK, 2011)	42
Table 16. Vegetable Products and Production Amounts Grown in Kırıkkale Province (Reference: TUIK, 2011) 43	
Table 17. Fruit Products and Production Amounts Grown in Kırıkkale Province (Reference: TUIK, 2011) 43	
Table 18. Vegetable Products and Production Amounts Grown in Ankara Province (Reference: TUIK, 2011) 44	
Table 19. Vegetable Products and Production Amounts Grown in Ankara Province (Reference: TUIK, 2011) 45	
Table 20. Fruit Products and Production Amounts Grown in Ankara Province (Reference: TUIK, 2011)46	
Table 21. Potential endemic species along ETL route passing through Kırıkkale province.	60
Table 22. Potential endemic species along ETL route passing through Ankara province.....	61
Table 23. Kırıkkale Province Population Data.....	75
Table 24. Ankara Province Population Data	76
Table 25. Education Data of Kırıkkale Province– 2013 (TUIK)	76
Table 26. Education Data of Ankara Province– 2013 (TUIK).....	77
Table 27. The Distribution of Health Institutions by Districts in Kırıkkale Province	78
Table 28. Amount of Beds and Area in State Hospitals in Ankara	79
Table 29. Ankara Province Health Information.....	79
Table 30. Social Facilities in Kırıkkale Province	80
Table 31. Ankara Province Cultural Institutions.....	80
Table 32. Meteorology Station Information	81
Table 33. Average Wind Speed and Direction of Ankara Meteorology Station.....	82
Table 34. Long Term Average Pressure Data of Ankara Meteorology Station (hPa).....	83
Table 35. Long Term Relative Humidity Data of Ankara Meteorology Station (%)	83
Table 36. Long Term Temperature Data of Ankara Meteorology Station (°C).....	84
Table 37. Long Term Evaporation Data of Ankara Meteorology Stations (mm).....	84
Table 38. Long Term Precipitation Data of Ankara Meteorology Station.....	84
Table 39. Long Term Temperature Data of Kırıkkale Meteorology Station (°C)	85

Table 40. Long Term Precipitation Data of Kirikkale Meteorology Station	85
Table 41. Long Term Relative Humidity Data of Kirikkale Meteorology Station (%).....	85
Table 42. Average Wind Speed and Direction of Kirikkale Meteorology Station	85
Table 43. Long Years Wind Speeds (m/s)	86
Table 44. Long Years Wind Numbers According to Directions	86
Table 45. Emission Factors Originating From Diesel Vehicles (kg/ton).....	94
Table 46. Solid Waste Amount	95
Table 47. Water Usage Amount	97
Table 48. List of Machinery to be Used During First Part of Construction Phase	99
Table 49. Sound Power Level	100
Table 50. Sound Pressure Level Based on Distance	100
Table 51. Weight Coefficients According to Frequency	100
Table 52. Atmospheric Absorption (dBA).....	101
Table 53. Sound Pressure Level for Truck.....	101
Table 54. Sound Power Levels.....	101
Table 55. Total Sound Levels.....	102
Table 56. Sound Levels According to Distances Originating From Vehicles in the First Part of the Construction Phase.....	103
Table 57. List of Machinery to be Used During Second Part of Construction Phase	104
Table 58. Sound Power Levels.....	104
Table 59. Total Sound Values	105
Table 60. Sound Levels According to Distances Originating From Vehicles in the Second Part of the Construction Phase.....	105
Table 61. Regulation On Assessment and Management of Environmental Noise, Table 5: Environmental Noise Limit Values For Construction Site	106
Table 62. Transmission Line Maintenance Materials	115
Table 63. Relative Risks Factors Likely to Cause Cancer	117
Table 64. Limit Values For The 50/60 Hz – Electrical Magnetic Fields	118
Table 65. Voltage versus Minimum Working Distances.....	118
Table 66. High Tension – Electricity Transmission Facilities – Induced Electrical and Magnetic Spaces (Just Below Overhead Power Line, Just Above Underground Power Line, Approximate Measurement Range to SS)	118
Table 67. Vertical Distances Required For Safe Approach.....	119
Table 68. Horizontal Distances Required For Safe Approach.....	120
Table 69. Monitoring Program	127
Table 70. Mitigation Plan.....	130
Table 71. Interaction Chart.....	133

FIGURE LIST

Figure 1. Ankara General View of Transmission System	8
Figure 2. Site Location Map.....	13
Figure 3. Satellite Image	1
Figure 4. Photograph of the Project Area.....	2
Figure 5. Photograph of the Project Area (Bağlum Substation)	3
Figure 6. Sketch of OHTL and Residential Areas in the Vicinity	6
Figure 7. Determination of OHTL Route	8
Figure 8. Work Flow Chart	11
Figure 9. Generalized Stratigraphic Section (Ankara)	28

Figure 10. Generalized Stratigraphic Section (Kırıkkale).....	29
Figure 11. Seismicity Map of Ankara and Kırıkkale Provinces.....	30
Figure 12. Active Fault Map and OHTL Route (Reference: www.deprem.gov.tr)	32
Figure 13. Landslide Map and OHTL Route (Reference: http://yerbilimleri.mta.gov.tr/anasayfa.aspx)	33
Figure 14. Turkey Rock Fall Risk Map.....	34
Figure 15. Turkey Flood and Overflow Risk Map	34
Figure 16. SWA Irrigation Operations at the Project Area and In Its Vicinity: Ankara Province Environment and Status Report, 2011).....	37
Figure 17. Kırıkkale Air Quality Monitoring Station Data Graph	39
Figure 18. Ankara-Dikmen Air Quality Monitoring Station Data Graph.....	40
Figure 19. Forest Information of Kırıkkale and Ankara Provinces (Reference: General Directorate of Forestry)	49
Figure 20. Location of Project Route and ESIA Survey Area According to Protected Areas.....	53
Figure 21. Comparison of Turkey and Some European Countries in terms of Number of Plants.....	54
Figure 22. Images of the Project Area	55
Figure 23. IUCN Red List	56
Figure 24. Vegetation Map of Turkey.....	58
Figure 25. Phyto-geographic Regions of Turkey and Anatolian Diagonal	59
Figure 26. Squaring System of Turkey	60
Figure 27. Potential endemic species along ETL route passing through Kırıkkale province.	61
Figure 28. Potential endemic species along ETL route passing through Kırıkkale province	62
Figure 29. Map of Migration Routes of Birds in Turkey.....	66
Figure 30. Bird Repellent Mechanisms	70
Figure 31. Average Temperature Data of Ankara and Kırıkkale	87
Figure 32. Average Humidity	87
Figure 33. Average Precipitation Amount	87
Figure 34. Average Wind Speed.....	88
Figure 35. Kırıkkale Wind Speed Graph	88
Figure 36. Kırıkkale Wind Rose	88
Figure 37. Ankara Wind Rose	89
Figure 38. Sound Levels According to Distances Originating From Vehicles in the First Part of the Construction Phase Graph	104
Figure 39. Sound Levels According to Distances Originating From Vehicles in the Second Part of the Construction Phase Graph	106
Figure 40. Comparison of Radiation Values By Factors Confronted During Daily Life	116
Figure 41. Emergency Response Plan	135

APPENDICES

- APPENDIX-1:** 1/25.000 Scaled Topographic Map
- APPENDIX-2:** 1/100.000 Scaled Land Classification Map
- APPENDIX-3:** Flora and Fauna Tables
- APPENDIX-4:** Satellite Images of the Project Area
- APPENDIX-5:** Photographs of the Project Area
- APPENDIX-6:** Meteorology Bulletins
- APPENDIX-7:** TEİAŞ Expropriation Procedure
- APPENDIX-8:** Table of Personnel Who Prepared the Report

ABBREVIATIONS

DSİ	:	General Directorate of State Hydraulic Works
EBRD	:	European Bank of Reconstruction and Development
EIA	:	Environmental Impact Assessment
EMF	:	Electromagnetic Field
ESAMP	:	Environmental and Social Management and Monitoring Plan
ESIA	:	Environmental and Social Impact Assessment
EÜAŞ	:	Electricity Generation Company
GWh	:	Gigawatt Hour
IFC	:	International Finance Corporation
KEXIM	:	Korea Exim Bank
KV	:	Kilovolt
NGCCPP	:	Natural Gas Combined Cycle Power Plant
NTS	:	Nontechnical Summary
OHTL	:	Overhead Transmission Line
PR	:	Performance Requirements
SEP	:	Stakeholder Engagement Plan
SS	:	Substation
TEİAŞ	:	Turkish Electricity Transmission Company
TUIK	:	Turkish Statistical Institute
TÜPRAŞ	:	Turkey Petroleum Refineries Co.

SECTION I: EXECUTIVE SUMMARY

This document contains Environmental and Social Impact Assessment (ESIA) studies of **“380 kV ACWA Power Kırıkkale Overhead Transmission Line”** project which is planned to transmit energy that will be generated in ACWA Power Kırıkkale NGCCPP within the boundaries of Kırıkkale Province, Yahşihan County, Municipality of Kılıçlar to Bağlum Substation situated in Ankara Province Keçioren District, in compliance with National and International legislation-procedure and standards.

ESIA is a research study of physical, natural, cultural, social and socioeconomically impacts of the project's construction and operation phases. ESIA Report defines the Project and impacts of Project on the environmental and social conditions and informs about how the Project is designed, mitigation measures to decrease negative impacts and procedures to maximize positive impacts.

ESIA is requested by ACWA Power Electricity Operation and Management Industry and Trade Co. and implemented by MGS Project Consultancy Engineering Trade Limited Company.

International investment banks introduce the requirement of complying with standards stated below to achieve environmental and social sustainability:

- The European Bank for Reconstruction and Development (EBRD) Performance Requirements for Environmental and Social Standards,
- International Finance Corporation (IFC) Performance Standards on Social and Environmental Sustainability
- Environmental and Social Impact Assessment Standards of World Bank,
- Environmental and Social Principles and Standards of European Investment Bank,
- Equator Principles
- Korea Eximbank Common Approaches

Project also needs to be in compliance with Turkish Republic environmental and social legislations. For this, Environmental Impact Assessment (EIA) Report should be prepared according to Turkish Legislations. EIA process is started by ELTEM-TEK Electrical Installation Engineering Services, Telecommunications, Mining, Consulting, Construction, Trade Co. on 08.07.2013 by submitting EIA Application File to the Ministry of Environment and Urbanization. EIA process has been completed by taking the decision of "Environmental Impact Assessment Is Positive" on 20/02/2014.

Moreover, since EBRD is included to the Project and Turkey is a candidate country to enter the European Union, project must comply with EU Directives about environmental and social protection.

Evaluation of Overhead Transmission Line Project is carried out in accordance with aforementioned guidelines and procedures. In the evaluation process, a systematic procedure is implemented including; physical, natural, cultural, social and socioeconomically impacts of the Project, mitigation measures, improvements and compensation of negative impacts and providence of benefits.

SECTION II: LEGISLATIVE FRAMEWORK

Legislations and standards which are taken in the account for construction, operation and decommissioning phases of the Overhead Transmission Line Project are given in two headings.

National Legislation

380 kV ACWA Power Kırıkkale Overhead Transmission Line is contained in the list of ANNEX – I with Title of The Projects Subject To Environmental Impact Assessment in **“Article – 32 154 kV (kilovolt) and above voltage overhead transmission facilities (transmission lines, substations and switching fields) longer than 15 km”** of “Environmental Impact Assessment (EIA) Regulation” which took effect upon being published in Official Gazette numbered 26939 and dated 17 July 2008 (amended by O.G. numbered 27980 and dated 30 June 2011).

- 1380 numbered Water Products Law and Related Regulations
- 2863 numbered Protection of Cultural and Natural Properties Law and Related Regulations (3386 and 5226 numbered revision)
- 2872 numbered Environmental Law and Related Regulations
- 2918 numbered Road Traffic Law and Related Regulations
- 3083 numbered Agrarian Reform Law on Regulation of Irrigation areas 4342 numbered Grassland Law and Related Regulations
- 4857 numbered Labor Law and Related Regulations,
- 5403 Soil Conservation and Land Use Law and Related Regulations
- 6831 numbered Forestry Law and Related Regulations
- “Regulation on Construction of Pits Where Sewage Channel cannot be Constructed” 13.03.1971 dated and 13783 numbered Official Gazette,
- “Solid Waste Control Regulation” 14.03.1991 dated and 20814 numbered Official Gazette),
- “Water Products Regulation” 10.03.1995 dated and 22223 numbered Official Gazette),
- “Environmental Audit Regulation” 21.11.2008 dated and 27061 numbered Official Gazette),
- “Occupational Health and Safety Regulation” 09.12.2003 dated and 25311 numbered Official Gazette),
- “Environmental Impact Assessment (EIA) Regulation” 17.07.2008 dated and 26939 numbered Official Gazette),
- “Permissions and Licenses have to be taken in regard to Environmental Law” 29.04.2009 dated and 27214 numbered Official Gazette),
- “General Principles about Waste Management Regulation” 05.07.2008 dated and 26927 numbered Official Gazette),
- “Waste Oil Control Regulation” published in 30.07.2008 dated and 26952 numbered Official Gazette (O.G.)
- “Regulation on Revision of Waste Oil Control Regulation” 30.03.2010 dated and 27537 numbered Official Gazette),
- “Excavation Soil, Construction and Demolition Wastes Control Regulation” 18.03.2004 dated and 25406 numbered Official Gazette),
- “Occupational Health and Safety Regulation on Temporary Works or Fixed Term Works” 15.05.2004 dated and 25463 numbered Official Gazette)
- “Waste Batteries and Accumulator Control Regulation” 31.08.2004 dated and 25569 numbered Official Gazette),

- “Regulation on Revision of Waste Batteries and Accumulator Control Regulation” 30.03.2010 dated and 27537 numbered Official Gazette)
- “Industrial Source Air Pollution Control Regulation” 03.07.2009 dated and 27277 numbered Official Gazette),
- “Regulation on Revision of Industrial Source Air Pollution Control Regulation” 30.03.2010 dated and 27537 numbered Official Gazette),
- “Water Pollution Control Regulation” 31.12.2004 dated and 25687 numbered Official Gazette),
- “Regulation on Revision of Water Pollution Control Regulation” 30.03.2010 dated and 27537 numbered Official Gazette),
- “Hazardous Wastes Control Regulation” 14.03.2005 dated and 25755 numbered Official Gazette)
- “Regulation on Revision of Hazardous Wastes Control Regulation” 30.03.2010 dated and 27537 numbered Official Gazette),
- “Soil Pollution Control Regulation and Regulation Regarding Areas Polluted by Point Source” 08.06.2010 dated and 27605 numbered Official Gazette),
- “Environmental Noise Assessment and Management Regulation” 04.06.2010 dated and 27601 numbered Official Gazette),
- “Medical Waste Control Regulation” 22.07.2005 dated and 25883 numbered Official Gazette),
- “Regulation on Revision of Medical Waste Control Regulation” 30.03.2010 dated and 27537 numbered Official gazette),
- “Protection of Wetlands Regulation” 17.05.2005 dated and 25818 numbered Official Gazette),
- “Regulation on Revision of Protection of Wetland Regulation” 26.08.2010 dated and 27684 numbered Official Gazette),
- “Packaging Waste Control Regulation” 24.08.2011 dated and 28035 numbered Official Gazette),
- “Vibration Regulation” 23.12.2003 dated and 25325 numbered Official Gazette),
- “Electrical Heavy Current Facilities Regulation” 30.10.2000 dated and 24246 numbered Official Gazette),
- “TEİAŞ Occupational Safety Regulation” 25.02.2010 dated Official Decision
- “Exhaust Gas Emission Control Regulation” published in 04.04.2009 dated and 27190 numbered Official Gazette”
- “Air Quality Assessment and Management Regulation” published in 06.06.2008 dated and 26898 numbered Official Gazette”

In the context of the Project, Environmental Law and other laws, legislations, circulars, notices and provisions issued pursuant to this Law will be complied.

International Legislation

International directives and standards information which have been considered during the preparation of the ESIA Report are given in below:

- EBRD Environmental and Social Policies and Performance Requirements
- IFC Performance Standards
- Korea Exim Bank Common Approaches
- Equator Principles
- EU Directives

The European Bank for Reconstruction and Development (EBRD) Performance Requirements for Environmental and Social Standards

The EBRD adopted its first Environmental Policy in 1991 at the initial meeting of the Board of Directors. The scope of the Policy has evolved over time and it is now an Environmental and Social Policy. In recent years the EBRD has developed related Performance Requirements that were first introduced in 2008 (For details see EBRD Environmental and Social Policy Report, 2008).

Bank-financed projects are expected to meet good international practice related to sustainable development. To help clients and/or their projects achieve this, the Bank has defined specific Performance Requirements (PR) for key areas of environmental and social issues and impacts as listed below:

- PR1 – Environmental and Social Appraisal and Management
- PR2 – Labor and Working Conditions
- PR3 – Pollution Prevention and Abatement
- PR4 – Community Health, Safety and Security
- PR5 – Land Acquisition, Involuntary Resettlement and Economic Displacement
- PR6 – Biodiversity Conservation and Sustainable Natural Resource Management
- PR7 – Indigenous Peoples*
- PR8 – Cultural Heritage
- PR9 – Financial Intermediaries*
- PR10 – Information Disclosure and Stakeholder Engagement

**Not applicable for this project.*

PRs 1 through 8 and 10 include the requirements for direct investment operations; PR 2 and PR 9 are for financial intermediary operations. Each PR defines, in its objectives, the desired outcomes, followed by specific requirements for clients to help them achieve these outcomes. Compliance with relevant national laws is an integral part of all PRs.

The following documents have been prepared in the scope of the studies:

- Nontechnical Summary (NTS)
- Stakeholder Engagement Plan (SEP)
- Environmental and Social Management and Monitoring Plan (ESMMP)
- Environmental and Social Impact Assessment Report (ESIA)

IFC Performance Standards

Environmental and Social Impact Assessment studies contain IFC Performance Standards that listed below:

Performance Standard 1 : Assessment and Management of Environmental and Social Risks and Impacts

Performance Standard 2 : Labor and Working Conditions

Performance Standard 3 : Resource Efficiency and Pollution Prevention

Performance Standard 4 : Community Health, Safety, and Security

Performance Standard 5 : Land Acquisition and Involuntary Resettlement

Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources

Performance Standard 7 : Indigenous Peoples*

Performance Standard 8 : Cultural Heritage

**Not applicable for this project.*

In addition, during ESIA studies The Environmental, Health, and Safety (EHS) Guidelines are utilized which are technical reference documents of IFC. The EHS Guidelines for Electric Power Transmission and Distribution include information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas.

Korea Exim Bank Common Approaches

Korea Exim Bank is member of Organization for Economic Co-operation and Development which is an international economy organization and has adopted “Common Approaches” recommended by the organization. Common Approaches includes a control mechanism for the compliance with environmental and social requirements for officially supported export credits. (For details see Organization for Economic Co-operation and Development, Common Approaches, 2012).

Equator Principles

Another applied standard for preparation of Environmental and Social Impact Assessment Report is Equator Principles. Standards which are composed of ten main principles are the benchmark for the evaluation of social and environmental impacts of the projects over the value of \$ 10 million.

Principle 1: Review and Categorization

Principle 2: Social and Environmental Assessment

Principle 3: Applicable Social and Environmental Standards

Principle 4: Action Plan and Management System

Principle 5: Consultation and Disclosure

Principle 6: Grievance Mechanism

Principle 7: Independent Review

Principle 8: Covenants

Principle 9: Independent Monitoring and Reporting

Principle 10: EPFI (Equator Principles Financial Institutions) Reporting

EU Directives

The below EU Directives on environmental and social protections have been considered during the preparation of this report:

- World Bank Environmental Management Plan (OP 4.01 Environmental Assessment Annex-C),
- EIA Directive, 85/337 EEC and 97/11/EC Directive revision,
- “Air Quality Framework Directive”, 96/62/EC,
- “Water Framework Directive”, 2000/60/EC,
- “Urban Wastewater Treatment Directive”, 91/271/EEC,
- Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)”, EC 1907/2006
- “Directive on Environmental Noise”, 2002/49/EC,
- “Council Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora”, 92/43/EEC,
- “Directive on the Conservation of Wild Birds”, 79/409/EEC,
- “Commission Decision Concerning a Site Information Format for Proposed Natura 2000 Sites”, 97/266/EC,
- CITES Convention (EEC/362/82, EEC/3418/83 and EC/338/97),

- Hazardous Waste Directive, 1991/689/EEC,
- Waste Incineration Directive, 2000/76/EC,
- Packaging Waste Directive (94/62/EC),
- Regular Storage Directive (99/31/EC),
- Waste Framework Directive (75/442/EEC (revised: 2006/12/EC)).

SECTION III: DEFINITION AND PURPOSE OF THE PROJECT

(Subject of the Project, definition, lifetime, service aims, market or service fields of the activity and within this field importance and requirements across the country, region and/or province in economic and social terms)

This document contains Environmental and Social Impact Assessment (ESIA) studies of “380 kV ACWA Power Kırıkkale Overhead Transmission Line” project which is planned to transmit energy that will be generated in ACWA Power Kırıkkale NGCCPP within the boundaries of Kırıkkale Province, Yahşihan County, Municipality of Kılıclar to Bağlum Substation situated in Ankara Province Keçioren District. The length of 380 kV OHTL is 119 kilometers and approximately 14.5 kilometers hereof is inside the boundaries of Kırıkkale Province and the rest being more or less 104.5 kilometers is situated within the boundaries of Ankara Province.

Said overhead transmission line; shall be established by ACWA Power Electricity Operation and Management Industry and Trade Co. and be transferred to TEİAŞ together with its property rights. In this context, a System Connection Agreement shall be signed between TEİAŞ and ACWA Power Electricity Operation and Management Industry and Trade Co.

Along the overhead transmission line route, 31 some poles, 1 end pole and 310 carrier poles shall be constructed.

A 5 km – area, being 2.5 km from RH and 2.5 km from LH of the overhead transmission line route has been designated to be “ESIA Survey Area (Corridor)”. It is aimed that current features of environment within such space likely to be influenced by the project are identified and necessary precautions are developed. 1/25.000 Scaled Topographic Map showing route of Overhead Transmission Line and ESIA Survey Area is presented in **Appendix-1**.

The information on line characteristics and activity owners has been provided in **Table 1**.

Table 1. Project Characteristics and Activity Owners

Line Characteristics	Responsible Institution Possessing Activity			Total Length (km)
	Facility	Operation	Post - Operation	
380 kV OHTL	ACWA Power Electricity Operation and Management Industry and Trade Co.	TEİAŞ	TEİAŞ	119

380 kV ACWA Power Kırıkkale Overhead transmission line is contained in the list of ANNEX – I with Title of The Projects Subject To Environmental Impact Assessment in “**Article – 32 154 kV (kilovolt) and above voltage overhead transmission facilities (transmission lines, substations and switching fields) longer than 15 km**” of “Environmental Impact Assessment (EIA) Regulation” which took effect upon being published in Official Gazette numbered 26939 and dated 17 July 2008 (amended by O.G. numbered 27980 and dated 30 June 2011).

Regional Production and Transmission Status

As it would be seen from the following map in the vicinity of Overhead transmission line, there are 380 kV and 154 kV – overhead transmission lines.

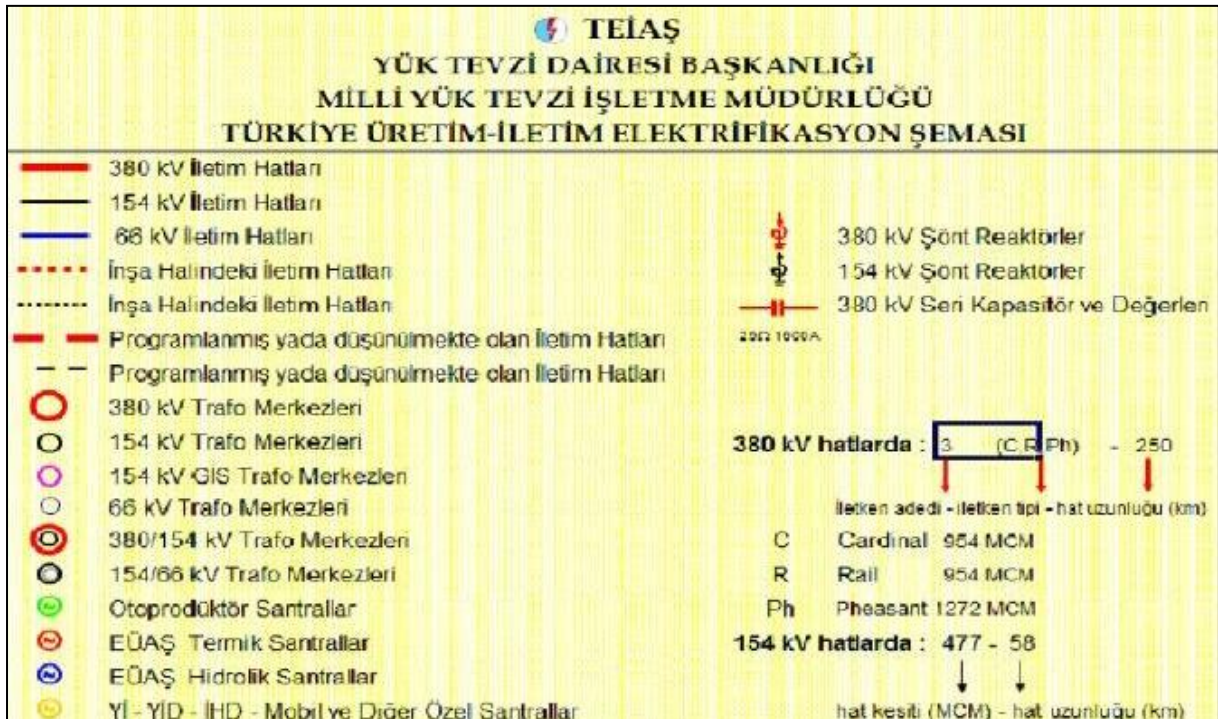
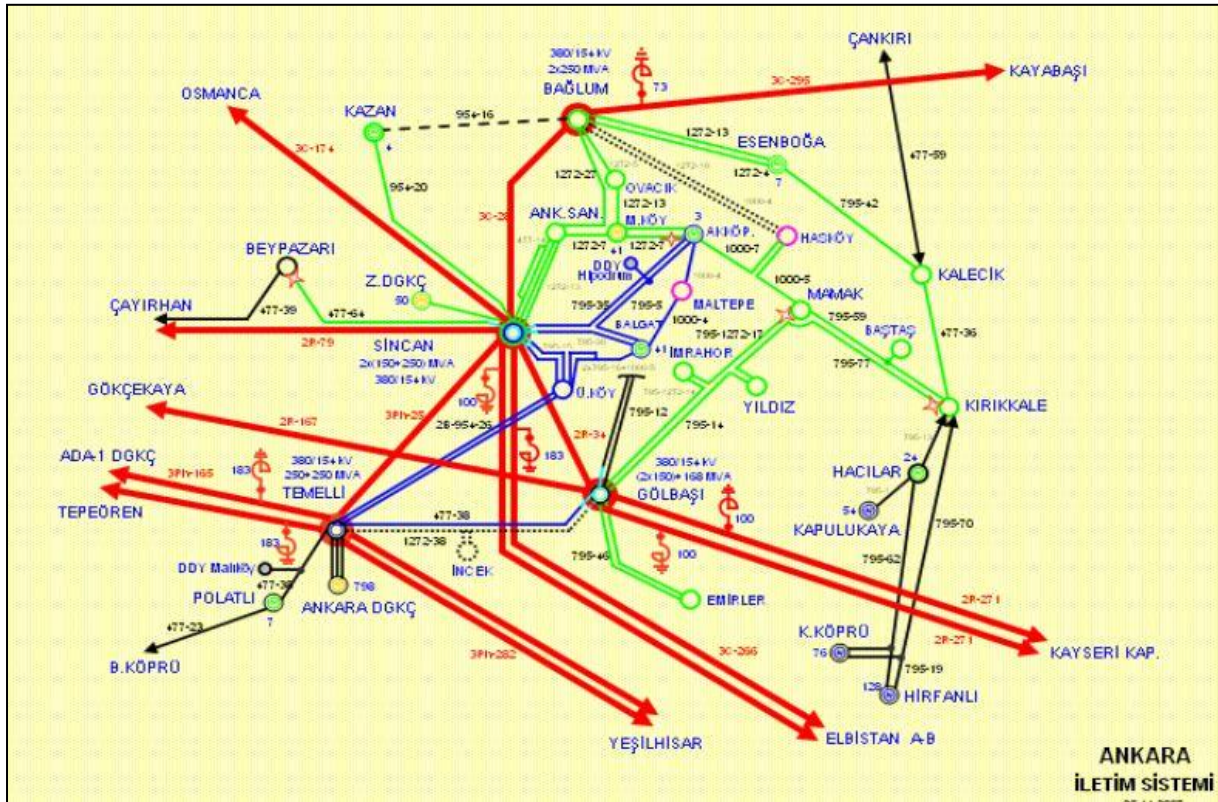


Figure 1. Ankara General View of Transmission System

Service Life

It is predicted that the mean economical life of overhead transmission line would be more or less 40 years.

Service Objectives of the Activity

The main objective in the energy sector is the ability to fulfill the energy requirements of the increased population and developing economy in a continuous and uninterrupted way and in as lowest costs as possible. In this context, TEİAŞ has been established on date 05 February 2001 in order to carry out study and planning of the new transmission lines (switching, OHTL, substation) foreseen according to the principles of efficiency and profitability of overall energy and economy policies and electricity transmission and distribution – related policies and activities of the Government and being in connection hereto, cause them to be included in the investment plan and be realized and take over all transmission facilities, operate, carry out maintenance, repair and rehabilitation of existing plants and ones to be established and when deemed necessary, to purchase service for the purpose of accomplish these functions.

Primary mission of TEİAŞ General Directorate might be defined as operating the electrical system its market in which electricity is transmitted in high quality, continuously, safe and economic form by establishing a sound transmission system.

In parallel to technology, as industrialization and population increase in the world energy needs augments as well. In this context, also the electrical energy needed by our country enhances depending on development of industry, rise in using technology devices and population density.

Development of energy sources and overhead transmission lines through years in Turkey is given below according to statistics of TEİAŞ.

Table 2. Annual Development of Overhead Transmission Line Lengths (Unit km)

YEAR	380 kV	220 kV	154 kV	66 kV	TOTAL
2002	13625.5	84.5	30163.2	670.7	44544.0
2003	13958.1	84.5	30961.7	718.9	45723.2
2004	13970.4	84.5	31005.7	718.9	45779.6
2005	13976.9	84.5	31030.0	718.9	45810.3
2006	14307.3	84.5	31163.4	477.4	46032.6
2007	14338.4	84.5	31383.0	477.4	46283.3
2008	14420.4	84.5	31653.9	508.5	46667.3
2009	14622.9	84.5	31931.7	508.5	47147.6
2010	15734.2	84.5	32906.4	508.5	49233.6
2011	15978.4	84.5	32878.4	509.4	49450.7
2012	16343.7	84.5	33480.8	509.4	50418.4

Note: In 2005-2006 years; 66 kV OHTL changed to 33 kV which explains the decrease.

Reference: TEİAŞ Statistics, 2012

Table 3. Annual/Monthly Development of the Energy Transmitted By Transmission System (Unit: Gwh)

Months/Years	2005	2006	2007	2008	2009	2010	2011
January	10452.6	11207.1	13600.2	15556.0	14,915.7	15,182.7	17,582.2
February	10073.0	10651.5	12567.7	14347.1	13,301.0	13,789.7	15,862.6
March	10598.9	11334.5	13571.8	14167.5	14,184.7	14,836.0	17,182.8
April	9832.2	10415.4	12944.2	13612.4	13,242.6	14,093.5	16,051.0
May	9918.6	10899.9	13087.5	14112.8	13,555.1	14,604.8	15,770.1
June	9818.6	11299.8	13513.4	14321.8	14,122.3	15,070.3	16,078.5
July	11245.8	12408.7	15160.0	15926.9	15,737.5	17,260.1	18,940.4
August	11552.9	13978.9	15356.3	16076.4	15,821.0	18,139.3	18,622.6
September	10390.7	12293.7	13520.3	13962.3	13,699.6	15,077.9	17,034.9
October	10537.7	11659.1	12807.4	12981.0	13,995.7	15,137.4	16,901.5
November	10430.5	12961.0	13878.6	13504.0	13,882.5	14,396.4	17,225.0
December	11287.0	13906.3	14545.2	14067.0	15,730.0	16,746.8	18,995.0
Total	126138.5	143015.9	164552.6	172635.2	172187.7	184,334.9	206,246.5

Reference: TEİAŞ Statistics, 2011

Upon realization of said project, it shall be ensured that the electrical energy to be generated from ACWA Power Kırıkkale Natural gas Combined Conversion Plant planned to be established within the boundaries of Kırıkkale, Town of Yahşihan, Kılıçlar Municipality to be transmitted to interconnection system. By the use of interconnection system, the project will play important role for supply of uninterrupted energy demand of mainly Kırıkkale and Ankara provinces in which transmission line passes through as well as the region.

Field Importance and Requirements across the Country, Region and/or Province in Economical and Social Terms)

As stated above, upon having been established and commissioned in such direction, one more pace would have been taken in terms of providing a countrywide – targeted, more efficient, uninterrupted and continuous power supply. In addition, employment opportunity shall also be created under present unemployment conditions within the region. Assuming that every one of 120 persons planned to be employed in stage of construction of said project would have a mean 4 – member family, approximately 480 persons are envisaged to utilize economic benefit due to this Project. Moreover, it also intended to get unskilled labor from the region as to be used during infrastructural works of the Project. Consequently, both regional economy and also Turkey economy will get affirmatively affected.

SECTION IV: LOCATION OF THE PROJECT AREA

IV.1 Display of line route and substation on land classification map, distance to the settlements in the vicinity, display of agricultural, industrial and protection areas, health protection band on the map, specification of distances, panoramic photographing of the area/vicinity

380 kV ACWA Power Kırıkkale Overhead Transmission Line starts from ACWA Power Kırıkkale NGCCPP planned to be established within boundaries of Kırıkkale Province, Yahşihan County, Kılıçlar Municipality and passes through the Ankara Province, Kalecik, Çubuk, Pursaklar, Yenimahalle Counties and ends up in Bağlum SS situated in Keçiören County.

Yahşihan County of Kırıkkale province, where ACWA Power Kırıkkale Natural Gas Combined Cycle Plant Project is planned to be installed and The Energy Transmission Line (ETL) starts, has an elevation of 680 m from sea level. The County has a total area of 155 sqm. The lands in the County are surrounded by Demirlibel, Ardıçlı Hills and Küre and Delikli Mountains. Ankara-Kırıkkale asphalt highway runs through Yahşihan County and serves as the access road for 43 cities. Yahşihan County is located at a distance of 6 km to Kırıkkale city center and 70 km to Ankara province.

OHTL also passes through Kırıkkale central County, which has an elevation of 700 m from sea level. This County is located on the slope where Çamlıca, Karakaya and Kırıkkale hills in the North of the city reach the plain.

OHTL passes through the province of Ankara, through the boundaries of Keçiören, Kalecik, Çubuk, Pursaklar and Yenimahalle Counties, which are also within the boundaries of Bağlum SS. Keçiören County of Ankara is one of the central Counties and has an elevation of 850 m from sea level. The County has an area of 759 km². Kalecik County has an elevation of 725 m from sea level and an area of 1,318 km². Çubuk County has an elevation of 1,100 m from sea level and an area of 1248 km². Pursaklar County has an elevation of 1,700 m from sea level and an area of 157 km². Yenimahalle County has an elevation of 894 m from sea level and an area of 295 km².

Coordinates of start and end points of overhead transmission line and some poles between these points is given in **Table 4**.

Table 4. Coordinates of Some Poles

Plot No	Some No	Coordinates	
		Y	X
I30B2	S.1	535138.576	4417315.013
I30B2	S.2	535069.493	4416656.535
I30B2	S.3	535472.976	4416079.004
I30B2	S.4	535850.453	4416000.348
I30B2	S.4/A	537519.072	4416498.033
I30B2	S.5	539172.537	4417367.155
I30B2	S.6	539682.468	4418185.739
I30B2	S.7	540000.545	4426409.273
H30C3	S.8	539138.888	4429785.835

Plot No	Some No	Coordinates	
		Y	X
H30C3	S.9	539780.813	4438367.422
H30C3	S.10	539498.119	4439050.170
H30C2	S.11	540148.831	4443389.559
H30C2	S.11/A	539785.642	4444852.209
H30C2	S.12	536511.741	4449188.244
H30C1	S.13	528423.270	4455484.260
H30B4	S.14	524644.668	4456733.248
H30A3	S.15	517100.147	4463181.895
H30A3	S.16	510859.991	4467373.770
H30A4	S.17	505831.182	4467605.327
H30A4	S.18	502691.819	4465985.261
H30A4	S.19	500556.830	4464400.297
H29B3	S.20	498533.746	4461156.139
H29B3	S.21	496049.383	4456973.602
H29C2	S.22	493026.976	4452375.660
H29C1	S.23	488297.830	4448172.061
H29C1	S.24	486905.931	4445805.194
H29C1	S.25	485075.689	4444436.373
H29C4	S.26	482713.001	4441564.819
H29C4	S.27	481783.948	4437136.183
H29C4	S.28	483229.226	4434298.861
H29C4	S.29	483686.112	4433865.016
H29C4	ND.2	483990.189	4433688.132

Site location map of overhead transmission line has been provided in **Figure 2**. Satellite view showing locations of route of overhead transmission line as to residential areas in **Figure 3** and **Appendix 4** and part of the photos of areas where some poles shall be constructed are given in **Figure 4-5** and the whole **Appendix 5**.

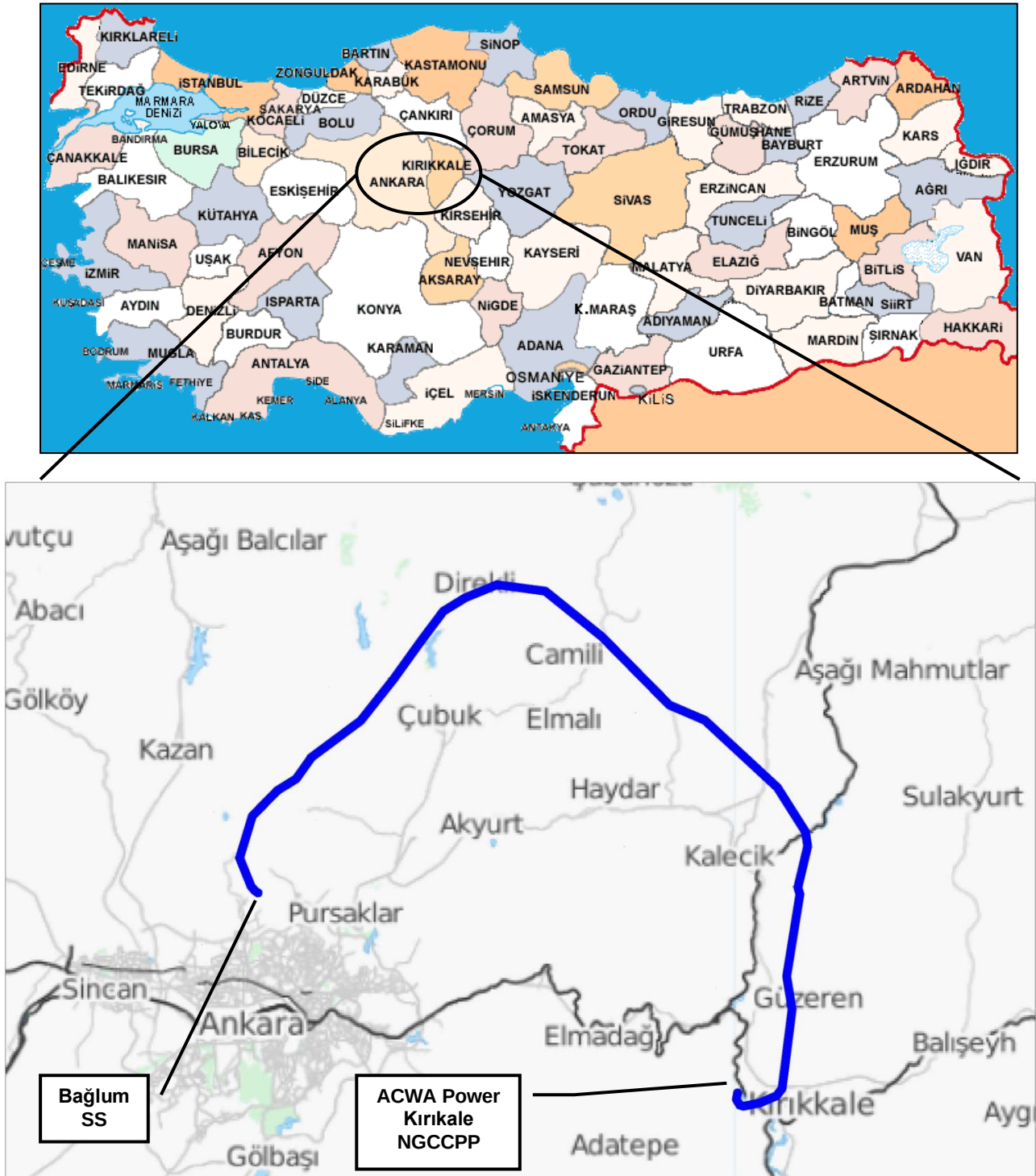


Figure 2. Site Location Map





Figure 4. Photograph of the Project Area



Figure 5. Photograph of the Project Area (Bağlum Substation)

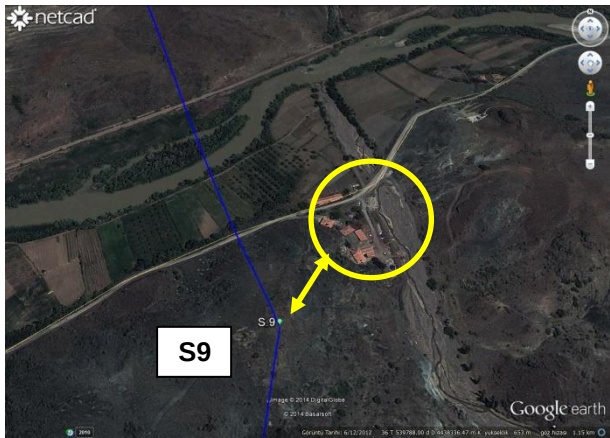
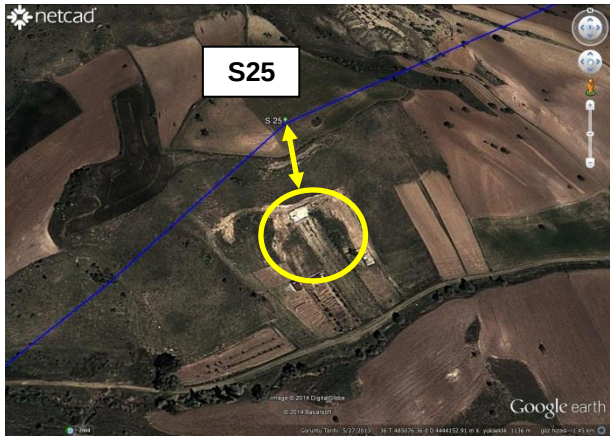
The locations and distances of the nearest residential areas and sensitive structures to the overhead transmission line have been provided in **Table 5** and **Table 6** respectively. Location and distances indicated according to satellite images as approximately and aims only locational information. The distances referred to are not committed.

Table 5. Residential Area Centers In the Vicinity of OHTL Route and Their Distances to the Route

Province	County	Village	Direction (location as to OHTL)	Distance to Line (m)
Kırıkkale	Yahşihan	Yenişehir District Industrial Site	South, North	180
Kırıkkale	Yahşihan	Hacbalı Village	North, East, West	2500
Kırıkkale	Yahşihan	Mahmutlar Village	West	1000
Ankara	Kalecik	Yukarı Samanlık District within the boundaries of Samanlık Village	West	650
Ankara	Kalecik	Aşağı Samanlık District within the boundaries of Samanlık Village	West	1200
Ankara	Kalecik	Gökdere Village	West	740
Ankara	Kalecik	Gümüşpınar Village	East	1000
Ankara	Kalecik	Keklicev Village	East	1300
Ankara	Kalecik	Hacı Village	Northwest	550
Ankara	Kalecik	Kılıcak Village	Northwest	1100
Ankara	Kalecik	Değirmenkaya Village	Southeast	1050
Ankara	Kalecik	Hasayaz Village	Southwest	830
Ankara	Kalecik	Yeşilöz Village	Northeast	1540
Ankara	Kalecik	Tavşancık Village	Northeast	980
Ankara	Çubuk	Karaali District	West	350

Ankara	Çubuk	Camili Village	Southwest	1800
Ankara	Çubuk	Oylumiğde Village	Northeast	1870
Ankara	Çubuk	Demirci Village	Northeast	2160
Ankara	Çubuk	Kuyumcu Village	Southwest	980
Ankara	Çubuk	Meşe Yaylası	Northeast	1600
Ankara	Çubuk	Susuz Village	South	1160
Ankara	Çubuk	Kuruca District within the boundaries of Yukarı Çavundur Village	North	1450
Ankara	Çubuk	Çit Village	North	500
Ankara	Çubuk	Sele Village	South	1050
Ankara	Çubuk	Sarıkoz Village	Northwest	1000
Ankara	Çubuk	Yazlıca Village	Southeast	830
Ankara	Çubuk	Saraycık Village	Northwest	2000
Ankara	Çubuk	Karaman Village	Southeast	1200
Ankara	Çubuk	Ovacık Village	Northwest	1600
Ankara	Çubuk	Karaağaç Village	Southeast	2200
Ankara	Çubuk	Sülüklü District within the boundaries of Karaağaç Village	Southeast	850
Ankara	Çubuk	Eğriekin Village	Southeast	1470
Ankara	Çubuk	Yukarı Obruk Village	Northwest	420
Ankara	Çubuk	Aşağı Obruk Village	Southeast	1110
Ankara	Çubuk	Sığırlıhacı Village	Southeast	2200
Ankara	Çubuk	Tuğlaköy Village	Northwest	960
Ankara	Çubuk	Kutuören Village	Southeast	2500
Ankara	Pursaklar	Taşkesen District within the boundaries of Gümüşyayla Village	Southeast	1500
Ankara	Pursaklar	Gümüşyayla Village	Northwest	720
Ankara	Pursaklar	Yuva Village	Southeast	630
Ankara	Pursaklar	Sirkeli Yeşilyurt District	Southeast	1700
Ankara	Pursaklar	Yeşilova District	Southeast	2300
Ankara	Keçiören	Çalseki Village	Northwest	1400
Ankara	Pursaklar	Başpınar Location	Southeast	750
Ankara	Yenimahalle	Yakacık Residence	Southwest	1650
Ankara	Keçiören	Bağlum Town	Southeast	2300

Table 6. The Nearest Sensitive Structures to Some Points and Their Distances to Some Points

Residential Area	Distance to Some Point (m)	Location as to Some Point	Image
Houses	130	Northeast of S9	
Field Houses within the boundaries of Sirkeli Town	85	South of S25	

Sketch showing OHTL and residential areas in the vicinity is given in **Figure 6**.

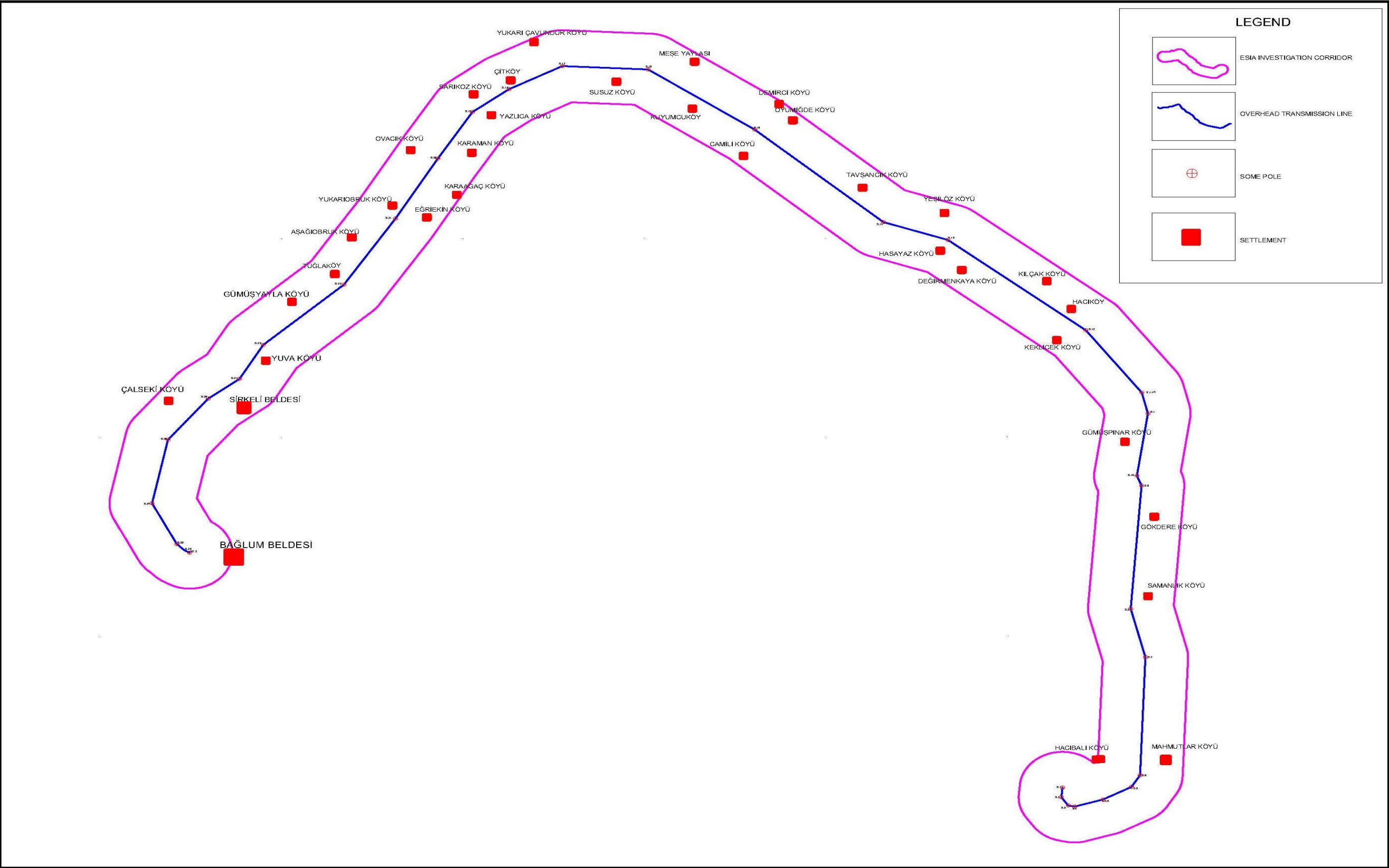


Figure 6. Sketch of OHTL and Residential Areas in the Vicinity

As a result of the survey and cadastral archive studies land usage status of the OHTL route, 80 km of the route passes through agricultural land (private property), 37 km forest area and 1 km zoning (reconstruction) area.

Pursuant to Expropriation Law numbered 2942 amended by the law numbered 4650, TEİAŞ General Directorate shall make prices of the land to the owners of right holders either ownership or easement in direction of expropriation plan to be constituted throughout EIA process making expropriations by means of expropriation commission. Expropriation procedure prepared by TEİAŞ is presented in **Appendix 7**.

Within scope of these operations, easement from 25 meters on both sides of line, totally a 50 meter – wide corridor shall be constituted as a whole. As for the places where legs of pole fall to, the space ownerships varying according to the size of pole type will be expropriated.

Before the start of construction Works, to use agricultural lands within the scope of the Project for non-agricultural use, the provisions of “Law on Protection of Soil and Land Use” no 5403 which came into effect after announcement in Official Gazette dated 19.07.2005 and numbered 25880 shall be abided by and necessary precautions will be taken.

For the pasturelands pursuant to Pasture Law No. 4342, necessary permits shall be obtained from the Kırıkkale Provincial Food, Agriculture and Livestock Directorate as well as from the Ankara Provincial Food, Agriculture and Livestock Directorate.

Since forest areas have no expropriation procedure, regarding the line which passes through forest areas, as per article 17 of Law on Forest no 6831, necessary permissions will be taken from General Directorate of Forestry.

In the case of overhead transmission line route through areas of irrigation, the required permits will be obtained in accordance with Agrarian Reform Law on Regulation of Irrigation areas and Fisheries Law.

Overhead transmission line route is around the mining licenses, but it does not coincide with the areas of overhead transmission lines.

IV.2. Line Route and Selection Location and Alternatives

Overhead transmission line route, primarily, is determined on 1:25,000 scale map approximately by the Directorate General of TEİAŞ and at this stage ports (SS, OHTL, etc.) have great importance. Then, by going to the scene of the overhead transmission line route (on-site) re-examined taking into consideration the terrain topographic and geographic conditions. In this investigation, the distance from residential areas of overhead transmission line, the line will be as short as possible transition routes, plant-care-business facilities, swamp-avalanche gully-exposed areas, such as forest-fruit-poplar areas, military areas, airports - state farms-privately-owned lands, PTT, Special Protection areas, Highways, state Railways, dams, ponds, irrigation canals, zoned areas, mines, coal fields taking into account factors such as the overhead transmission line route is determined. In summary the OHT route is determined to have the least social and environmental impacts.

As a result of the investigations, if the line goes any through the above-mentioned, other alternative routes in case of detection are evaluated. Taking into account the criteria set out contractor; the final version of the route is determined and presented for approval to TEİAŞ.

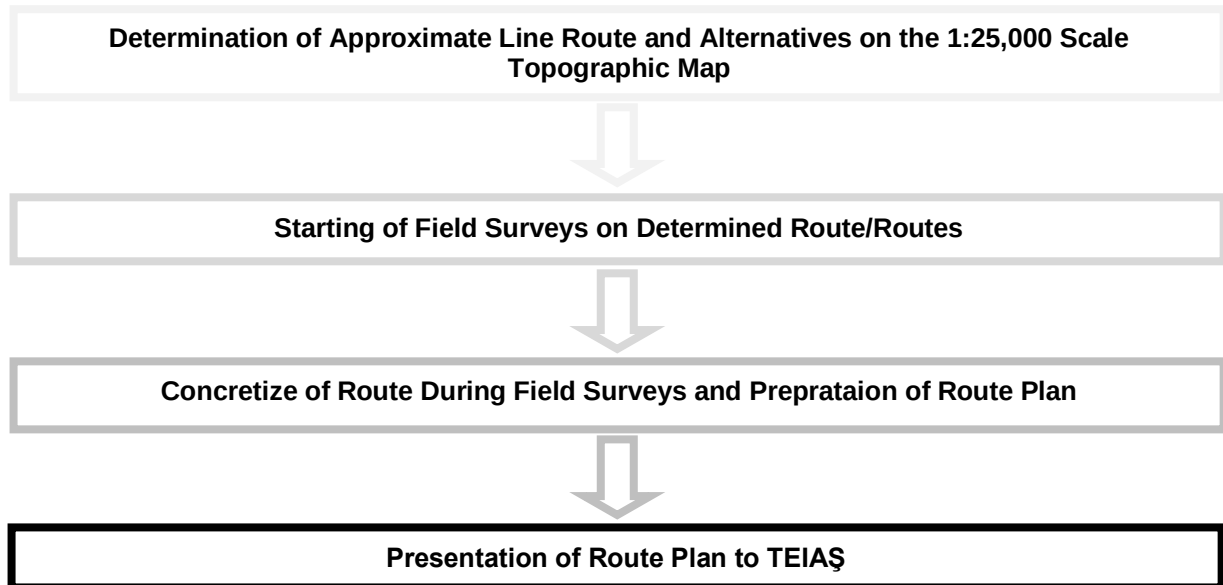


Figure 7. Determination of OHTL Route

TEİAŞ has evaluated options in the determination process of the most appropriate line route, especially considering existing mines throughout the area and not to intersect with them.

Above works have been done for Over Head Transmission Line and after evaluation of alternative routes, final version of OHTL route has been approved by TEİAŞ.

New substation is not planned in scope of the project. Therefore, alternatives for substation is not been considered in this document.

Technological Alternatives

There are two technology alternatives for energy transmission lines: underground lines and overhead lines.

Overhead lines are defined as electric lines where the conductors are installed above the surface generally using isolators and appropriate carriers (posts) and auxiliary equipment and hardware¹.

Underground lines are defined as electric lines where the conductors are installed underground or water with the use of additional equipment.

Despite their certain advantages in environmental and economic terms, underground cables have quite high first investment costs. On the other hand, overhead lines have lower first investment costs than underground lines; especially expropriation cost is an important factor that affects project costs.

Overhead technology was used in the present project.

A new substation is not planned in the scope of this project, so that no alternative for substation is studies.

IV.3. Location of Units within the Scope of the Project

In the route of Overhead Transmission Line, 31 some poles, 1 end pole and 310 carrier poles will be used, approximetly. In addition, 3 construction sites are planned to be installed in different places for accommodation, meals, showers and etc. requirements of staff working in the construction of transmission line.

For the construction sites, housings close to worksite are planned to be rented. However, in case of non-availability of close housings, prefabricated worksite housings will be installed on suitable areas close to transmission line route. After clarification of housing situation, Provincial Directorate of Environment and Urbanization of Ankara and Kirrikale will be informed officially.

Overhead Transmission Line and ESIA investigation area are presented at 1/25,000 scale topographic map in **Appendix-1**.

¹ <http://www.teias.gov.tr/4grupmd/sozluk/selektik.htm>

SECTION V: ECONOMIC AND SOCIAL DIMENSIONS OF PROJECT

V.1. Project Realization – Related Financial Sources

ACWA Power Electricity Operation and Management Industry and Trade Co. will provide the necessary finance for the design, procurement, and construction of the transmission line through means of credit loans and /or equities. Post – provisory acceptance ownership of the overhead transmission line shall be transferred to TEİAŞ together with its ownership on no – charge basis. Cost of overhead transmission line shall be reimbursed to ACWA Power Electricity Operation and Management Industry and Trade Co. within scope of System Connection Agreement executed between both parties over the system usage tariff.

V.2. Project Cost

The Project value of said overhead transmission line is estimated to be TL 30 million. Factors influencing the Project cost;

- Survey, Plan-Project, EIA costs,
- Expropriation costs,
- Material supply,
- Construction operations – induced cost (personnel employment, personnel requirements, transport, fuel to be used for construction vehicles etc.),
- Cost of measures to be taken to minimize environmental impacts (disposal of wastes, arrangement of land, etc.),
- Operational expenditures, loss & damage expenditures,
- Closure / renewal expenditures

V.3. Project Realization – Related Work Flow Chart or Time Table

In general, work flow chart – related to making the overhead transmission line is presented in **Figure 8**.

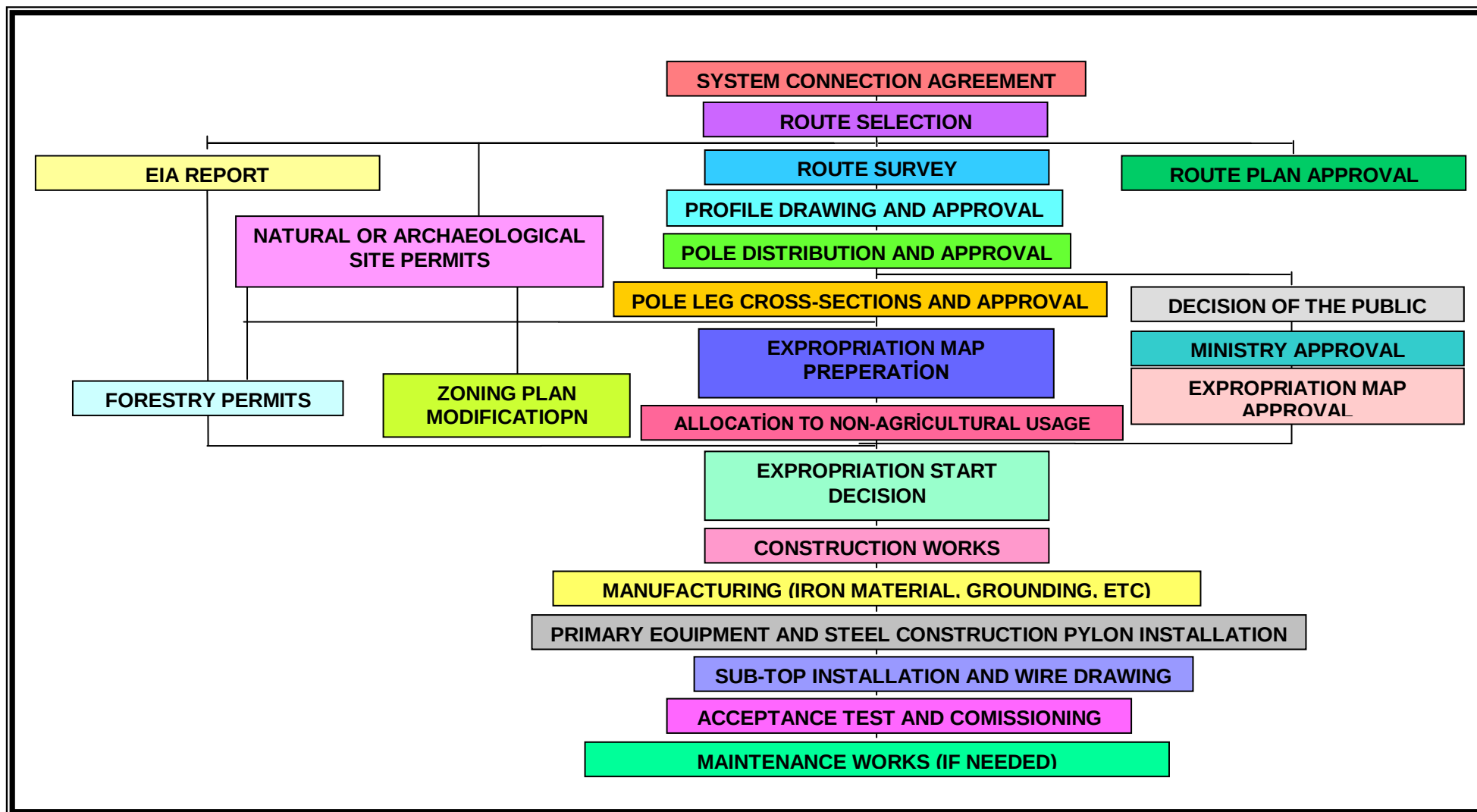


Figure 8. Work Flow Chart

Since work flow chart was considered, the following have taken place on said Project;

- Connection Agreement Shall Be Executed,
- Line Route Approved,
- EIA Process Commenced.

Following EIA process and other permit and approvals, the efforts of expropriation shall be initiated then it shall be preceded to the construction stage. At construction stage, respectively operations of lower – assembly, upper assembly, wire drawing, acceptance tests and commissioning shall be actualized. The detailed knowledge related to the operations to be realized at stage of construction has been provided below.

Lower Assembly

The first operation to be performed during overhead transmission line construction is the action of making four separate ditches in varying dimensions depending of the type of pole for every each leg of the pole legs where these four legs would be secured firmly. In this context, four distinct ditches will be opened as per pole. The legs of poles will be placed into these ditches opened and a cylindrical mold made of iron bars shall be positioned around the legs. During these works, the grounding electrodes to be installed are required to be buried averagely down to a 1.5 meter – depth. Following placement of such electrodes, concrete shall be poured into cylindrical mold up to surface so as to form a venture structure.

Earthing action of the overhead transmission line shall be made in accordance with “Installation Technical Specification” of TEİAŞ General Directorate.

According to this, the resistance of grid-based grounding of poles is being measured prior to placement of an earthing element in place. In case where earthing resistance.

For all concrete and grid-type foundations whose premature earthing resistance is greater than 20 ohms, an earthing rod or plate is manufactured in the center of locality of the pole and such rod or plate is diagonally secured to two opposite legs. In case where earth resistance has dropped below 20 ohms in consequence such operation, no other earthing operation is applied.

In case where earth resistance is above 20 ohms, contra-project implementation units (wire cables prepared in form of coil when grounding circuits were poorly made) are added hereto. Such additions shall be kept being made until a 20 ohm – grounding resistance shall be obtained as per leg of the pole involved. Resistance measuring action shall be made by means of grounding wire disconnected from the rod or resistor and chlorides or conductivity salts will not be used.

Upon completion of the earthing operation, cement shall be poured up to soil surface in form of a venturi thus lower installation operation of the poles shall have been accomplished.

Upper Installation

Upon completion of manufacturing all pole legs, the galvanized steel pylons will be attached to each other using bolts to build the electricity poles. Following completion of constructing the poles, insulators will be installed.

Wire Drawing

Upon completion of lower and upper assembly works, conductor wires will be drawn between the poles. Wire drawing machine shall be used during such operation.

Acceptance Tests

During provisory acceptance and final acceptance transmission lines, “Danger of Death Signs” and all types of safety measures – entailed standard signs and warning plates will be placed on the transmission poles upon completion of construction works for the line. Upon control of the line following completion of all operations, the line shall be delivered to TEİAŞ General Directorate.

During the construction phase of the project, any damages will be borne by the contractor.

Timing chart of the process starting with the design ending with the completion has been presented in **Table 7**.

Table 7. Timing Chart

Year	2013		2014												2015												2016												2017		
Month	5-8	8-12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
Plan Project Studies																																									
National EIA Process																																									
ESIA Process																																									
Expropriation Stuides (Expropriation Plan Preparation, Implementation, Forestry Permits)																																									
Construction Works (Lower-Upper Installation, Wire Drawing)																																									
Temporary Acceptance																																									
Final Acceptance																																									

V.4. Project Cost – Benefit Analysis

Energy in developing countries has increasingly gained importance in parallel to industrialization and as a result of rise in use of electricity. When evaluated from the aspect of our country, said requirement augments day by day, even much more.

Other than the qualified personnel who shall work at the construction phase of said overhead transmission line, it is intended to get the unskilled personnel to work from regional people. Thus, employment opportunity shall be generated under the unemployment conditions within the region as well. With an assumption that each one of 120 persons planned to be hired at the construction phase of said Project has a 4 – person family, with such Project, economically, it is envisaged that benefit shall be provided for approximately 480 persons.

In addition, overhead transmission lines are the infrastructural investments and their influence to the economy of country takes place indirectly. The energy consumption increases day by day in parallel to the rise in population, advancement of industrialization, spread of technology and rise in the welfare level and the need for this and similar projects increases every other day elapsing.

Upon establishment and commissioning of overhead transmission line, one more step will have been taken regarding the countrywide - targeted more efficient, uninterrupted and continuous energy supply.

Thus, both regional economy and Turkish economy shall be affirmatively influenced from said project.

Project value of overhead transmission line has been estimated to be TL 30 million. When both regional – based and our country – base socioeconomic contributions are taken into consideration, project price will pay for more than its cost.

V.5. Other Economic, Social and Infrastructural Activities Not Covered by Project However Designed to Be Actualized by the Investor Company or Other Companies Depending on Realization of Project

Within scope of said project, construction of only 380 kV ACWA Power Kırıkkale Overhead Transmission Line is being planned.

V.6. Expropriation

As a result of the survey and cadastral archive studies land usage status of the OHTL route, 80 km of the route passes through agricultural land (private property), 37 km forest area and 1 km zoned area.

TEİAŞ General Directorate, pursuant to Expropriation Law numbered 4650 amended by a change numbered 2942, shall make payment for the land costs to the shareholders by means of expropriation commission for both the ownership and easement in direction of expropriation plan to be drawn up throughout EIA process. Expropriation Procedure prepared by TEİAŞ is presented in **Appendix-7**.

Within scope of the studies carried out, easement is planned to be constituted for a totally 50 m – wide corridor as a whole, being 25 meters from its RH and LH sides. However,

easement shall get clearer in process of expropriation endeavors. As for the locations where pole feet of the overhead transmission line come across, necessary permits shall be taken according to the land size varying according to the type of pole.

Since there is not any expropriation operation in the forestry areas, concerning the section of overhead transmission line through forestry area, necessary permits shall be acquired from Forest General Directorate pursuant to Clause – 17 of Forest Law numbered 6831.

V.7. Project – Related Permit Procedure (Measures to be taken after EIA process)

The land costs including both the ownership and easement in direction of post – EIA process expropriation plan of said overhead transmission line shall be paid by means of expropriation commission to the shareholders upon realization of the expropriations.

Within scope of the studies carried out, easement is planned to be constituted for a totally 50 m – wide corridor as a whole, being 25 meters from its RH and LH sides. However, easement shall get clearer in process of expropriation endeavors. As for the locations where pole feet of the overhead transmission line come across, necessary permits shall be taken according to the land size varying according to the type of pole.

Prior to begin construction works for the use of agricultural areas to be utilized for non – agricultural purposes and treasury lands, necessary measures shall be taken by following the provisions of “Soil Conservation and Land Use Law” taken effect upon having been published in the Official Gazette numbered 25880 and dated 19 July 2005 and relevant regulation.

Concerning the pasture areas staying within the pasture areas covered by Pasture Law numbered 4342; necessary permits shall be obtained from Province of Kirikkale, Directorate of Food, Agriculture and Animal Husbandry and Province of Ankara, Directorate of Food, Agriculture and Animal Husbandry.

Since there is not any expropriation operation in the forestry areas, being related to the section of overhead transmission line passing through forestry areas, necessary permits shall be taken from Forest General Directorate pursuant to Clause – 17 of Forest Law numbered 6831.

In case it goes through irrigation areas, necessary permits shall be acquired according to the provisions of Agricultural Reform Law Regarding Land Arrangement in Irrigation Areas numbered 3083 and Water Products Law numbered 1380.

V.8. Being Related to Project, Brief Explanation of Works and Procedures Realized up to Now and Time Table

In consequence to the needs of the project in question, the route of overhead transmission line has been identified on the 1/25.000 – scaled topographic maps. Then, identified locality for the route of overhead transmission line has been visited (in situ) and it has been re-examined in consideration of topographic and geographical conditions. During such survey, the distance of overhead transmission line from settlements, its transition course which would ensure the line to be as short as possible, controls have been accomplished considering the installation – maintenance – operational facilities, areas of marsh – flood bed and exposed to avalanche, areas like forest – orchard – poplar wood,

military zones, airports - state farms - privately-owned lands, the elements like Specially Protected Areas, Highways, State Railways, dams, ponds, irrigation canals, zoned areas, mines, coal fields and the approximate route has been determined.

According to the Approved route plan, EIA process has been initiated on date 08/07/2013. In the context of EIA process, two separate Public Participation Meeting shall be held for informing the public and obtaining their views and offers relating to the activity as one is at Ankara Province, Çubuk County on 12.08.2013 and one is at Kırıkkale Province, Yahşıhan County on 13.08.2013. In order to determine the EIA Report Special Format, Scope and Format Determination Meeting was held in the Ministry of Environment and Urbanization. With official letter dated 28.08.2013 and numbered 14169, EIA Special Format is given by the Ministry of Environment and Urbanization. EIA Report was prepared and submitted to the Ministry of Environment and Urbanization according to this format. EIA process has been completed by taking the decision of "Environmental Impact Assessment Is Positive" on 20/02/2014.

SECTION VI: IDENTIFICATION OF AREA TO BE AFFECTED BY PROJECT AND EXPLANATION OF CURRENT ENVIRONMENTAL PROPERTIES INSIDE THIS AREA

VI.1. Identification of Area to Be Affected by Project (How and According to What Impact Area Was Identified Shall be Explained and Impact Area Shall Be Indicated on Map)

Overhead Transmission Line starts from ACWA Power Kırıkkale NGCCPP planned to be established within boundaries of Kırıkkale Province, Yahşihan County, Kılıclar Municipality and passes through the Ankara Province, Kalecik, Çubuk, Pursaklar, Yenimahalle Counties and ends up in Bağlum SS situated in Keçiören County.

The length of 380 kV OHTL is 119 kilometers and approximately 14.5 kilometers hereof is inside the boundaries of Kırıkkale Province and the rest being more or less 104.5 kilometers is situated within the boundaries of Ankara Province.

Environmental, economic and social – dimension impacts envisaged to emanate from Project during identification of area to be affected from Project should be evaluated altogether. In this context, the impact area of the line has been identified in consideration of the peculiarities such as fauna – flora, noise, EMF (Electromagnetic Flux), agricultural areas, settlements etc.

The construction operations to be actualized for installation of OHTL consist of lower assembly, upper assembly and wire drawing operations.

Therefore, when the construction and operation phases of Project are considered, an impact with two different qualifications shall take place in short - term and long – term. The influences at the construction phase are of provisional impacts and are of short – term. The data of these impacts, the information related to the measures to be taken and calculations are explained in relevant sections of ESIA report.

The impacts like dust, noise, etc. which will emanate from the operations to be carried out at the land preparation and construction of the line shall be short – term and temporary. Considering the dust and noise calculations made the impact area at the land preparation and construction phase has been identified to be a 50 – meter space from both sides, OHTL being the centerline, totally a 100 meter wide corridor.

During all construction operations, firstly, land use form on the areas where the poles shall be installed shall change for a short time. The construction works particularly on the areas where the poles shall set up shall get dense. In addition to this, across the route, during wire drawing operation which is the final stage of all works, again inside the 100 meter – corridor, short – term operations shall be carried out.

As for its operation phase impacts are of long – term ones and the impact area at operation phase – considering EMF and noise factors – has been envisaged to be a 100 – meter corridor consisting of 50 – meter space from left hand and right hand sides of OHTL.

As the EIA Study area, a 5 kilometer – corridor consisting of 2.5 km from LH and RH sides OHTL has been taken as basis and The Line Route and ESIA Survey Area which are contained in 1/25.000 – scaled Project Route Topographic Map is presented in **Appendix-1** and 1/100.00 – Scaled Project Route Land Classification Map in **Appendix-2**.

VI.2. Characteristics of Physical and Biological Environment and Use of Natural Resources

In Overhead Transmission Line Projects, route is being designated by considering distance of OHTL to settlement locations, transition route that shall enable the line to be short to the extent possible, facility-maintenance-operation possibilities, swamp-flood bed-land sliding exposed areas, areas such as forest-orchard-poplar, military areas, air fields, state producing farms, personal lands, communication lines (telephone, e-mail), Special Environmental Protected Areas, Highways, State Railways, dams, ponds, irrigation channels, zoning areas, mines, coal areas.

VI.2.1. Geological Properties of Line Route (Tectonic movements, mineral resources, landslide, unique formations, avalanche, flood, rock fall etc.)

1/100.000 explorations of Mineral Research and Exploration Institute were used to determine geologic characteristics of 380 kV ACWA Power Kırıkkale OHTL.

Stratigraphy of the area that is defined as the study area and that covers the area of the transmission line consists of tectonically related rocks in Triase-Jura Sakarya zone; Young Cretase-Early Eocene sediment rocks in İzmir-Ankara zone and similarly rocks in Late Cretase-Early Eocene Kırşehir block.

Cap rock that starts with Mid Eocene transgression discordantly overlies these units.

Cap rocks have a character of foreland basin sediments on base rock. These are alluvia consisting of Mid Eocene Baraklı formation; Çayraz formation; Çavuşlu volcanite; Deliler volcanite; Tohumlar volcanite; Hüseyingazi volcanite; Late Eocene-Oligocene İncik formation; Mid Miocene-Early Pliocene Central Anatolia group sediments; Pliocene Gölbaşı and Karakeçili formation and Quaternary river sediments.

Sakarya zone between Pontides and Anatolide-Torid belts is composed of bottom-up tectono- stratigraphically related Karakaya complex consisting of Emir formation; Elmadağ formation, Ortaköy formation and Keçikaya formation and Jura Bayırköy and transitional Akbayır formations that discordantly overly these units.

The unit which is composed of metamorphosed, carboniferous-Permian limestone blocks and Triase pebble stone, sand stone, quartz, silt stone, slate, radiolarite, mudstone, metaspilite, syphilitic basalt and diabase complex was first defined as Karakaya formation by Bingöl et al., (1973).

The study area that covers the route of the project is composed of Karakaya complex, Emir formation, Ortaköy formation, Elmadağ formation and Keçikaya formations.

Stratigraphic Geology

Emir Formation (Tae)

It is the oldest unit observed as autochthonous unit on the area. It was for the first time used in Akyürek and (1982, 1984) et al. Metamorphosis has been in question in green schist faces as a result of being subject to regional metamorphosis of clay, sand and volcanic rocks. It is made of muscovite-quartz schist, sericite-chlorite-quartz-schist- sericite-chlorite schist, phyllite, quartz-albite-chlorite schists. In addition to this, there are volcanites whose primitive state has been partially protected. They are generally yellow, grizzly and brown.

They are in displacive extension of northeast-southwest as Ankara center. Rock types consisting Emir formation are frequently folded. Folds are more distinctive in fine grain and fine layer sections. Fine grain rocks as well coarse grained pebble stones have been subject to metamorphism. Distinctive extension and tectonicity are observed in pebbles. Unit is fine-middle layer and tectonicity has been developed in parallel with bedding. At top hill in north of Hasanoğlu, it has undergone metamorphism together with units within Emir formation, and ultramafic rocks have been observed.

Meta sandstone is made of grain quartz, feldspar (albite, plagioclase), mica (muscovite, biotite), quartzite, metamorphic grains, epidote, chlorite, volcanic grains and opaque grains and cherts in petrography investigations of samples taken from various sections of Emir formation. Generally, abundance of grains derived from previous granite has drawn attention. Cement of these sand rocks is comprised of carbonate, silica, chlorite and sericite.

Emir formation is transitive with Elmadağ formation. It is observed between Kibris and Kusunlar villages in Ağildere where transition zone flows north from west of Yakupaptal village. Rock types are alternated in relation to transition zone for both partial Emir formation and partial Elmadağ formation. However, contacts with fault are observed in the north of Hasanoğlu in parallel with regional overlapping.

No fossil has been detected inside Emir formation. However, fossils of *Puzosia*, *Cyclogyra* cf. *mahajeri*, *Earlandia tintinniformis*, *Glomospira* sp., *Glomospirella* sp. corresponding to transition zone with Elmadağ formation have been encountered in the vicinity of Hacilar village in north of Çubuk. (Akyürek and et al., 1979 a, 1979 b, 1980, 1981). Age of this fossil community and unit has been determined to be Sub Triassic.

Ortaköy Formation (Tao)

Unit has been distinguished with different rock type properties within propagation of Elmadağ formation extended in the direction of southwest-northeast. It was for the first time used in Akyürek and (1982, 1984) et al. Unit consists of diabase type rocks, basalt (Spilite) undergoing metamorphism in low degree even partially protected its partial primitive state as well as their tuffs, volcanic material sand rocks and agglomerates. Limestones frequently observed within Ortaköy formation has been distinguished as İmrahor member, radiolarite-mudstones observed very little as radiolarite member and diabases in dike position as diabase dike. There are some sections though there are pillow structures protected rarely in dark green black color. Spilites are with gas clearances and gas clearances are filled by calcite. Distinctive tectonicity is seen in compliance regional folding in spilites. Permian aged limestones within Ortaköy formation are observed as blocks in various dimensions. In addition to this, volcanites consisting of Ortaköy formation in the brook of Hasanoğlu embraced and penetrated primitive related Trias aged lime stones.

These are products of volcanism active in the region during sedimentation of Ortaköy formation, Elmadağ formation and partially Keçikaya formation and are interlaced with lower sections of Elmadağ and Keçikaya formations transversely. Lower border of unit is not observed however, availability of non-distinguished volcanites inside Emir formation shows that volcanism is active during sedimentation of Emir formation. At the top, it is covered with upper levels of Keçikaya formation.

Fossils of *Meandrosira dinarica*, *Glomospira* sp., *Endothyra* sp., *Trochammina* sp. have been encountered in limestones with band location inside Ortaköy formation. Age of Ortaköy formation as to this fossil community has been determined as Middle-Upper Trias.

Ortakoy formation consists of products of volcanism entering into sediments from time to time and being active in the area of Ocean formed between time frame up to sedimentation of lower levels of Keçikaya formation and commencing during sedimentation of Emir formation and during sedimentation of Elmadağ formation. Permian aged blocks have entered depending on grabenization inside volcanites of Ortaköy formation discharged from cracks occurred as a result of grabenization developed during sedimentation of Emir and Elmadağ formations. Ortaköy formation is contemplated as lava section of ocean crust formed in Middle/Upper Trias.

Elmadağ Formation (Tael)

Unit extends in the direction of southwest and northeast. It was for the first time used in Akyürek and (1982, 1984) et al. Elmadağ formation consists of conglomerate, sandstone, mudstone, sandy lime stone, limestone and volcanite, agglomerate and volcanite and tuff having undergone metamorphism within the borders of green schist faces and/or protecting partially primitive state reducing gradually metamorphism against lower to upper position. There are various dimensioned blocks consisting of Carbonifer and Permian aged lime stone and crumbs inside this unit. Elmadağ formation is commonly yellow, grizzly, brown and gray colors. Unit in Thin and Middle thickness layer is frequently corrugated. Folding is distinctive in fine grain and fine layer sections.

Elmadağ formation is transitive with Emir formation at the bottom. At the top, it is transitive with Keçikaya formation Elmadağ formation continues as alternation of landstone, sand lime stone on transition one and passes to Keçikaya formation. This transition zone is observed at the north of Hasanoğlu and at the north of Keçikaya hill. Elmadağ formation is interlaced with Ortaköy formation consisting of transversely metavolcanite, metatuff, volcanite and agglomerate. Brook is observed from Hasanoğlu and over plateau road together with interlacing Çalıkbağ.

Fossils of Meandrospira pusilla, Cyclogyra mahajeri, Earlandia tintinniformis, Glomospira sp., Glomospirella sp., Ammodiscus sp. and Sub Trias being on transition zone of Elmadağ formation and Emir formation age have not been detected Bands in Elmadağ formation are limestone fossil and fossils of Meandrospira dinarica, Glomospira densa, Ammobaculites sp., Trochommina sp., Endothyranella sp., Endothyra sp. and Anicien age have not been detected on various sections of these bands. Fossils of Involutina gaschei, Trochammina almtalensis, Involutina eamesozoica, Glomospirella sp., Ophthalmidium sp., Trocholina sp., Ammobaculites sp., Endothyra sp. and Middle-Upper Triassic age have been detected in samples taken from upper surfaces. As a result of these findings, Elmadağ formation is accepted to be in Lower, Middle-Upper Triassic age.

Elmadağ formation is distinctive with generally flysch character rock types. Unit is generally comprised of rock stone and rock types deposited as shale alternation and pebblestone canal sedimentation developed within these processes. While unit continues its sedimentation, developing volcanism and their products have contributed to sedimentation in various phases. While sedimentation and volcanism continue, Carbonifer and Permian aged clastic and limestones have arrived at sedimentation basis in block in various dimensions and have contributed to sedimentation.

Keçikaya Formation (Tak)

This is observed on the sections where Elmadağ and Ortaköy formations are commonly available showing dispersion in the direction of northeast and southwest in the region. This was for the first time referred by Akyürek and et al., (1982, 1984). Unit consists of limestone and sand limestone. It is gray, white color, crystalized and dolomite on some

sections. Stratification is not observed distinctively on each place due to easy corrosion feature of layer surfaces and a lot of broken and cracked places of middle and thick layers. A grey color limestone surface of Keçikaya formation contains abundant fossils.

Keçikaya formation is transitive with Elmadağ formation and Ortaköy formation at the bottom. Limestone layer increases on transition zone. Volcanites consisting of Ortaköy formation are hot relational with lower surfaces of Keçikaya formation. At the top, Hasanoğlu covers incompatibly Keçikaya formation with pebble stones and sand stone surfaces.

Fossils of *Involutina eomesozoica*, *Glomospirella* sp., *Opthalmidium* sp., *Trocholina* sp. as well as fossils of *Involutina gaschei*, *Trochammina almtalensis* have been detected even if rare in unit determined as Middle Trias. Age of Keçikaya formation as to this fossil community has been determined as Middle-Upper, Upper Trias.

Keçikaya formation is formed as a result of shallowing and resting of environment gradually following sedimentation of rock types in flysch character at the bottom. It is penetrated to limestone from sandy lime stone, silt stone and sand stone alternation on transition zone.

Hayırköy Formation (Jb)

The unit is composed of poor gradated pebble, sand stone, mudstone and limestone intercalation. The unit was termed as Bayırköy formation by Altınlı (1973a). The unit was first termed as Bayırköy sandstone by Grabit and Tintant (1960) and as Hasanoğlu formation by Akyürek et al., (1982).

The pebbles in the unit mainly consist of meta sandstones and granite pebbles. Hasanoğlu outcrops in small areas around the central district in the study area. The unit discordantly overlies Elmadağ formation. Dogger-Malm Akbayır formation transitionally overlies the unit. Bayırköy formation starts with alluvial fan sediments in the base and continues with marine transgressive sequences. Pebble stones sediment in the form of coastal sand stones and channel fillings. Coastal sandstones are intercalated with shelf marns and clastic carbonates in short distances (Akyürek et al., 1997).

Bayırköy formation starts with basin collapse caused by ocean opening and sedimented on the edge of the basin (Akyürek et al., 1997).

Akyürek et al., (1997) identified *Involitina liassica* (Jones), *Opthalmidium martanum* (Farinacci), *Trocholina* sp. *Lagenidae* sp. fossils from sandy limestone band and lenses in the unit and based on this, determined the age of the unit as Liasse.

Akbayır Formation (JKa)

This unit is composed of white, cream, beige and sometimes red colored, concoidal, fine-medium layered chert spheroid and band clayey sandstone and/or biomicritic limestones. The unit was termed as Akbayır formation by Akyürek et al., (1982).

The unit outcrops in an area that borders east-northeast of district center of Hasanoğlu in the study are. Akbayır formation is equivalent to Jura limestone (Bilgütay, 1960), Lalelik formation (Batman, 1978), Soğukçam limestones and Soğukçam formation (Saner, 1980). Akbayır formation is transitional with the bottom Bayırköy formation and starts with yellow, brown and green marn, siltstone and clayey limestone intercalation in transition area. These levels continue with hemiplegic limestone which is the dominant rock

type in the unit (Akyürek et al., 1997). Akbayır formation has tectonic contact on Elmadağ formation.

Protopeneroplis striata (Weynschenk), Alveosepta gr. jaccardi (Schrodt), Conicospirillina hasiilensis (Mohler), Neotrocholina valdensis (Reichel), Neotrocholina sp., Trocholina sp., Spirillina sp., Textularidae, Miliolida, Lagenidae, Valvulinidae, Calpionella alpina (Lorenz), Calpionella elliptica (Cadisch), Tintinopsella sp., Calpionella sp., Radiolaria, Spongia, Echinoidae, Byrozoa and Mxophite, Alg fossils were identified on Ballıkuyumcu locality of Akbayır Formation by Akyürek et al. (1997). Based on this data, the unit was aged as Kimmericiyen-Titoniye-Barremiyeh (Neocomien). Akyürek et al. (1997) aged Akbayır Hill as Malin based on Calpionella alpina (Lorenz), Calpionella elliptica (Cadisch) fossils. Akbayır formation developed by the techno-sedimentary process which caused the formation of Bayırköy formation. Taking the stratigraphic location in the near surrounding of the study area, Akbayır formation was aged as Dogger-Malm-Low Cretase in the present study.

Izmir-Ankara Zone

Rocks in İzmir-Ankara Zone in the study area extend in northeast-southwest direction between Elmadağ district and Kırıkkale province. Rocks belonging to Sakarya zone in tectonic terms are observed in the unit; however the unit itself is observed tectonically on the rocks that belong to Kırşehir block. The rocks in this zone are composed of tectonically related Young Cretaceous Artova ophiolite complex, Kocatepe formation, Karadağ formation, Ilıcavınar formation, Samanlı formation, Haymana formation and Paleocene-Early Eocene Düziltaşlar formation and Sarıkata formations. İzmir-Ankara zone rocks are typically composed of Upper Cretaceous-Lower Eocene, closing basin deposits. The relationships between the deposits, especially which show flysch characteristics are in the form of under thrusts observed in an approximating and closing basin (Dönmez and Akçay, 2006).

Artova Ophiolite Complex (Ka)

The unit is composed of unseparated slice and blocks of basic, ultrabasic, volcanic, ophiolitic and sedimentary rocks. It was termed as Artova ophiolite complex by Özcan et al. (1980).

The sequence is composed of regular slice or block of green, white, purple, multicolored gabbro, diabase, serpentine, syphilitic lava; slices and blocks of andesite, basalt, tuff, agglomerate, marble, Triassic neritic, pelagic rock blocks, pink, gray, brown, red colored, blocked, radiolarite interlayered clay stone, millstone, sandstone, clayey limestone, shale and volcanite sequences.

The unit was termed as Hisarköy formation by Akyürek et al. (1982, 1997) and was reported to be composed of varying sizes of olistolite and olistostroms derived from ophiolites and pebble, sandstone and concurrent syphilitic and diabase volcanites deposited on continental margin with high slope.

Artova ophiolite complex can be correlated with Ankara mélange (Bailey and McCallien 1950), Upper Cretaceous submarine volcanite series, ophiolite series, basic intrusive (Ketin, 1956, 1963), serpentine and radiolarites (Baykal, 1943), Ankara complex, Karakaya ultramafite (Seymen, 1982) and Hisarköy formation (Akyürek et al., 1982, 1997).

The sequence tectonically overlies the rocks in Kırşehir block, while overthrust rocks in Sakarya zone are observed on the unit. The unit formed in an approximating continents and closing basin environment (during the closure of İzmir-Ankara ocean) and has

techtono-straphic relationship with flyschel deposits in front of it. Limestone deposits occurred on the unit after occasional slowdown of the environment. The unit is observed on band and was termed as a member of Kocatepe limestone by Akyürek et al., (1982, 1997).

In the present study, on the other hand, based on the identified *Cuneolina* sp., *Globotruncana fornicata* Plummer, *Globotruncana ventricosa* White, *Globotruncana helvetica* Belli, *Globigerina* sp., *Praeglobotruncana stephani* Gandolfi, *Rotalipara appenninica* (Renz), *Ticinella* sp., *Hedbergella* sp., *Pseudocyclammina hedbergi* Maync fossils in the unit that is termed as Kocatepe formation, the unit was aged as Senomaniyen-Kampaniye. This indicates that settlement age of the unit started from Senomanien.

The blocks in Ophiolite Complex are of varying sizes, show no lateral continuity, present irregular geometric shapes and have no paste or primary relationships. The blocks are indicated as Triase limestone blocks (TRkb), serpentine slice or block (Ksb), radiolarite slice or blocks (Kr), gabbro and diabase blocks (Kgd) and syphilitic basalt blocks (Kc).

Kocatepe Formation (Kko)

The unit is composed of fractured, baudinage form long distance pelagic clay and limestone, radiolarite-sandstone and calci-turbite intercalation. The unit was identified as a member of Kocatepe limestone by Akyürek et al.i (1997). However, in this study, the unit was called as Kocatepe formation.

The unit is equivalent to limestone levels in Irmak formation which was termed by Norman (1972).

Limestones are red-gray colored; fine-moderate layered and concoidal (Akyürek et al., 1997). Calci-turbidites contain shallow sea or reef limestones and low amounts of volcanic rocks (Akyürek et al., 1997). Radiolarite-mudstones are red in color and in the form of fine layers (Akyürek et al., 1997).

Based on *Cuneolina* sp., *Globotruncana fornicata* Plummer, *Globotruncana ventricosa* White, *Globotruncana helvetica* Belli, *Globigerina* sp., *Praeglobotruncana stephani* (Gandolfi), *Rotalipara appenninica* (Renz), *Ticineila* sp., *Hedbergella* sp., *Pseudocyclammina hedbergi* Maync fossils identified on the unit by Akyürek et al., (1997), the unit was aged as Senomaniyen-Campanien.

Karadağ Formation (Kkk)

Unit has been for the first time named by Akyürek and et al., (1982, 1982.1984). Karadağ formation commences with alteration of volcanic grained sandstone and pebblestone at the bottom and maintains as alteration of sandstone-mudstone towards upper sections. Surfaces overlapped with fully clayed limestone by increasing pelagic clay limestone (Kurşunludüz limestone member (Kkkk) have been separately mapped.

There are pebble stone levels, olistostromes and large ophiolitic formations as lenses inside unit. They are pebblestone, and mudstone, green, brown, grizzly, reddish, tight fitted and fine-middle layer. Sandstones have gradation, parallel laminating, flowing cross laminating convolite stratification. They are mudstone, gray, brown, grizzly colour tight fitted fine layer and acicular crack. Mudstones penetrate sandstone layer transitively. Parallel laminating is commonly observed in mudstones. Clayed limestones are grey, grizzly, red, fine-middle stratification and mussle shell clastic formation.

Karadağ formation is transitive with Hisarköy formation at the bottom. Volcanites and calcite turbidities of Hisarköy formation and alteration of sandstone and siltstone of Karadağ formation are observed together on this transition zone. Karadağ formation is interlaced with Hisarköy formation transversely. Karadağ formation is transitive with Ilıcınar formation and Haymana formation towards upper section. However, this relation is not clearly observed due to young faults.

Karadağ formation is sediments of Hisarköy formation at deeper and flat sections. Bottom section is of divergent turbidity character and top sections are of intermediate turbidity character. That Karadağ formation is of divergent and intermediate turbidity character, covering ophiolitic formation in less volumes, containing clay limestone levels as thick surfaces and being interlaced and transitive with Hisarköy formation comprised of sediments of upper sections of submarine scale shows that unit deposited in an area distant from volcanism activity and sections nearer to meadows in deeper sections of deep sea as to Hisarköy formation.

Ilıcınar Formation (Kı)

Formation has been for the first time named by Norman (1972). Unit consists of improper alteration of conglomerate and sandstone. Conglomerates are brown, grizzly, reddish color and medium tightened and thick-very thick layers. Layer bases are corrosive. Large scale syncline cross stratifications are observed in some places in conglomerates. Gradation is medium. Sandstones are green, brown color, medium tightened, medium-thick layers. Graded stratification, parallel laminating and small scale flow cross laminating are observed in sandstones. Conglomerates and sandstones have very little or no cement.

Lower limit of Ilıcınar formation is with fault on working site. There is a close correlation between formation environments and rock types constituting Kılıçlar Group with sub layers of unit observed. There are pebbles belonging to rock types constituting Kılıçlar Group in channel sediments inside Ilıcınar formation. Thus, it is hereby contemplated that Ilıcınar formation is deposited into hollows of channel sediments at the bottom section opened over Kılıçlar Group, in other words, where excavation surface is reached by Ilıcınar formation over Kılıçlar Group. Ilıcınar formation is interlaced and transitive with Haymana formation at the top and lateral positions. No fossil has been detected on unit. However, it is accepted that it is in the same age with interlaced Haymana formation, in other words, Maastrichtien age.

Ilıcınar formation has deposited over primarily Hisarköy formation in upper sub marine scale after volcanism activity in Upper Kretaceous formation has decreased.

Samanlık Formation (Ks)

This turbiditic unit is composed of yellow, green and brown, gray colored pebble stones, sandstone and shale intercalation; it was formed in flyschel environment. The unit was called as Samanlık formation (Akyürek et al., 1984).

The unit extends in parallel to Ilıcınar formation and in northeast-southwest direction in the study area. Pebble stones are greenish, yellowish and brown colored; tight and fine-moderate layered. The grading transits from pebble stone to sandstone. Pebble stones contain transported same aged rudist and coals (Akyürek et al., 1984).

Sandstones are green, yellow and brown in color. They are tight, cornered and fractured, with fine-medium layers. The shales are dark gray colored, loose, fine layered and sometime laminated (Akyürek et al., 1984). The unit is laterally and vertically transitional with

the bottom Ilıcınar formation and upper Dizilitaşlar formation. However, tectonic contacts are observed due to the events explained in Ilıcınar formation that affected depositing environment.

Based on Globotruncana rosetta (Carsey), Globotruncana stuarti (de Lapparent), Orbitoides sp., Siderolites sp., Lepidorbitoides sp. Fossils identified in Samanlı formation by Akyürek et al. (1984), the unit was aged as Maastrichtian.

This unit is equivalent to Bölükdağ formation (Norman, 1972) and can be correlated with one section of Haymana formation (Rigo de Righi and Cortesini, 1959).

Haymana Formation (Kh)

Name of Haymana formation was for the first time used by Rigo de Righi and Cortesini (1959). Unit consists of shale alteration of conglomerate and sandstone. It is observed with basalt lava, tuff intermediate levels between Günalan-Karaali villages. Where volcanic rocks are distinguished, volcanites are distinguished on member level.

Haymana formation is transitive and lateral with Ilıcınar formation on the sections where Ilıcınar formation is observed at the bottom. Relationship of unit cannot be observed due to young tectonic movements with Karadağ and Hisarköy formations. However, environment and rock type properties may be transitive. Haymana formation with intermediate turbidity sedimentation settles over Karadağ and Hisarköy formations that are divergent turbidity sediments. At the top, it is acquired from sedimentological data that primitive locations of sediments are transitive although border with Dizilitaşlar formation is observed as fault at all locations. In addition to this, Haymana formation is interlaced on vertical and lateral positions with Malboğazı formation where Rudist reefs are observed by being shallow when moving to upper section.

Dizilitaşlar Formation (Tpd)

The unit is composed of turbiditic pebble stone, sandstone, clay stone and low amounts of gypsum and reef limestone blocks and was termed as Dizilitaşlar formation by Norman (1972).

In this study, two different Dizilitaşlar formations were explained on İzmir-Ankara zone and Kırşehir block. The one explained in this section involves Paleocene-Early Eocene turbiditic sediments that deposited in flysch basin developing in front of Artova ophiolite complex starting from Upper Cretaceous. After Kırşehir block began to rise since Paleocene, Çaldağ formation and turbiditic Dizilitaşlar formations that are transitional with territorial deposits that are called Kürebağazı formation (Uğuz et al., 1999) on Kırşehir block sedimented. Dizilitaşlar formation that developed in front of Dizilitaşlarlar formation which developed on Kırşehir block and Artova ophiolite complex are mixed with each other in the middle of the basin. It was not possible to distinguish these as map units. The unit extends in northeast-southwest direction in the study area and outcrops in a wide large area around Hacıbalışarkısı, Mahmutlarsarkışı, Bedesten, Hpdar, Sarıkaya, Keklice, Küçükbatay, Daydanlı villages and Küredağ and Bala district. The unit has fine-medium-thick layers with regular stratification. The unit shows good particles and gradation, sorting and rounding level excluding the sections with large pebbles. Polygenic pebble stones that are observed around east-northeast of Keçili village that represent regressive sequence vary from very tiny pebbles to block size that are composed of pebbles with a diameter of 3 m. Especially in sections that are composed of andesites, they reach a size of 3m; they are slightly compact in structure and are supported with tuff, clay and carbonate. The matrix is medium/compact in sections with medium and small pebbles. Sandstones are light-dark brown, gray and

yellowish in color; they are sometimes transverse layered. The matrix is clay and carbonate. In sections with intensive carbonate cement, sandstones show sandy carbonate character. Volcanic material is dominant in some sections of the unit. A significant characteristic of sandstones is that they are in diamond shape (Akyürek et al., 1982). Birgili et al., (1975), on the other hand, reported that the unit overlies Malbağazı formation and ophiolites with angular discordance. This might be caused by the fact that a continuous marine sedimentation continued in the west of Kızılırmak line which lasted until the end of Early Eocene; while the sedimentation was interrupted due to the rising intrusives (foreland rise). Baraklı and Çayraz formation discordantly overlies the upper contact.

The fact that Dizilitaşlar formation is also composed of olistolites indicates that it sediments in deep sea environment which are dominated by intensive and active turbiditic flows (Bilgin et al., 1986).

Kuşkayatepe Limestone Olistolite (Tpdk): limestone blocks that settled in the unit simultaneously with the units that form Dizilitaşlar formation was termed as Kuşkayatepe limestone olistolite. The unit is gray, gray-white in color, in massive appearance, sandy, porous, melting voids, with a high algae and reef content and shows reef limestone characteristic. These are observed as olistolites that were carried and settled in Dizilitaşlar formation by turbiditic flows. They are generally in the form of the accumulation of blocks in 3-5 m.

Phyllocoenia corollaris (Reuss), Hippurite s (Tanımlayan: E. Öngüç, 1975) ve Pironaea polystyla siavonica (Hilber) Kühn (Defined by: N. Karacabey) fossils were identified in the unit. Based on these fossils, the unit was aged as Maastrichtian (Bilgin et al., 1986).

Sarıkaya formation (Tps)

The unit which is composed of gray, black and brown colored volcanic material containing pebble stone, sandstone, agglomerate and mainly andesitic lava was called Sarıkaya formation.

Sarıkaya formation extends in a wide area in the study area in northern sections of Sarıkaya and Keklicecek village. Blocks of this unit are observed in various sections of Dizilitaşlar formation. Volcanic interlayers observed in the unit by Uğur et al., (1999) were reported to derive from magma with basalt and andesite content. This unit was mapped and explained as purple and yellow colored volcanites in Küredağı formation by Uğuz et al., (1999). In hipohyaline porfirc lava, plagioclase, biotite and opaque minerals are the principle phenocrysts. Plagioclases are euhedral and polysynthetic twinning. Occasional zoning is also observed. They are generally stained with silicate, clayey and iron-oxides. Biotites are euhedral, brown in color and highly pleocroic. They became opaque starting from edges and slices. Opaque minerals are euhedral and non-euhedral and scattered. The cement is generally composed of volcanic glass and plagioclase microlites. Volcanic glass is entirely devitrified and has a clayey character.

ÜST SİSTEM	SİSTEM	SERİ	FORMASYON	SİMGE	LİTOLOJİ	AÇIKLAMALAR
SENOZOYİK	KUVATERNER		Alüvyon	Qa		Kum, Çakıl
	TERSİYER	PLİYÖSEN	Gölbaşı Formasyonu	Tg		Konglomera, kumtaşı, çamurtaşı
			Bozdağ Bazaltı	Tb		Bazalt
		MİYÖSEN	Tekke Volkaniti	Tt		Andazit, trakiandazit, tuf, aglomera
			Mamak Formasyonu	Tma		Aglomera, tuf, andazit
			Hançili Formasyonu	Th		Kumtaşı, silttaşı, marn, killi kç, tuf, jips, bitümlü şeyl
MESOZOYİK	JURA	LİYAS	Akbayır Formasyonu	Ja		Beyaz, krem ve kırmızı renkli silis bant ve yumrulu kç
			Hasanoğulları Formasyonu	Jh		Konglomera, kumtaşı, silttaşı, kumlu kç
	TRİYAS		Keçikaya Formasyonu	Trak		Gri beyaz renkli kç
			Ortaköy Formasyonu	Trao		Spilit, diyabaz, tuf, volkanitlerle, aglomera
			İmrahor Formasyonu	Traoi		Volkanitlerle ilksel ilişkili kç
			Elmadağ Formasyonu	Trael		Metakonglomera, metakumtaşı, kumlu kç, kumtaşı, kireçtaşı
			Kireçtaşı Bloğu	Pckp		Kireçtaşı
			Kireçtaşı Bloğu	Okb		Kireçtaşı

Figure 9. Generalized Stratigraphic Section (Ankara)



Kırıkkale section of overhead transmission line falls into 2nd degree earthquake zone while Ankara section falls into 2nd, 3rd and 4th degree earthquake zone (See **Figure 11**). Turkey Earthquake Zones are rated based on the values of acceleration values which are given below.

Earthquake Zone	Explanation	Acceleration Value
1st Degree Earthquake Zone	Include tectonic depressions and areas near active fault lines. Here, earthquakes can cause loss of life and property in a great extent.	Higher than 0.40 g
2nd Degree Earthquake Zone	Areas where earthquakes can	Between 0.40 g and 0.30 g

	cause less damage compared to 1st Degree Earthquake Zones.	
3rd Degree Earthquake Zone	Shakes in these areas pass with minimum loss.	Between 0.30 g and 0.20 g
4th Degree Earthquake Zone	Shakes in these areas pass with minimum loss or no loss.	Between 0.20 g and 0.10 g
5th Degree Earthquake Zone	Shakes in these areas occur rarely or are not perceptible	Lower than 0.10 g

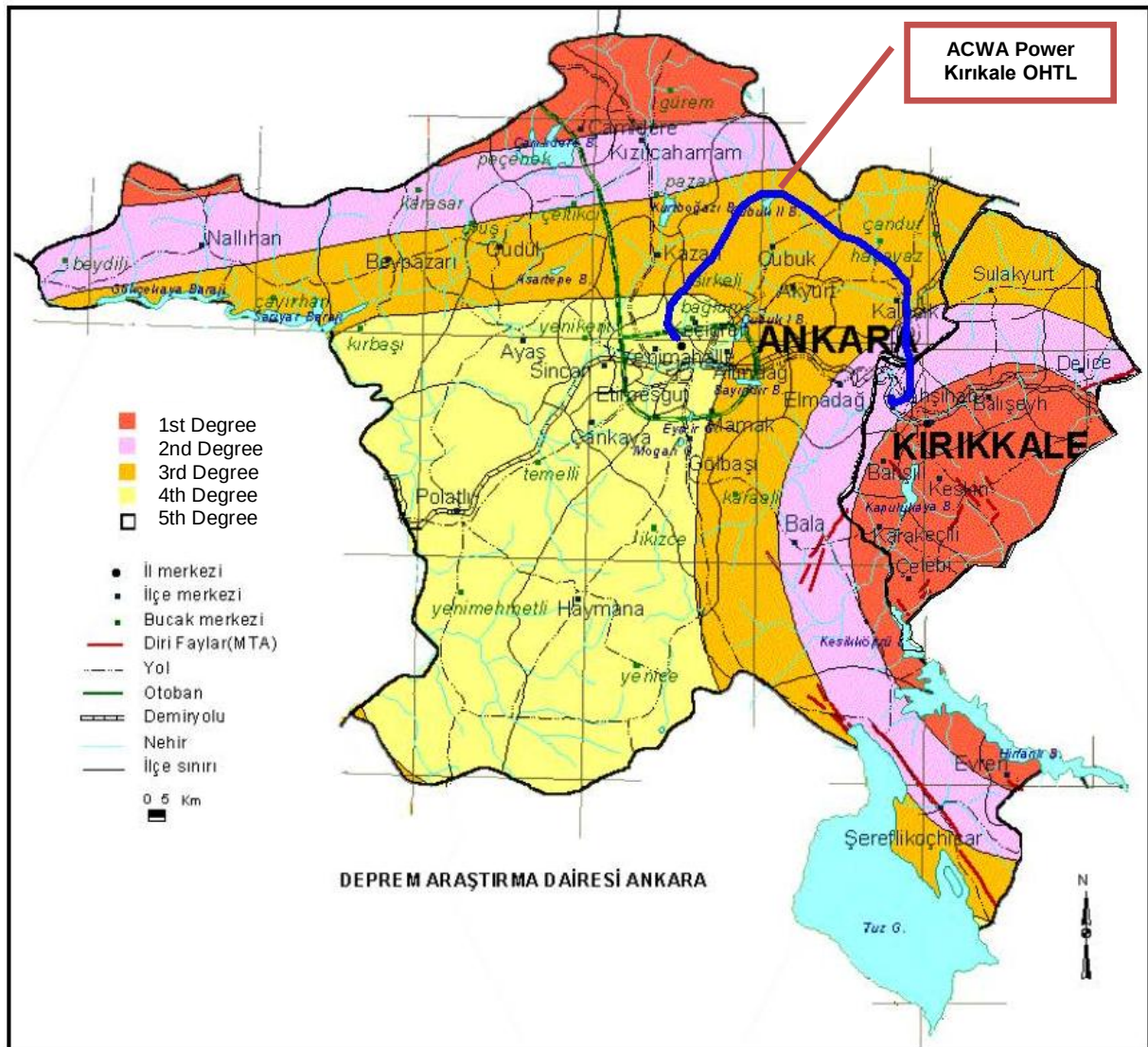


Figure 11. Seismicity Map of Ankara and Kırıkkale Provinces

In this case, earthquake risk in the Project area is quite low.

Ankara city center is in the 4th degree hazardous earthquake zone yet, up to now has not been the center of destructive earthquakes. In Ankara, although there is not active fault passing through its center which would generate a big earthquake, younger fault zones shearing each other and contained in the Northern Anatolian Fault System in 120 km distance towards north and south of the city center have produced important earthquakes. 2000 Gündül M=4.8, 2005 M=4.9 and 2007 5.6-5.5 Bala earthquakes have caused damage. The events of avalanche have been observed headed by town of Mamak first, in the towns of Kalecik, Çubuk and Nallıhan. The events of rock fall generally take place in the settlement

units of the towns of Altındağ, Beypazarı and Nallıhan where volcanic rocks are observed. There are areas exposed to floods in the city of Ankara, the towns of Elmadağ, Bala, Sereflikochisar, Kızılcahamam, Çubuk, Polatlı and Kalecik situated within the Kızılırmak basin.

A major part of Kırıkkale province is in the 1st degree hazardous earthquake zone. It is under the influence of Ezine Pazarı Fault Zone and the faults associated herewith. 1938 M=6.6 Kırşehir – Keskin Earthquake is the biggest earthquake which has affected Kırıkkale in recent century. The events of avalanche have been intensively sighted in rge towns of Sulakyurt and Delice. It is one of the cities where the event of rock fall is scarcely experienced and have been observed in the towns of Karakecili, Keskin and Sulakyurt. Kırıkkale is one of the cities where the events of flood are intensively lived and situated within Kızılırmak basin. Flooding events are being observed in the Cental and towns of Yahşihan, Balıseyh, Sulakyurt and Delice.

According to Turkish Active Fault Map, Çankırı Fault intercepting the route from north and Karakeçili Fault Zone which is an active quvaterner fault and second closest to the proje site at a distance (16 km) from the line southeastwardly (Refer to **Figure 12**).

Landslide map showing project route is shown in **Figure 13**. As seen from the map, old and active landslide areas are present on the OHTL route and the vicinity. In case of landslide events, negative impacts shall be prevented by ensuring physical stability of the poles. Moreover, construction works shall be suspended until the danger has passed.

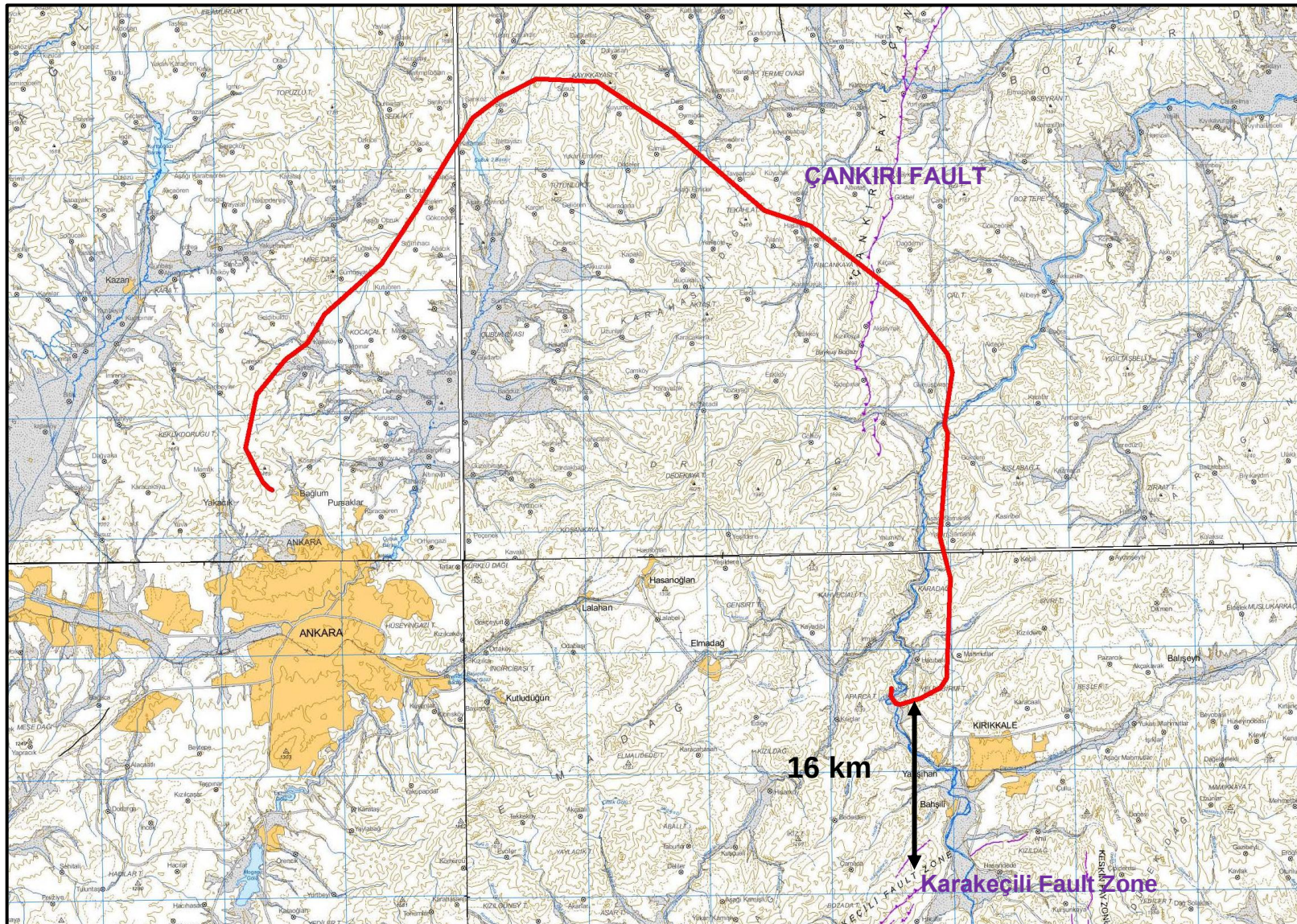


Figure 12. Active Fault Map and OHTL Route (Reference: www.deprem.gov.tr)



Furthermore, Turkey Rock Fall Risk Map prepared by the repealed Ministry of Public Works and Settlement and General Directorate of Disaster Affairs is presented below. It is understood from the map that number of occasions in Ankara, where the project will pass through, was 1-4; while number of occasions in Kırıkkale province was 0.

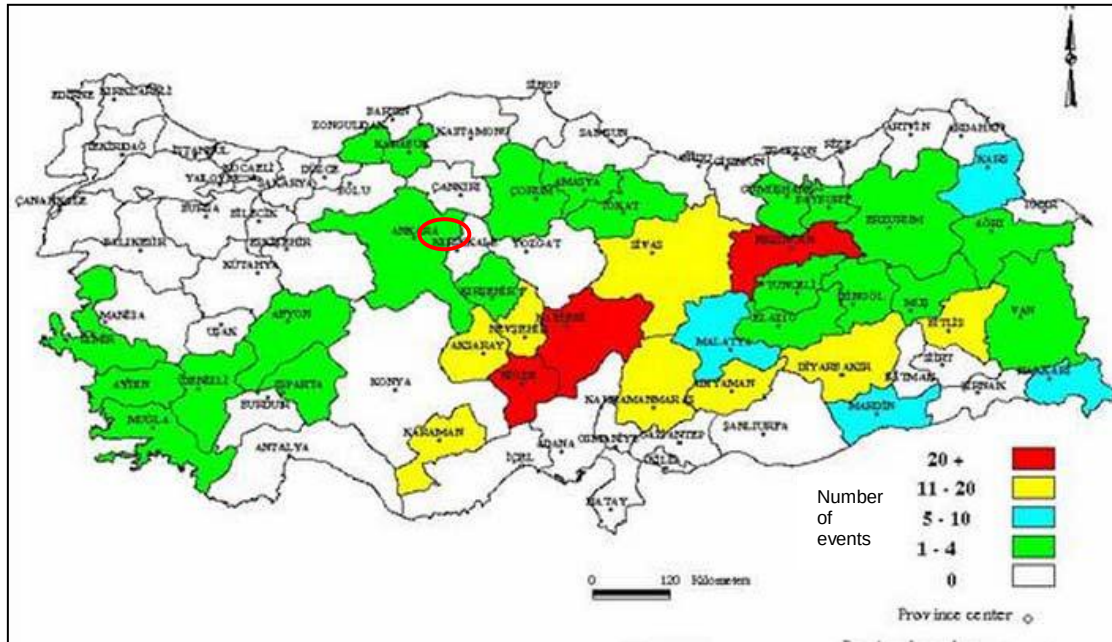


Figure 14. Turkey Rock Fall Risk Map

Flood and overflow risk map for Turkey is presented in the following figure. It is indicated on the map that number of occasions in Ankara, where the project will pass through was 5-9; while number of occasions in Kırıkkale province was 1-4.



Figure 15. Turkey Flood and Overflow Risk Map

Being related to the activity, the principles of “Regulation About Buildings to Be Built in Earthquake Zones” published in the Official Gazette dated 14 July 2007 and numbered 26582 and necessary precautions shall be taken.

VI.2.2. Hydro-geological Characteristics of Underground Water Resources and Thermal Springs on the Line Route (Water levels, quantities, safe draw quantities, flow rates of sources, current and planned usage)

Based on the information obtained from State Hydraulic Works, underground water potential of Ankara province as of 2006 is around 200 million m³. Major part (75%) of this potential is located in Ankara plain, Kazan-Mürted plain, to south of Polatlı and in the Şereflikoçhisar-Peçenek basin. Other efficient basins in terms of underground water potential are Kirmir basin (between Kızılcahamam and Beypazarı), Nallıhan Basin and Çubuk plain. In recent years, demand for underground water has increased in Ankara province. In particular, in districts of Ayas, Beypazarı, Polatlı, Kazan, Gölbaşı and Çubuk, many wells are being drilled, most of them being for irrigational purposes.

Underground Water Basins of Ankara Province and their reserves are given below.

Table 9. Underground Water Basins-Reserves

Place	Operational Reserve	Place	Operational Reserve	Place	Operational Reserve
South of Ankara	4,5 hm ³ /year	Mürted Plain	15,5 hm ³ /year	Bala	1,5 hm ³ /year
Ayaş- Beypazarı- Güdül	5,5 hm ³ /year	Temelli	0,5 hm ³ /year	Kızılcahamam	0,4 hm ³ /year
Çubuk Plain	9,0 hm ³ /year	East of Tuzgölü [Salt Lake]	3,0 hm ³ /year	Elmadağ	8,2 hm ³ /year
Hatip Plain	33,0 hm ³ /year	Bursal Valley	1,5 hm ³ /year	Kalecik	1,6 hm ³ /year
Kurakçöl	2,0 hm ³ /year	Around Gölbaşı	2,23 hm ³ /year	Polatlı	0,1 hm ³ /year
Yenimahalle	1,85 hm ³ /year	Kazan	0,54 hm ³ /year		

Hatipovası Groundwater Sources: There are lots of large and small sources arising from Permo-Triase crystallized limestones that crop out in the east and south of the basin. Flow rate of these sources vary between 1-20 lt/sec. Akpınar, Karapınar, Yaylapınar, Elmapınar, Kirizpınar, Kyaözü Çişıkdere sources have a flow rate of around 35 lt/sec. On the other hand, there are sources with a flow rate of 1 lt/sec in Tertiary volcanic series.

Mürted Plain Groundwater Sources: There are a lot of sources that meet drinking water supply of the villages in mountain skirts and plains in Mürted Plain. Most of these sources originate from alluvial cones and the skirts of these cones, while some of them originate from andesite cracks. Flow rate of these sources vary between 2.3 and 16/lt sec. the most important source is Büvet creek with a flow rate of 40 lt/sec.

Çubuk Plain Groundwater Sources: The sources in Çubuk Plain are contact and fault sources. T the source that originate from Pliocene-Miocene contact between Taşpınar village and Dedetepe which is located 5 km south of this village has a total flow rate of 30 lt/sec. On the other hand, the sources that originate from grovac and quartz cracks in the east of Ravlı has a flow rate of 0.5-2.5 lt/sec. The flow rate of the sources that originate from andesite cracks vary between 0.5-1.5 lt/sec.

There are 13 geothermal areas in Ankara province with a fluid temperature of over 30°C which are located at Kızılcahamam, Seyhamamı, Çubuk-Melikşah, Beypazarı-Dutlu, Beypazarı-Kapullu, Beypazarı-Merkez-Kızılsöğüt, Ayaş Mineral Springs and Çobanhamamı, Ayaş-Karakaya, Haymana, Polatlı-Sarıoba, Polatlı-Karacaahmet, Polatlı-Özhamamı and Sincan-Yenikent-Mülk. (Reference: Ankara Provincial Environment and Status Report, 2011)

Total safe reserve in the province : 10,5 hm³/year
Total Water Potential : 3 260,5 hm³/year

There are no thermal springs in Kırıkkale Province. (Reference: Kırıkkale Provincial Environment and Status Report, 2005)

VI.2.3. Hydrologic Current and Planned Usage of Surface Water Resources (Usages like potable, domestic, irrigation water, electricity production, dam, lakes, ponds, aquatic products, water-way transportation facilities, tourism, sports and similar – purpose water and / or use of the coast, in addition, information regarding whether or not there are surface water sources in nature of wetland at the points where main poles shall be erected planted to be provided, if any, the measures to be taken to be mentioned and other uses)

The most important surface water resources identified within OHTL route and ESIA Survey Corridor totally in 5 km in width is Kızılırmak River and Çubuk-2 Dam. Kızılırmak River stands at a 300 meter - distance from OHTL starting Pole (S1). There are crossovers planned over the river along the route of OHTL. During Planning studies, guard band defined as the distance of 200 m from right and left hand of the Kızılırmak River has been respected / shall be followed. Çubuk-2 Dam stands at a 1000 m to the route and 1400 m to the nearest some pole (S19).

There is not any surface water in nature of wetland at the points where the poles will be erected.

The streams showing seasonal flow across the line; are streams of Asmalı, Çırınçak, Erikli, Büyükçökek, Gürebağları, Köklüce, Tarla, Uzunuyu, Tatlının, Kavaklı, Sondede, Taşlıgeçit, Dolaşan, Yılgin, Kara, Ovazın, Damla, Gürleğen, İncekavak, Kisin, Sudere, İnce, Akyokuş, Katiağaç, Armutlu, Kirliğin, Damlaağaç.

As for the streams showing continuous flow; are the streams of Kırmı, Taşocağı, Bayamlı, İğdeköy, Kamanlı, Mendek, Bekirin, Tahirinsazak, Kırkelma, Danişman.

The closest operating State Hydraulic Works (SWA) irrigation cooperative to the Project area is at Kayadibi, 7.5 km – distance from the route (See **Figure 16**).

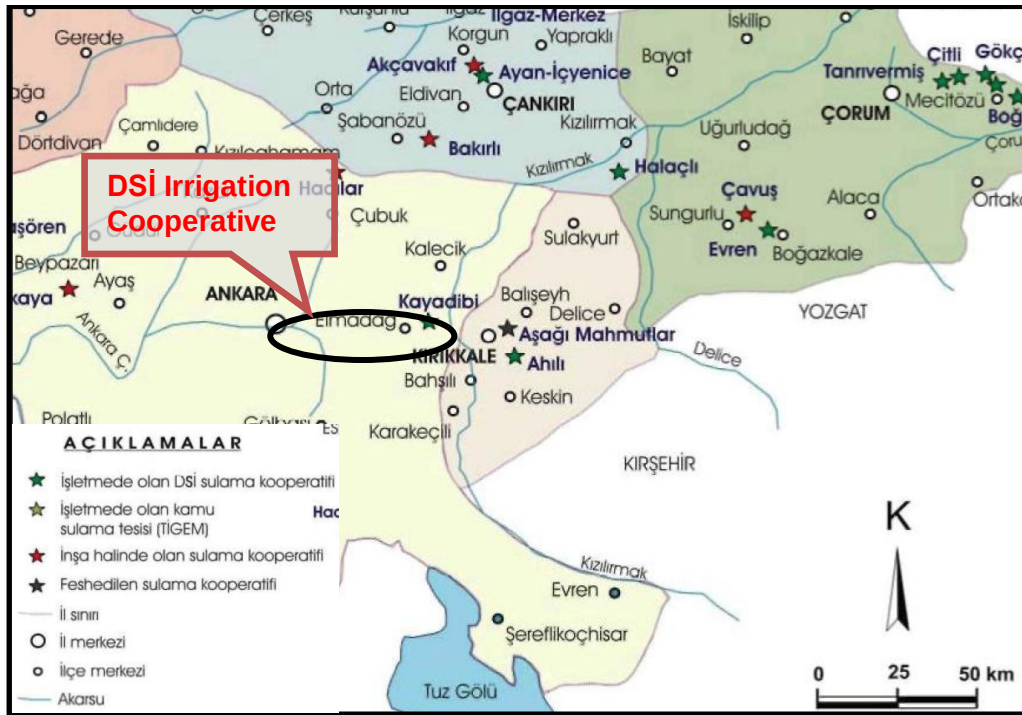


Figure 16. SWA Irrigation Operations at the Project Area and In Its Vicinity: Ankara Province Environment and Status Report, 2011)

VI.2.4. Soil Characteristics and Usage Status (Land Use Capability Classification of Soil, Erosion, Meadow, Pasture, Current Usage Status of Land, etc.), (Obtaining of necessary permissions according to Soil Protection and Land Usage Law no. 5403, obtaining of necessary permissions pursuant to the Meadow Law no 4342)

Soil characteristics of lands located within the line route and in the impact zone corridor have been grouped by using Ankara and Kırıkkale Provinces Land Classification Maps as a source (See **Appendix-2**).

Soil types commonly seen along the OHTL route are; brown soils, reddish brown soils, bare rock and debris, colluvial soils and brown forest soils. Information about soil types are given below.

Brown Soils (B): These soils are mostly found in arid and semi-arid climates. Their natural vegetation consists of short grass and bushes. They contain plenty amount of calcium in their profiles. They are rich in vegetable nutrients. They have good natural drainage. They have a brown color as their name suggests. They have medium level organic matter content. Usually, a hardened lime accumulation layer is present beneath the subsoil. A gypsum accumulation layer is present underneath. These lands remain dry for long periods during summer. Temperature is low in winter and in spring when most of the precipitation takes place. Consequently, chemical and biological activities in soil are slow except for the short periods in spring and fall.

Reddish Brown Soils (F): Almost all their characteristics are same or similar with those of Brown soils except for the color. Just like them, these are found in arid and semi-arid climates. Their natural vegetation consists of grass and bushes. They have good natural drainage. Biological activity is low in these soils. They have a high natural yield.

Bare Rocks and Debris (ÇK): These are zones where 90% of land surface is covered by parent rock.

Colluvial soils (K): These soils are generally found in steep mountain skirts and openings of valleys. They are (A) C profile young soils that formed on the materials that accumulated by the effect of gravity, landslide and transport to lateral creeks. Although they look like upper land soils in the surrounding in terms of their properties, the main material has no or inadequate gradation. The profile shows layers with varying particle sizes according to the intensity of rainfall or surface flow and slope gradient. These layers are not in parallel to each other like those in alluvial soils; they are in irregular form. These soils have no salinity and sodification problem.

Brown Forest Soils (M): These soils have a main material with high lime content. Their reactions are alkaline and sometimes neutral. They are in granular or round-angular block form. Slight amounts of clay accumulation can be observed.

Current Land Usage

As a result of the survey and cadastral archive studies land usage status of the OHTL route, 80 km of the route passes through agricultural land (private property), 37 km forest area and 1 km zoned area. Based on land use capability class, class I, II, III, IV, VI and VII lands are located on the line route.

Prior to start of the construction works, necessary permissions shall be obtained for utilization of agricultural areas covered by the project scope for their utilization for non-agricultural purposes from Ankara and Kırıkkale Food, Agriculture and Livestock Provincial Directorates pursuant to "Soil Protection and Land Usage Law " no. 5403 which became effective by being published in the Official Gazette dated 19.07.2005 and numbered 25880.

As regards the meadow lands to be crossed along the line route, necessary permissions shall be obtained by filing application to Ankara and Kırıkkale Provincial Agriculture Directorate meadow commission for meadow assignment purpose modification pursuant to the Meadow Law no. 4342. Construction activities shall not be initiated without obtaining the concerned permissions. Furthermore, provisions of the Aquaculture Law and Regulation no. 1380 shall be fulfilled and necessary measures shall be taken at every stage of the activities.

Since forest areas have no expropriation procedure, regarding the line which passes through forest areas, as per article 17 of Law on Forest no 6831, necessary permissions will be taken from General Directorate of Forestry.

VI.2.5. Existing Air Pollution Load of Project Area and Impact Area

Natural gas distribution works in Kırıkkale Province have been completed and natural gas is started to be used for heating purposes in residences at the city centre. Some industrial plants as well have switched to using natural gas in processes. Since natural gas is not being used in the entire provincial centre and in industry, domestic and imported coal, fuel oil no. 4 and LPG are currently being used for heating and industrial purposes.

One of the air quality monitoring station in Turkey established by the Ministry of Environment and Urbanization is located in Kırıkkale Province, 8.9 km away to the closest overhead transmission line route (S4/A pole). Sulphurdioxide (SO₂) and particular matter

(PM) data of the 2011-2012 years of Kırıkkale air quality monitoring station is given in **Table 10** and the graph in **Figure 17**.

Table 10. Kırıkkale Air Quality Monitoring Station Data

Date	Maximum Concentration		Minimum Concentration		Average Concentration	
	PM ₁₀ µg/m ³	SO ₂ µg/m ³	PM ₁₀ µg/m ³	SO ₂ µg/m ³	PM ₁₀ µg/m ³	SO ₂ µg/m ³
01.12.2011-31.12.2011	196	86	28	2	105	25
01.01.2012-31.01.2012	204	24	39	0	86	10
01.02.2012-29.02.2012	-	101	-	9	-	32
01.03.2012-31.03.2012	134	61	11	7	92	20
01.04.2012-30.04.2012	169	35	10	0	64	9
01.05.2012-31.05.2012	83	24	27	0	48	3
01.06.2012-30.06.2012	82	19	31	0	53	1
01.07.2012-31.07.2012	88	3	32	1	54	2
01.08.2012-31.08.2012	85	2	33	0	49	1
01.09.2012-30.09.2012	120	10	39	0	77	2
01.10.2012-31.10.2012	107	9	37	4	66	6
01.11.2012-27.11.2012	120	10	19	5	63	7
Annual Average					69	10
Limit Values (Air Quality Assessment and Management Regulation)					40	20

Reference: www.havaizleme.gov.tr

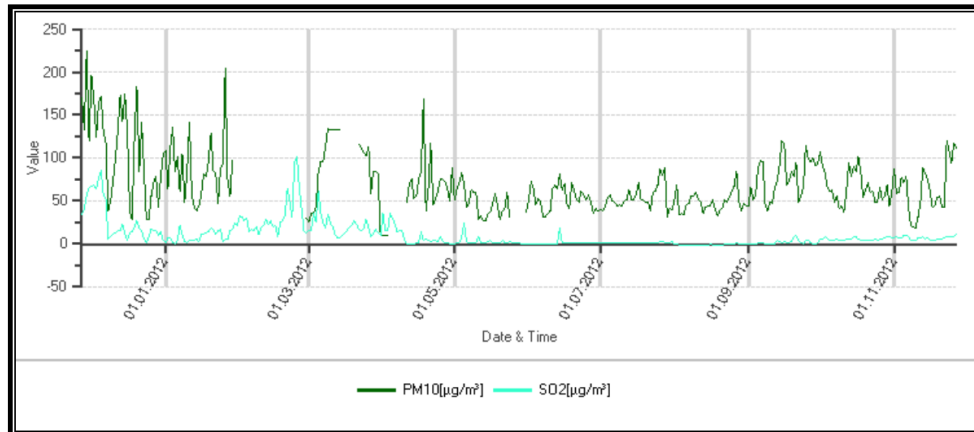


Figure 17. Kırıkkale Air Quality Monitoring Station Data Graph

According to **Table 10**, maximum SO₂ emission is recorded in February-2012 as 101 µg/m³ and maximum PM₁₀ emission is recorded in January-2012 as 204 µg/m³.

Natural gas usage for domestic heating source is low in Kırıkkale Province; instead people prefer to use coal. Irregular urbanization, lack of adequate insulation in buildings and weather conditions rather increase coal usage. This situation results in high PM concentrations and exceeding of limit values which is shown in **Table 10**.

Another air quality monitoring station in Turkey established by the Ministry of Environment and Urbanization is located in Ankara Province, Dikmen District, 17 km away to the closest overhead transmission line route (ND1 pole). Sulphurdioxide (SO₂), particular matter (PM) and nitrogen oxide (NO_x) data of the 2011-2012 years of Ankara-Dikmen air quality monitoring station is given in **Table 11** and the graph in **Figure 18**.

Table 11. Ankara-Dikmen Air Quality Monitoring Station Data

Date	Maximum Concentration			Minimum Concentration			Average Concentration		
	PM ₁₀ µg/m ³	SO ₂ µg/m ³	NO _x µg/m ³	PM ₁₀ µg/m ³	SO ₂ µg/m ³	NO _x µg/m ³	PM ₁₀ µg/m ³	SO ₂ µg/m ³	NO _x µg/m ³
01.12.2011-31.12.2011	180	59	123	22	0	9	80	18	53
01.01.2012-31.01.2012	108	53	74	13	1	8	42	22	41
01.02.2012-29.02.2012	48	47	111	3	10	20	19	30	55
01.03.2012-31.03.2012	135	35	75	6	3	14	62	14	43
01.04.2012-30.04.2012	141	25	73	15	2	7	62	8	32
01.05.2012-31.05.2012	91	19	100	48	10	29	60	13	50
01.06.2012-30.06.2012	254	14	73	37	2	51	125	7	64
01.07.2012-31.07.2012	328	12	-	93	5	-	151	9	-
01.08.2012-31.08.2012	342	14	-	40	5	-	129	10	-
01.09.2012-30.09.2012	308	20	-	24	6	-	143	13	-
01.10.2012-31.10.2012	104	17	-	22	9	-	63	11	-
01.11.2012-27.11.2012	145	16	315	17	8	62	75	11	156
Annual Average							84	14	62
Limit Values (Air Quality Assessment and Management Regulation)							40	20	30

Reference: www.havaizleme.gov.tr

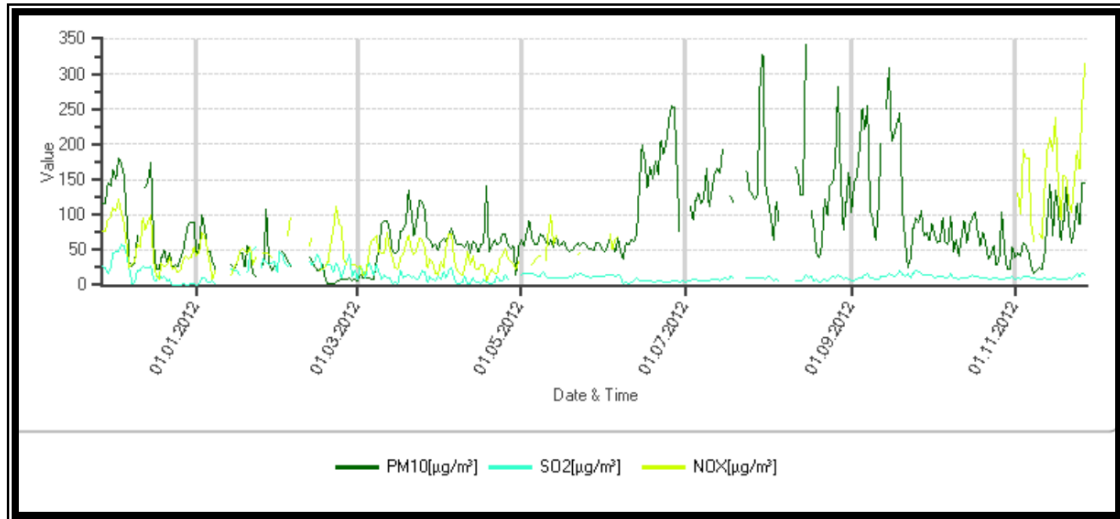


Figure 18. Ankara-Dikmen Air Quality Monitoring Station Data Graph

According to **Table 11**, maximum SO₂ emission is recorded in December-2011 as 59 µg/m³, maximum PM₁₀ emission is recorded in July-2012 as 342 µg/m³ and maximum NO_x emission is recorded in November-2012 as 315 µg/m³.

The most preferred heating way in Ankara has been natural gas for long years. However, when compared to Kirikkale Province, due to higher traffic load in Ankara, air quality values differ from each other. This situation results in high PM and NO_x concentrations and exceeding of limit values which is shown in **Table 11**.

VI.2.6. Agricultural Areas (Agricultural Development Project Areas, Areas of Special Crop Plantations, Size of Dry and Wet Agricultural Lands, Product Designs and Their Annual Production Quantities),

Overhead Transmission Line starts from ACWA Power Kırıkkale NGCCPP planned to be established within boundaries of Kırıkkale Province, Yahşihan County, Kılıçlar Municipality and passes through the Ankara Province, Kalecik, Çubuk, Pursaklar, Yenimahalle Counties and ends up in Bağlum SS situated in Keçiören County. Land Classes Distribution (ha) by Towns of Kırıkkale and Ankara Provinces are given in the table below.

Table 12. Land Classes Distribution by Towns of Kırıkkale Province (Reference: 2005 - Kırıkkale Province Environmental Status Report)

Towns	Total Agricultural Area	Class I (ha)	Class II (ha)	Class III (ha)	Class IV (ha)
Central	25,078		15,078	8,000	2,000
BahsProvincei	9,447		5,000	3,000	1,447
Baliseyh	50,873		21,000	25,000	4,873
Celebi	12,240		6,000	5,000	1,240
Delice	63,399		42,160	18,386	2,853
KarakecProvincei	12,736		7,000	4,000	1,736
Keskin	85,241		47,000	3,000	6,241
Sulakyurt	35,597		21,000	10,000	4,597
Yahşihan	11,895		5,400	4,000	2,495
Total	306,506		169,638	109,386	27,482

Table 13. Land Classes Distribution by Towns of Ankara Province (Reference: 2011 - Ankara Province Environmental Status Report)

Towns	Other (Settlem. Water etc.)	Class I (ha)	Class II (ha)	Class III (ha)	Class IV (ha)	Class V (ha)	Class VI (ha)	Class VII (ha)	Class VIII (ha)	TOTAL (ha)
Akyurt	243	5281	1387	3619	3319		6528	22671	54	43102
Altındag	4181	248	1251	1714	1597	13	2129	3942		15075
Ayas	384	10958	7963	10099	24643		13008	42821	228	110104
Bala	2258	19212	53010	37694	37662	923	22613	46419	105	219896
Beypazari	804	6773	13747	15652	15647		25373	99338	2353	179687
Çamlidere	3960	474	557	2500	1748		8653	43395		61287
Çankaya	8456	301	2276	1927	366		1672	8000	225	23223
Çubuk	2237	9279	9413	10598	11196	61	22039	64019	661	129503
Elmadağ	1117	3223	5232	3504	6675	84	3426	39671	424	63356
Etimesgut	3933	702	1070	86	774	9	1081	687	3	8345
Evren	4282	3640	1947	3811	1182		4130	3092		22084
Golbaşı	1681	9874	26444	18240	10403	1230	8701	13010	311	89894
Gudul	272	1724	2547	5118	3946		9019	26452	1777	50855
Haymana	1560	27182	43594	65861	35675		26181	65159	380	265592
Kalecik	999	12451	10272	13430	13816	76	18036	54289	1552	124921
Kazan	2273	13889	5653	1968	4691		3286	10265	1071	43096
Keciören	4754	1254	300	2641	1451		3191	8593		22184
Kızılcahamam	1224	2722	2997	5405	6033		16328	134004	1073	169786
Mamak	3429	1371	2721	1651	964	363	2863	9922	1212	24496
Nallıhan	389	6083	6144	8111	10493		10420	141568	16143	199351
Polatlı	2608	33422	61385	92825	55846	1359	33363	71752	195	352755
S.Kochisar	12689	13767	30199	32472	24078	107	22813	22466	229	158820

Towns	Other (Settlem. Water etc.)	Class I (ha)	Class II (ha)	Class III (ha)	Class IV (ha)	Class V (ha)	Class VI (ha)	Class VII (ha)	Class VIII (ha)	TOTAL (ha)
Sincan	1337	10360	6278	4244	3946		2872	10585	265	39887
Yenimahalle	10504	3231	7430	7805	4164		5959	13063	94	52250
Grand Total	75574	197421	30381	35097	28031	422	27368	95518	2835	2469549

Agricultural land distribution by Provinces and Towns for which Project was planned is provided in **Table 14**.

Table 14. Agricultural Lands Distribution (TUIK, 2011)

	Total Area (da)	Area Impacted (da)	Fallow Area (da)	Vegetable Area (da)	Fruit Domain (da)
Kırıkkale Province	2,971,476	1,794,564	1,123,047	25,083	28,782
Ankara Province	11,799,051	7,869,769	3,188,041	479,874	261,367

As it shall be seen also from **Table 14**, 53,865 da of total surface area of the lands in the Kırıkkale Province is irrigated land and constitute 1.8% of total town agricultural lands. As for Ankara Province; 741,241 da. of lands in Ankara Province is irrigated land and constitute 6.2% of total town agricultural lands of Ankara Province.

Year 2011 – raised agricultural crops in Kırıkkale and Ankara Provinces where Project was planned are given in **Table 15** and **Table 18** and vegetable production quantities in **Table 16** and **Table 19** and fruit production quantities in **Table 17** and **Table 20**.

Table 15. Kırıkkale Province - Grown Agricultural Crops and Production Quantities Grown (Reference: TUIK, 2011)

Crop name	Surface Area (da)	Total Production (ton)	Yield (kg/da)
Fig (Grain)	274	26	95
Bean (Dried)	1,085	205	189
Lentil (Green)	2,550	295	116
Chickpea	44,490	2,538	94
Vetch (Green Grass)	12,910	7,451	
Sainfoin (Green Grass)	980	598	
Corn (Table)	1,455	4,865	3,344
Alfalfa (Green Grass)	1,180	2,456	
Sugar beet	11,630	63,380	5,450
Barley (Other)	433,659	118,565	273
Wheat (Other)	1,128,442	267,917	237
Wheat (For pasta)	6,242	1,322	212
Rye	240	75	313
Paddy	7,013	7,936	1,132
Maize (Grain)	1,938	990	511
Safflower	395	68	172
Sunflower (appetizer)	134,208	12,840	96
Sunflower (Oil)	5,897	855	145

Table 16. Vegetable Products and Production Amounts Grown in Kırıkkale Province (Reference: TÜİK, 2011)

Product Name	Production (Ton)
Onion (green)	280
Onion (dry)	3.027
Leek	4.200
Tomato (For table)	14.320
Tomato (For processed)	286
Cucumber (For table)	1.405
Cucumber (For pickle)	6
Pepper (For processed)	13
Pepper (Bell)	73
Pepper (Green)	923
Okra	43
Eggplant	2.165
Pumpkin	107
Squash (for appetizer)	17
Bean (Green)	574
Melon	14.216
Watermelon	7.975
Cauliflower	4
Broccoli	2
Cabbages (White)	1
Lettuce (loose leaf)	46
Lettuce (cos)	118
Spinach	244

Table 17. Fruit Products and Production Amounts Grown in Kırıkkale Province (Reference: TÜİK, 2011)

Product Name	Area (decare)	Total Production (ton)	Productiveness (kg/tree)
Grapes (for table-seed)	19.595	10.723	547
Grapes (for wine use)	4.142	2.113	510
Apple (Golden)	348	611	26
Apple (Starking)	185	263	23
Apple (Amasya)	121	154	23
Apple (Grannysmith)	16	49	15
Apple (Other)	98	189	23
Pears	120	382	22
Quinces	42	189	23
Peaches (Other)	16	22	14
Plums	57	318	20
Apricots	495	494	13
Wild Apricots	4	93	19

Product Name	Area (decare)	Total Production (ton)	Productiveness (kg/tree)
Cherries	324	358	18
Sour cherries	162	188	17
Oleaster	0	4	13
Mulberry	0	75	14
Almonds	1.125	200	11
Walnuts	1.932	319	22

Table 18. Vegetable Products and Production Amounts Grown in Ankara Province (Reference: TUIK, 2011)

Product Name	Area (decare)	Total Production (ton)	Productiveness (kg/da)
Cow vetches	134.824	15.812	117
Broad beans (to consume)	50	10	200
Beans (dry)	8.884	1.404	159
Lentil (red)	660	76	115
Lentil (Green)	30.925	2.801	91
Chick Pea	145.375	14.867	107
Potato (Other)	1.149	3.636	3.164
Potato (Sweet)	50	100	2.000
Sunchoke	530	810	1.528
Wild vetches (green)	100	45	
Cow vetches (green)	52.763	53.437	
Beets for fodder	330	1.550	4.697
Sainfoin (green)	6.434	5.010	
Malze (Hasıl)	310	1.325	4.274
Malze (Silajlık)	27.840	130.626	4.692
Alfalfa (green)	36.215	68.963	
Sugar Beets	82.692	492.919	5.961
Barley (for beer)	153.250	45.145	295
Barley (other)	2.241.915	641.894	286
Wheat (other)	4.120.285	1.054.507	257
Wheat (Durum)	372.973	86.721	233
Rye	35.119	10.618	302
Rice	948	968	1.021
Malze (Dane)	4.459	3.198	717
Triticale (Dane)	650	303	466
Oats (Dane)	74.060	18.515	250
Safflower	35.109	5.367	153
Sunflower (for appetizer)	256.723	26.246	102
Sunflower (for oil)	45.136	6.016	133
Rapedeed	31	6	194
Sesame	100	5	50

Table 19. Vegetable Products and Production Amounts Grown in Ankara Province (Reference: TUIK, 2011)

Product Name	Production (Ton)
Onion (green)	18.676
Onion (dry)	450.293
Garlic (green)	74
Garlic (dry)	237
Leek	524
Carrot	110.005
Radish (horse)	196
Radish (red)	6.297
Tomato (for table)	159.675
Tomato (for processed)	5.060
Cucumber (for table)	13.126
Cucumber (pickle)	4.248
Hairy cucumber	347
Pepper (for processed)	263
Pepper (bell)	2.557
Pepper (green)	6.067
Okra	71
Eggplant	2.448
Squash	22.751
Pumpkin	13.415
Squash (for appetizer)	884
Bean (green)	6.844
Cowpea (green)	5
Broad beans (green)	83
Calavence (green)	134
Melon	210.398
Watermelon	153.615
Cauliflower	305
Broccoli	150
Cabbages (White)	1.010
Cabbages (Red)	1.604
Brussels Sprouts	40
Lettuce (loose leaf)	10.408
Lettuce (cos)	26.574
Lettuce (iceberg)	40.408
Artichokes	400
Spinach	23.247
Swiss chard	45
Parsley	187
Rocket	42

Product Name	Production (Ton)
Cress	149
Mint	34
Dill	42
Cultivated mushroom	156

Table 20. Fruit Products and Production Amounts Grown in Ankara Province (Reference: TUIK, 2011)

Product Type	Area (decare)	Total Production (ton)	Productivity (kg/tree)
Grapes (for table-seed)	48.195	33.867	703
Grapes (for table-seedless)	70	18	257
Grapes (for wine use)	9.160	6.160	672
Figs	5	13	10
Apple (Golden)	17.931	15.704	42
Apple (Starking)	7.846	7.689	43
Apple (Amasya)	4.408	3.994	36
Apple (Grannysmith)	256	884	48
Apple (Other)	3.204	4.573	42
Pears	11.644	16.946	39
Quinces	1.237	2.549	41
Medlar	0	46	15
Peaches (Nectarins)	80	105	28
Peaches (Other)	329	742	25
Plums	1.239	2.880	32
Apricots	3.444	5.727	43
Wild Apricots	68	1.447	37
Cherries	5.728	6.099	34
Sour cherries	32.015	28.071	34
Cornel	0	20	20
Oleaster	0	645	25
Stawberries	9	15	1.667
Mulberry	233	4.352	53
Pomegranates	240	39	7
Persimmons	0	1	50
Almonds	5.552	1.660	28
Walnuts	4.479	3.375	39
Pistachios	0	19	1
Aniseed	195	12	62
Cummin	103.800	7.479	72

Agriculture comes first among the economically activities of the settlements located within the project area. In Kirikkale Province in general, as bitkProvinceeri field crops like wheat, barley, corn, peas, beans, vetch, sugar beet, and peppers, tomatoes, Fresh beans, zucchini, eggplant, leek as vegetable and apricot, apple, pear, walnut as fruit are raised.

As large animal livestock in Kirikkale Province; cattle and buffalo are raised. Sheep and goat, (hair and mohair) are raised as small animal livestock. As for poultry; chicken,

turkey, geese, ducks are raised. As for aquatic products; are obtained from Kizilirmak River, Delice Brook and Cipi Stream and carp, perch and catfish are tried to be bred.

As for Ankara Province; as field crops; barley, wheat, rye, oats, vetch, clover, sainfoin, maize, sugar beet, sunflower, beans, chickpeas and lentils, and as fruits; apples, pears, grapes, peach, apricot, cherry, walnut, mulberry and appetizers production are carried out.

In Ankara Province, Anatolian red cattle livestock, and Montafon breed and Simmental breed in small quantities are raised. More intensive dairy farming in the province is carried out in Ayas, Gudul, Kazan and the central villages connected to our city. Fattening is carried out in Çubuk, Sincan, Akyurt, Polatli and the central villages.

As livestock farming in Ankara Province; small animal livestock is raised in Akkaraman, Morkaraman, and as Merino wool and angora goat, Angora goat is raised in small quantity grown goat farming is intensively carried out in Kizilcahamam, Ayas and Beypazari. Sheep is mostly raised in the towns of Haymana, Bala, Polatli and Sereflikochisar.

As poultry breeding in the integrated facilities in Ankara Province; breeding – purpose meat and egg poultry and in form of family operations in smaller number are carried out. Akyurt, Gölbaşı, Kazan, Sincan, Polatli and Nallihan are the egg provider towns and breeding – purpose poultry is raised in the cages set up in the town of Haymana.

In addition to this, there are different kinds of fishes in Canıllı (Ayaş), Aşartepe Dam, Mogan lake and large and small 30 irrigation lakes built by Rural Services. Cultural fishing is also done in 8 fish farms. The capacities of the fish groups are: Carp group 222 ton/year, Atherina 400 ton/year, Crawfish 151 ton/year, Zander 15 ton/year.

Mechanization level in agricultural production in the study area is high. Tractor equipments, muck and pesticide spreader and hoeing machines are present in every village. The use of fertilizer and agricultural pesticides are high. Fertilizer from animal in vegetative production is known and used. District Directorate of Agriculture provides technical help and support to producers. The technique that is used in agriculture is used by means of District Directorate of Agriculture.

VI.2.6.1. Description of Land

Overhead Transmission Line starts from ACWA Power Kırıkkale NGCCPP planned to be established within boundaries of Kırıkkale Province, Yahşihan County, Kılıçlar Municipality and passes through the Ankara Province, Kalecik, Çubuk, Pursaklar, Yenimahalle Counties and ends up in Bağlum SS situated in Keçiören County.

As a result of the survey and cadastral archive studies land usage status of the OHTL route, 80 km of the route passes through agricultural land (private property), 37 km forest area and 1 km zoned area.

On the route of OHTL, expropriation and permit studies will be performed on private and governmental lands. Within scope of the studies carried out, easement is planned to be constituted for a totally 50 m – wide corridor as a whole, being 25 meters from its RH and LH sides. However, easement shall get clearer in process of expropriation endeavors. As for the locations where pole feet of the overhead transmission line come across, necessary permits shall be taken according to the land size varying according to the type of pole.

Prior to start of the construction works, necessary permissions shall be obtained for utilization of agricultural areas covered by the project scope for their utilization for non-agricultural purposes from Ankara and Kırıkkale Food, Agriculture and Livestock Provincial Directorates pursuant to "Soil Protection and Land Usage Law " no. 5403 which became effective by being published in the Official Gazette dated 19.07.2005 and numbered 25880.

Since forest areas have no expropriation procedure, regarding the line which passes through forest areas, as per article 17 of Law on Forest no 6831, necessary permissions will be taken from General Directorate of Forestry.

Following EIA process and other permit and approvals, the efforts of expropriation shall be initiated. So that, at this stage proprietary information about the area can not be obtained.

1/100.00 – Scaled Project Route Land Classification Map is given in **Appendix-2**.

VI.2.7. Forest Areas

Overhead Transmission Line starts from ACWA Power Kırıkkale NGCCPP planned to be established within boundaries of Kırıkkale Province, Yahşihan County, Kılıçlar Municipality and passes through the Ankara Province, Kalecik, Çubuk, Pursaklar, Yenimahalle Counties and ends up in Bağlum SS situated in Keçiören County.

There is forest wealth in the towns of Camlıdere, Kızılcahamam, Beypazarı and Nallıhan within the boundaries of Ankara Province. Forested area in the province (normal and impaired) 357,592,000 in all and total area of Ankara province is 2,742,168 ha. When compared, its forestry percentage seems to be 13%. Total forestry area (normal and impaired) in Kırıkkale Province is 46710.5 and overall area of Kırıkkale Province is 388,001 ha. As for its forest percentage is seen to be 13%.

Kızılcahamam pine forests contained in transition belt of Western Black Sea in the north of Ankara is an mountainous area covered by pine forests, oak communities, and meadows. Its climate is cooler and rainy in comparison to other localities. The conifer plants like *Abies nordmanniana* subsp. *bornmuelleriana*, *Pinus sylvestris* and *Pinus nigra* draw attention. Black Sea residual forests with similar characteristics come across in Çubuk and Karagöl. Once similar forests used to be denser in the mountainous sections around Ankara, but in consequence of destructions, they have turned into impaired oak forests or vetch (mostly *Astragalus microcephalus*) steppes. Nevertheless, the oak forests with xerophytic characteristic are encountered in the vicinities of Kargasekmez, Çubuk and Kırıkkale. Hereabouts, *Quercus pubescens* and *Quercus cerris* are dominantly found. In the steppes, sometimes forest left – over indicator shrubs and bushes are also come across. These are the species indicating hereabouts once used to be forest. *Crataegus orientalis*, *Crataegus monogyna*, *Pyrus elaeagnifolia*, *Rosa canina*, *Juniperus oxycedrus* and *Berberis crataegina* are samples to these.

The species of trees in the forest of Kırıkkale Province, oak species especially *Quercus pubescens* are found at relatively low altitudes, and as for high altitudes, *Pinus nigra*, as to high altitudes pine *Pinus sylvestris* and *Abies bornmülleriana* are found in pure and mixed state. There are areas where juniper species are found from place to place as well.

Summarized information related to Kırıkkale and Ankara Forest Data has been presented in **Figure 19**.

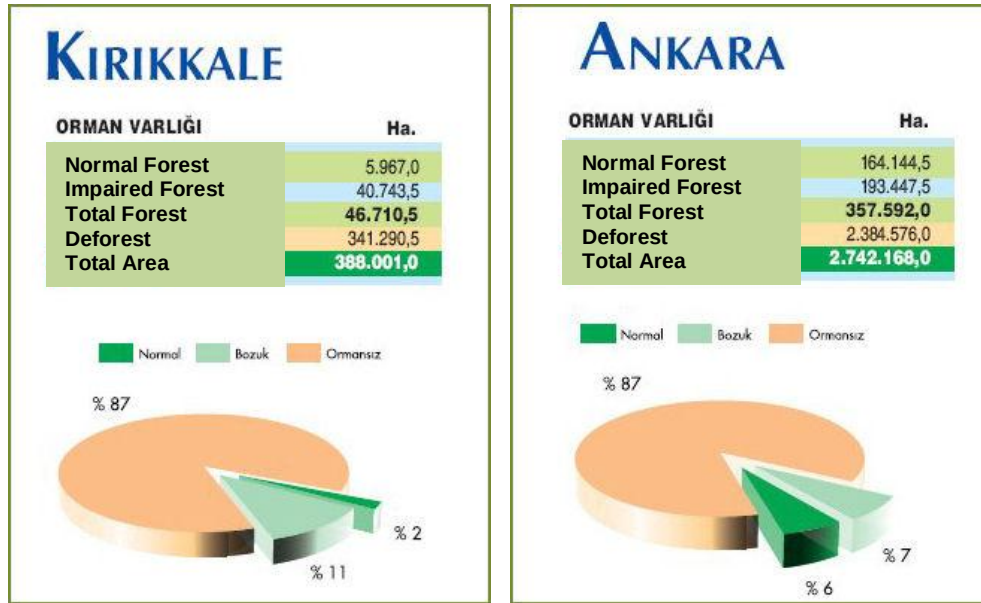


Figure 19. Forest Information of Kırıkkale and Ankara Provinces (Reference: General Directorate of Forestry)

Overhead Transmission Line starts from ACWA Power Kırıkkale NGCCPP planned to be established within boundaries of Kırıkkale Province, Yahşihan County, Kılıçlar Municipality and passes through the Ankara Province, Kalecik, Çubuk, Pursaklar, Yenimahalle Counties and ends up in Bağlum SS situated in Keçiören County.

As a result of the survey and cadastral archive studies land usage status of the OHTL route, 80 km of the route passes through agricultural land (private property), 37 km forest area and 1 km zoned area.

As a result of route land studies of the areas which are specified to be forest in Land Classification Map (**Appendix-3**), they were not physically in quality of normal forest. These areas being in quality of coppice forest are the systems which have lost their properties in general due to destruction.

Necessary permits shall be obtained from General Firectorate of Forestry pursuant to Clause - 17 of Forest Law numbered 6831 in relation to the forested areas situated across overhead transmission line.

VI.2.8. Protection areas (National Parks, Nature Parks, Wetlands), Nature Monuments, Nature Protection Areas, Wildlife Protection Areas, Biogenetic Reserve Areas, Biosphere Reserves, Natural Sit and Monuments, Archeological, Historical and Cultural Sits, Special Protection Areas, statement whether protection areas exist along the route and specification for the distance of nearest protection area

Overhead Transmission Line starts from ACWA Power Kırıkkale NGCCPP planned to be established within boundaries of Kırıkkale Province, Yahşihan County, Kılıçlar Municipality and passes through the Ankara Province, Kalecik, Çubuk, Pursaklar, Yenimahalle Counties and ends up in Bağlum SS situated in Keçiören County.

Areas required to be protected pursuant to the legislation of our country

a) Within the overhead transmission line route and ESIA investigation area, there are no National Parks, Nature Parks, Natural Monuments and Nature Conservation Areas, which are defined in Article 2 of the National Parks Law No. 2873, dated 09.08.1983 and are identified pursuant to Article 3 of this Law.

b) Within the overhead transmission line route and ESIA investigation area, there is no "Wildlife Development Area" determined in accordance with the Terrestrial Hunting Law No. 4915, dated 01.07.2003.

c) Within the overhead transmission line route and ESIA investigation area, there are no areas defined as "Cultural Heritage, Natural Heritage, Conservation Area and "Protection Area" pursuant to sub-paragraphs 1, 2, 3, and 5 under paragraph (a) entitled as "Definitions" based on Article 3, paragraph 3 of the Law on the Protection of Cultural and Natural Heritage No. 2863, dated 21.07.1993, and pursuant to the relevant articles of the same Law No. 3386, dated 17.06.1987 (Law on the Amendment in some articles of the Law No. 2863 on the Protection of Cultural and Natural Heritage and the inclusion of some articles to this law).

ç) Within the overhead transmission line route and ESIA investigation area, there are no Water Products and Reproduction Areas within the scope of the Fisheries Law No. 1380, dated 22.03.1971.

d) Within the overhead transmission line route and ESIA investigation area, there are no areas defined in Articles 17, 18, 19 and 20 of the Water Pollution Control Regulation, which was issued in the Official Gazette No. 25687 dated 31.12.2004.

e) Within the overhead transmission line route and ESIA investigation area, there are no "Sensitive Pollution Regions" defined in Article 49 of the Regulation on Air Pollution Control", which was issued in the Official Gazette No. 19269, dated 02.11.1986.

f) Within the overhead transmission line route and ESIA investigation area, there is no "Specially Protected Areas" determined and declared as by the Council of Ministers pursuant to Article 9 of the Environmental Law No. 2872, dated 09.08.1983.

g) Within the overhead transmission line route and ESIA investigation area, there are no areas protected under the Bosphorus Law No. 2960, dated 18.11.1983.

ğ) Within the overhead transmission line route and ESIA investigation area, there are areas considered as forest areas pursuant to the Forestry Law No. 6831, dated 31.08.1956. Regarding forestry areas to be used under the project, the General Directorate of Forestry shall be applied and all necessary permits shall be obtained pursuant to the Forestry Law 6831.

h) Within the overhead transmission line route and ESIA investigation area, there are no areas having a coastal construction ban pursuant to the Coastal Law No. 3621, dated 04.04.1990.

ı) Within the overhead transmission line route and ESIA investigation area, there are no areas specified in the Olive-Growing and Grafting of Wild Varieties No. 3573, dated 26.01.1939.

l) Within the overhead transmission line route and ESIA investigation area, there are no areas specified in the Pasture Law No. 4342, dated 25.02.1998. If the use of pasturelands is in question under the project, a demand for allocation purpose change shall be made to the Provincial Pasture Commission pursuant to Article 14 of the Pasture Law No. 4342.

j) Within the overhead transmission line route and ESIA investigation area, there are no wetlands specified in the Regulation on the Protection of Wetlands, which entered into force after being published in the Official Gazette No. 25818, dated 17.05.2005.

Areas required to be protected pursuant to international conventions to which our Country is a party.

a) On the route of the overhead transmission line and within the ESIA investigation area, there are no cultural, historical and natural areas given a status of "Cultural Heritage and Natural Heritage" that are under protection by the Ministry of Culture in accordance with articles 1 and 2 of the "Convention for the Protection of the World Cultural and Natural Heritage", which entered force after being published in the Official Gazette No. 17959, dated 14.02.1983.

b) On the route of the overhead transmission line and within the ESIA investigation area, there is no any area taken under protection pursuant to the Conservation of wetlands Having International Importance Particularly as Waterfowl Habitat (Ramsar Convention), which entered force after being published in the Official Gazette No. 21937, dated 17.05.1994.

Areas required to be protected

a) Areas determined as to be protected in existing features and having a prohibition for construction (biogenetic reserve areas, geothermal areas, etc. which of the natural features must be protected): On the project site and its immediate vicinity, there are no biogenetic reserve areas and geothermal areas of which the natural character needs to be protected.

b) Agricultural Areas: On the project area and its immediate vicinity, agricultural lands are available. Regarding areas that remain within the scope of the Protection and Land Use Law No. 5403, necessary permits shall be obtained from the Kırıkkale Provincial Food, Agriculture and Livestock Directorate as well as from the Ankara Provincial Food, Agriculture and Livestock Directorate.

c) Wetlands: Natural or artificial, permanent or temporary, static or flowing water, fresh, brackish or salty water, all waters, marches, reeds and turbaries which bear importance as habitat for species particularly waterfowl, covering a depth that does not exceed 6 meters during the withdrawal phase of tidal movement, and areas that remain as wetlands from the coastal line towards inland in ecological aspects: There are no wetlands on the route of the overhead transmission line and within the ESIA investigation area.

d) Lakes, rivers, groundwater processing areas: The most important surface water within the ESIA Investigation Area are Çubuk-2 Dam and Kızılırmak River.

e) On the route of the overhead transmission line and within the ESIA investigation area, there are no areas which are of importance for scientific researches and/or that are habitats for endangered species or for species that are endemic for our country and there are no areas of biosphere reserve, biotopes, biogenetic reserve areas, unique geological and geomorphologic formations.

Location of Overhead Transmission Line Route and ESIA Survey Area according to protected aread is shown in the following figure. According to **Figure 20**, the nearest protected area is Karagöl Natural Park which is located 12,2 km distance from the OHTL route. Karagöl Natural Park is not expected to be adversely affected from the project



Figure 20. Location of Project Route and ESIA Survey Area According to Protected Areas

VI.2.9. Flora and Fauna (Species, particularly the local endemic species, animal species living in the area naturally, species taken under protection according to national and international legislation, rare species and those under the risk of extinction and their habitats, names, populations of the hunted animals and the decisions of the 2012-2013 Central Hunting Committee related to these animals and tables of these), showing the vegetation types in the project area on a map, the measures to be taken required for the living beings that will be affected from the project and works (in the construction and operation stages).

380 kV ACWA Power Kırıkkale Overhead Transmission Line starts from ACWA Power Kırıkkale NGCCPP planned to be established within boundaries of Kırıkkale Province, Yahşihan County, Kılıçlar Municipality and passes through the Ankara Province, Kalecik, Çubuk, Pursaklar, Yenimahalle Counties and ends up in Bağlum SS situated in Keçiören County.

To be able to identify the flora and fauna of Project area and surroundings, fieldwork has been conducted and also various literature broadcasts and the publications of studies previously carried out have been reviewed.

FLORA

With approximately 12.000 flowering plants, Turkey is one of the richest countries in temperate zone in terms of floristic diversity (including sub-species taxa).

Flora of Turkey is related with Central Europe and Asia. Considering that there are approximately 11.000 species from the west of Ural Mountains and the whole continent of Europe, it can be stated that Turkey shows a continental character in terms of floristic diversity. With more than 3000 endemic species, flora of Turkey has a prominent place among other countries.

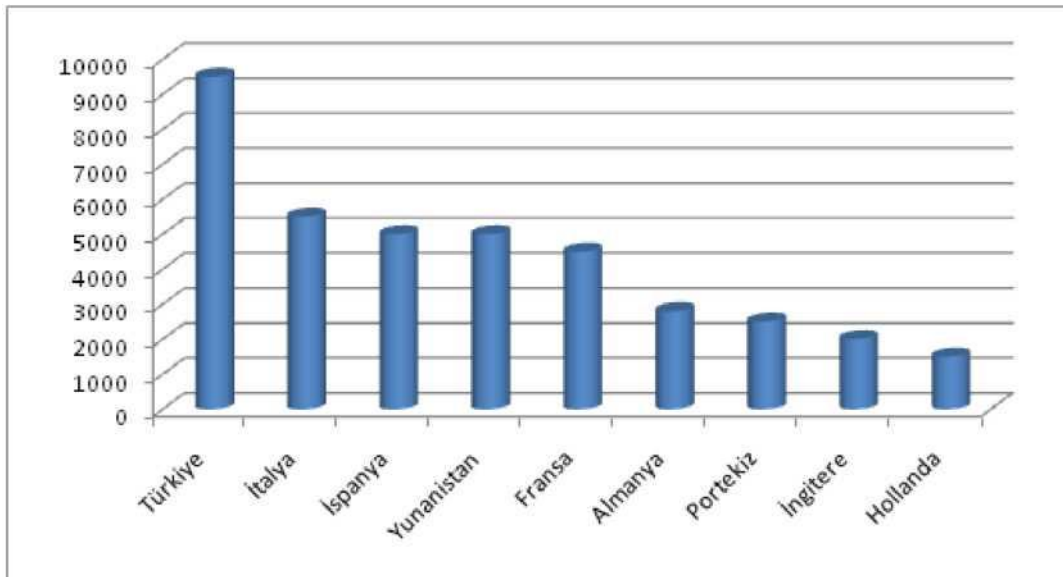


Figure 21. Comparison of Turkey and Some European Countries in terms of Number of Plants

This section of the report aims to explain terrestrial flora (gymnosperm and angiosperm plants) elements, the characteristics of these plants, potential effects of this project on terrestrial flora and measures to be taken.



Figure 22. Images of the Project Area

Criteria for the Analysis of Flora Species and Explanations

In addition to field survey, Turkish Plants Data Service (TUBIVES) was used in literature studies. Turkish Plant Dictionary prepared by Prof. Dr. Turhan Baytop was used to identify Turkish names of flora species. Endemism and threat categories of flora were evaluated according to Red Data Book of Turkish Plants, 2000 (Turkey Association for Natural protection and Van 100. Yil University) prepared by Prof. T. Ekim et al. Furthermore, the species were evaluated according to The Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention) and its Appendices.

Flora lists are presented according to family and species. Analysis criteria and abbreviations in the list are presented below.

Red Data Book IUCN Categories and Explanations

IUCN, the Red List of Threatened Species (IUCN Red List) is the most comprehensive Global Protection status inventory around the world for plant and animal species. IUCN Red List is managed by International Union for Conservation of Nature and Natural Resources.

IUCN Red List is developed by assessing extinction risk of thousands of species and subspecies using certain criterion. This criterion is related with all species and all regions in the world. The Red List aims to draw attention of public and politicians to protection issues and to help international community to reduce the extinction of species. IUCN Red List,

which is developed by a strong infrastructure, is considered as the most valid guide about the status of biologic diversity.

EX	• Tükenmiş Türler (Extinct)
EW	• Doğada Tükenmiş (Extinct in the Wild)
EN	• Tehlikede Olan Türler (Endangered)
CR	• Çok Tehlikede (Critically Endangered)
VU	• Zarar Görebilir Türler (Vulnerable)
LR	• Az Tehdit Altında (Lower Risk)
LR/cd	• Koruma Önlemi Gerektiren (Conservation Dependent)
LR/nt	• Tehdit Altına Girebilir (Near Threatened)
LR/lc	• En Az Endişe Verici (Least Concern)
DD	• Veri Yetersiz (Data Deficient)
NE	• Değerlendirilemeyen (Not Evaluated)

Figure 23. IUCN Red List

EX: Extinct. No known individuals remaining.

EW: Extinct in the Wild. Known only to survive in captivity, or as a naturalized population outside its historic range.

CR: Critically Endangered. Extremely high risk of extinction in the wild.

EN: Endangered. High risk of extinction in the wild.

VU: Vulnerable. High risk of endangerment in the wild.

LR: Lower Risk.

LR/cd: Conservation Dependent. The species requiring taxon-specific or habitat-specific conservation program targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories within a period of five years.

LR/nt: Near Threatened. Likely to become endangered in the near future.

LR/lc: Least Concern. Lowest risk. Does not qualify for a more at risk category. Widespread and abundant taxa are included in this category.

DD: Data Deficient. Not enough data to make an assessment of its risk of extinction.

NE: Not Evaluated. Has not yet been evaluated against the criteria.

Bern Convention

The Convention on the Conservation of European Wildlife and Natural Habitats, also known as Bern Convention, was signed in Bern, Switzerland. Turkey became a party of this convention in 1984.

The convention aims to protect endangered and potentially endangered wild flora and fauna elements, giving priority to especially migratory ones; to protect their habitats and to build collaboration of more than one country for these purposes.

The parties to this convention are responsible to take necessary and appropriate legal and administrative measures to safeguard special protection of flora species in Appendix I of

the convention that are under certain protection and to prohibit deliberate picking up, collection, cutting or uprooting of these species and to prohibit possession and purchase-sales of these species.

Endemism

Turkey is one of the richest countries in Middle East and European countries in terms of number of species and endemic species due to the following reasons:

- Climatic diversity
- Topographic differences
- Diversity of aquatic environments such as marine, lake and rivers due to geologic and geomorphologic diversity,
- Elevation differences varying from 0-5000 m; geographic location on the intersection of three different plant geographies,
- Considering Anatolian diagonal as a border, ecologic differences between the east and west of the country and the reflection of this in floristic differences.

There are 2651 endemic taxa belonging to 63 families in Turkey. Subspecies or varieties of some species are endemic. Therefore, this number increases to 3090 at subspecies and variety level. Endemism ratio is 33.5% in Turkey.

Turkey is the richest phyto-geographic region in Iran-Turan region in terms of endemic taxa with a proportionally high number of endemic species. Iran-Turan region is followed by Mediterranean and Euro-Siberian region.

Mode of Identification

- O-----Observation
- L-----Literature
- R-----Reports

Vegetation types in the Project Area and its Near Surrounding

Although no scientific regional flora identification study was carried out within the borders of Kırıkkale and Ankara provinces excluding those local ones, the vegetation generally consists of herbaceous plants.

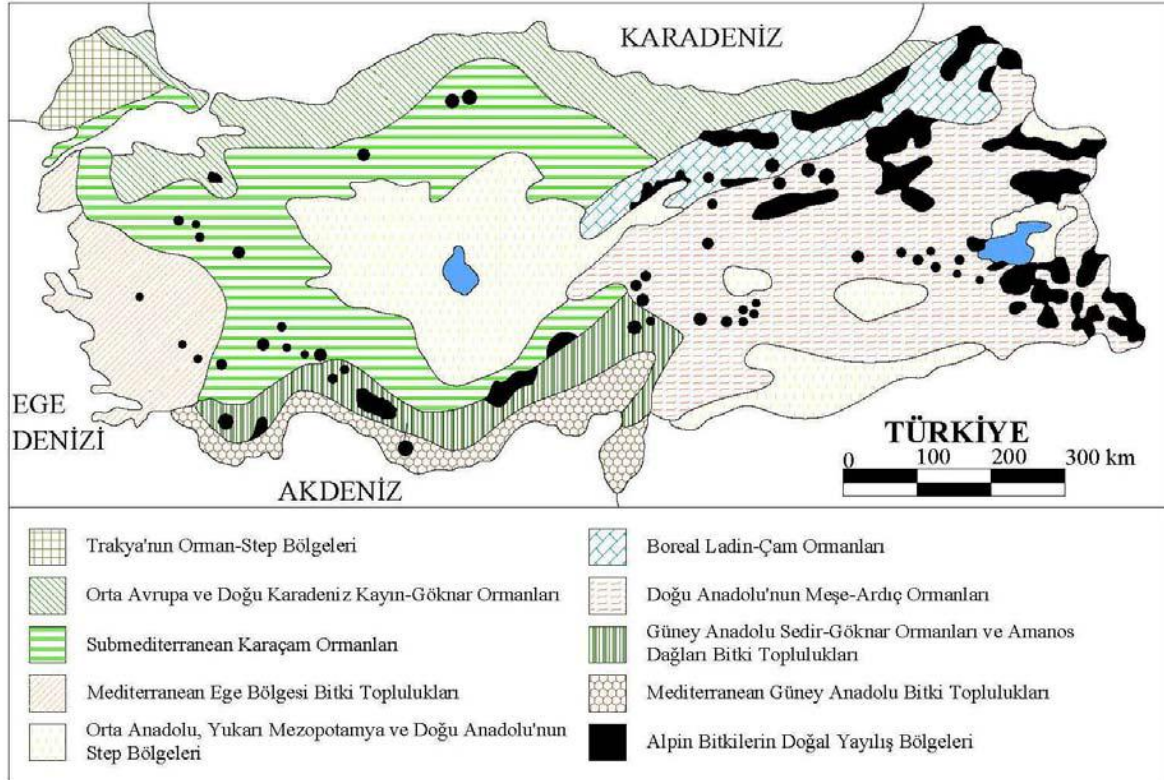


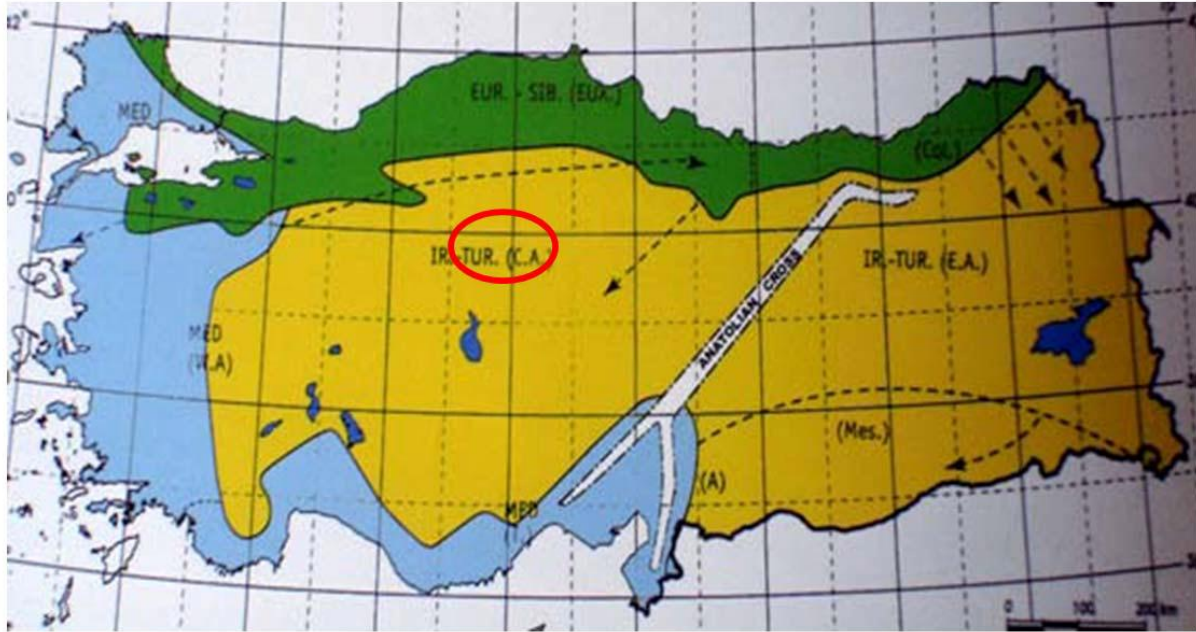
Figure 24. Vegetation Map of Turkey

Phyto-geographic Analysis

Harsh continental climate prevails in Kırıkkale province. Winters are cold, summers are warm. Some of the land of the province is covered with damaged oak forests (1).

Continental climate prevails in southern and central regions of Ankara. Winters are cold and snowy, summers are warm and arid. On the other hand, mild and rainy Black Sea Climate prevails in the northern regions. Day and night temperatures significantly vary in the regions with continental climate. There are also significant temperature differences between summer and winter seasons (2).

Considering this climatic data and topography of the area, Euro-Siberian and Mediterranean element species are present in Kırıkkale and Ankara provinces; however it can be stated that Iran-Turan element species are also found.



*EUR-SIB. (EUX): Euro-Siberian Region (Euxine Site) Col: Colchis Sector of Euxine site. MED: Mediterranean Region (Eastern Mediterranean Site). W.A.: Western Anatolian Section. T: Taurus Mountains. A: Amanos Mountains. IR-TUR: Ira-Turan Region. C:A. Central Anatolia. E.A.: Eastern Anatolia MES: Mesopotamia. X: Probably Central Europe/Balkan Site of Euro-Siberia Region. Mt: Mountain.

Figure 25. Phyto-geographic Regions of Turkey and Anatolian Diagonal

Iran-Turan flora region which generally consists of Central Anatolia, Eastern Anatolia and Southeastern Anatolia regions, shows typical characteristics of steppe, mountain steppe and semi-arid regions of Iran and Central Asia.

Iran-Turan flora region sometimes mixes into Europe-Siberia and Mediterranean flora regions that surround Iran-Turan flora region in Turkey. Annual precipitation generally varies between 300-400 mm in Iran-Turan flora region. Actually two vegetation areas can be distinguished in this flora region excluding the high mountainous areas. The first one is considerable damaged forest areas. These forest areas were replaced with steppe elements. Steppe formation have been changed by human intervention due to excessive grazing and the use of steppe species such as Astragalus and Acantholimon as fuel in Eastern Anatolia (Behçet and Ünal, 1999: 104; Özgökçe, 1999: 788). The second vegetation in Iran-Turan flora region is the actual steppe areas like Tuzgölü basin and Iğdır basin. Iran-Turan region is very rich in terms of plant species (herbaceous species) with a high ratio of endemics (2).

Furthermore, the cities on the route of the line fall into A4 and B4 squares in terms of grid system of P.H.Davis (Flora of Turkey and the East Aegean Islands).

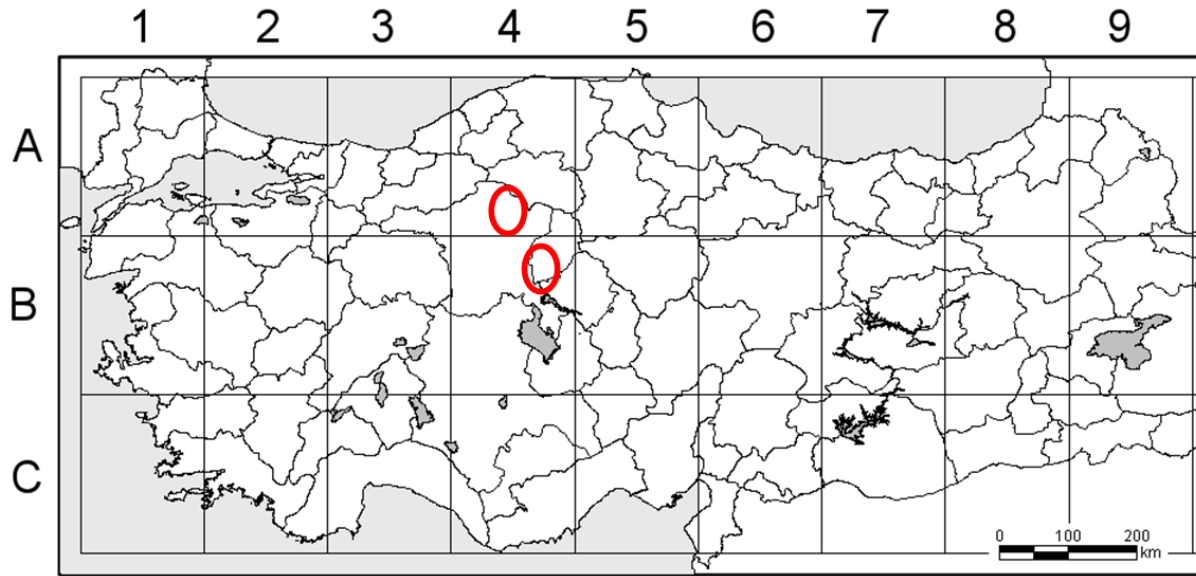


Figure 26. Squaring System of Turkey

Flora species which are potentially found in the route will be examined in two sections individually for each city.

Flora Evaluation along the route of ETL passing through Kırıkkale province

Inventory of plant species which are potentially found in the study area was prepared based on field observations and a review of the literature for the section that passes through Kırıkkale province. Flora table prepared is presented in **Appendix 3**.

Field survey found no endemic or endangered species in the study area. However, the species in the following table were identified as possible species in the project area based on literature review.

Table 21. Potential endemic species along ETL route passing through Kırıkkale province.

Family/Species	Endemism	Red Data
ASTERACEAE		
<i>Achillea phrygia</i> BOISS. ET BAL.	+	LR/lc
CAM PAN U LAC EAE		
<i>Campanula kırıkaleensis</i> DONMEZ ET GUNER	+	LR/nt

All of the 6 endemic species which are possible found in the study area fall into LR/lc category according to Red Data Book of Turkish Plants. LR/lc (least concern) category is used for the taxa that do not require any conservation or that are not endangered.

Plant species which are potentially found in the study area were evaluated according to Appendix I of Bern Convention and no protected species was found in the study area.



Figure 27. Potential endemic species along ETL route passing through Kırıkkale province.

Ankara İli' nden Geçen EİH Güzergahı Boyunca Flora Değerlendirmesi

Flora Evaluation along the route of ETL passing through Ankara province

Inventory of plant species which are potentially found in the study area was prepared based on field observations and a review of the literature for the section that passes through Ankara province. Flora table prepared is presented in **Appendix-3**.

Field survey found no endemic or endangered species in the study area. However, the species in the following table were identified as possible species in the project area based on literature review.

Table 22. Potential endemic species along ETL route passing through Ankara province

Family/Species	Endemism	Red Data
APIACEAE		
<i>Heracleum platytaenium</i> BOISS.	+	LR/lc
ASTERACEAE		
<i>Anthemis wiedemanniana</i> FISH. ET MEY.	+	LR/lc
<i>Cirsium alatum</i> (GMELIN) BOBROVsubsp. pseudocreticum DAVIS ET PARRIS	+	LR/lc
<i>Crepis macropus</i> BOISS. ET HELDR.	+	LR/lc
CONVOLVULACEAE		
<i>Convolvulus assyricus</i> GRISEB.	+	LR/lc
FABACEAE		

All of the 6 endemic species which are possible found in the study area fall into LR/lc category according to Red Data Book of Turkish Plants. LR/lc (least concern) category is used for the taxa that do not require any conservation or that are not endangered.

Plant species which are potentially found in the study area were evaluated according to Appendix I of Bern Convention and no protected species was found in the study area.

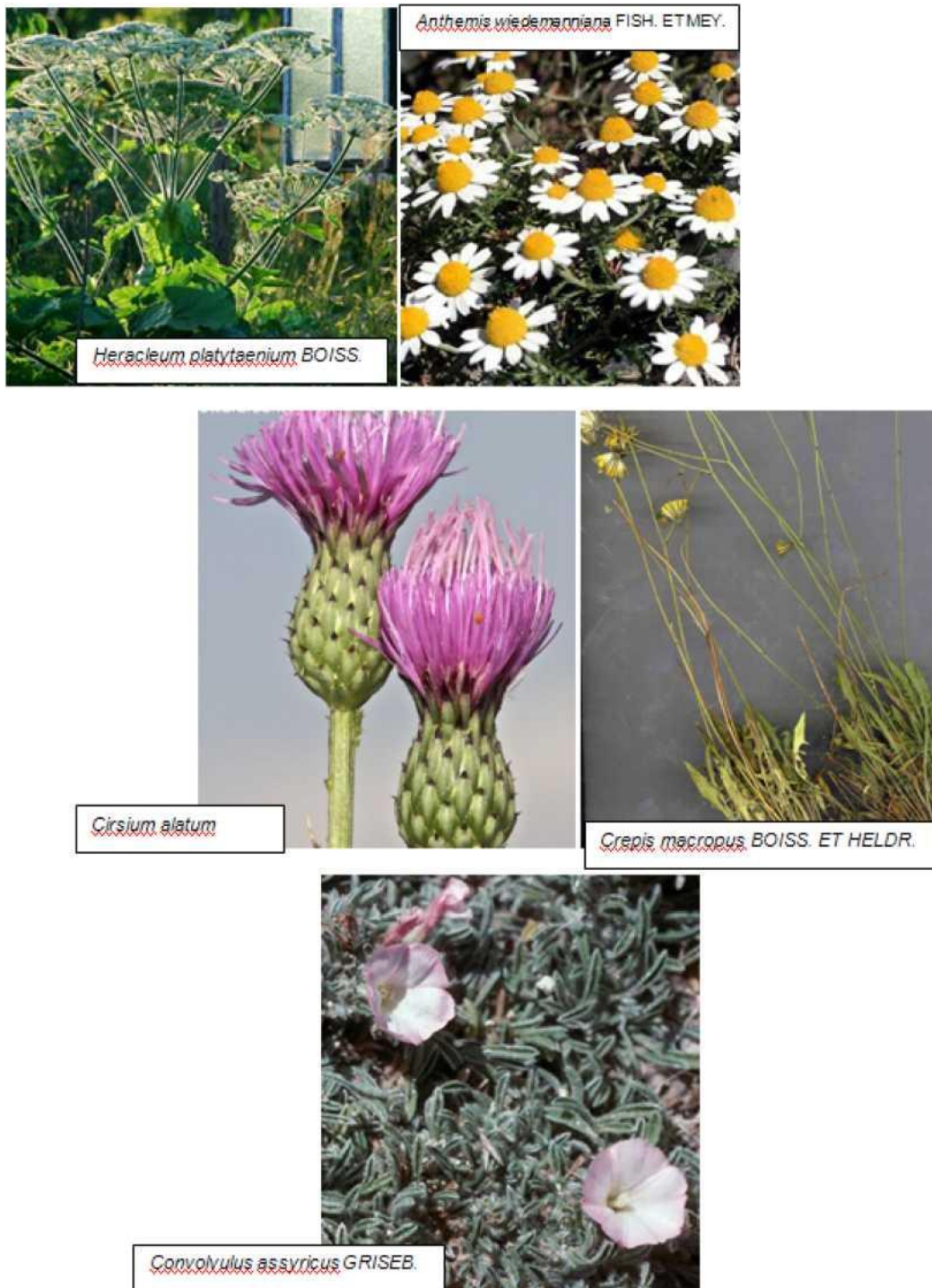


Figure 28. Potential endemic species along ETL route passing through Kirkkale province

The Effects of the Project on the Flora and Measures to be Taken

The effects of energy transmission lines on floristic diversity can be analyzed in two groups including electromagnetic effect and habitat loss.

Electromagnetic Effect

All technologic devices such as all transmitter, receivers, fire stations, satellites, TV and radio transmitter and receivers, electrical lines, transformation centers, computers, televisions, fridges, microwave ovens, washing machines, hoovers, hair dryers, kettles and all electrical home appliances cause Electromagnetic (EM) field and EM environmental pollution.

The effects of Electromagnetic Field (EMF) depend on the frequency, degree of EMF, body size, electrical properties of body, the distance to EMF and most importantly effect duration.

On the other hand, the differences between short waves and micro waves are thought to be directly proportioned with the effect field of biologic effects of EM waves and reversely proportioned with wave length.

Habitat Loss

Soil layers that will be stripped during construction works should be paid attention and the stripped soil should be kept for future use in restoration works.

Earthmoving as a result of oil stripping causes habitat loss. The flora and fauna that use these habitats as living environments are expected to be lost. Vegetative soil will be stripped and stored during the works to dig pits for the footings of transmission poles and excavation works will start later. In this case, all rocks and cut-out plants will be temporarily stored near the pits that will be opened. Vegetative soil will be spread around the footing of each pole after the completion of construction, thus bushes and herbaceous species will be able to grow again.

Furthermore, special conservation measures will have to be taken for the species in the study area which fall in the category of LR(nt), (lc) according to Red Data Book of Turkish Plants.

FAUNA

Information was collected on animal species in terrestrial ecosystem based on field survey, reports of local people and a review of the literature.

As is known, fauna of vertebrates are categorized under 4 large groups which are amphibians, reptiles, aves and mammals in evolutionary order.

Environmental Impact Assessment (2002) Book prepared by Prof. DR. Nuri Yiğit, Prof. Dr. Ercüment Çolak, Prof. Dr. Osman Ketenoğlu, Assoc. Prof. Dr. Latif Kurt et al.; Ornithology (2008) prepared by Prof. Dr. Nuri Yiğit et al. and Turkey's Birds prepared by Prof. Dr. İlhami Kızıroğlu were used in literature studies. The mentioned works were assessed according to appendices of Bern Convention. In addition, reptile, aves and mammal species were evaluated according to the decisions of 2013-2014 Hunting Period, Central Hunting Commission. Analysis criteria and abbreviations used in fauna lists are presented below.

Bern Convention

Appendix II of Bern Convention includes fauna species which are definitely under protection while Appendix III includes fauna species which are under protection.

Signatory countries of Bern Convention are liable to take necessary and appropriate legal and administrative measures to safeguard special conservation of wild fauna species in Appendix II. The following actions are particularly prohibited for these species:

- All kinds of deliberate catching, retention and slaughtering,
- Deliberately damaging reproduction or resting locations,
- Deliberately disturbing wild fauna especially in reproduction, breeding and hibernation periods in such a way to contradict with the objectives of the convention,
- Collecting, deliberately damaging eggs from wild environments; retention of eggs even if they are empty,
- Alive or dead retention and internal trade of embalmed animals, including any easily recognizable parts obtained from animals and the materials used for those purposes.

Signatory parties of Bern Convention are liable to take necessary and appropriate legal and administrative measures to safeguard the protection of wild fauna species in Appendix II of Bern Convention. In this respect, to reach wild fauna species in the mentioned appended list to adequate population levels, the operation is temporarily or regionally prohibited and other principles regulating the operation such as closed hunting seasons are implemented.

IUCN Categories

Red Data Book IUCN categories are presented below.

EX: Extinct.
EW: Extinct in the Wild.
CR: Critically Endangered.
EN: Endangered.
VU: Vulnerable.
LR: Lower Risk.
LR/cd: Conservation Dependent.
LR/nt: Near Threatened.
LR/lc: Least Concern.
DD: Data Deficient.
NE: Not Evaluated.

Detailed explanations are presented for the above given categories in “Red Data Book IUCN Categories and Explanations”.

Central Hunting Commission Decisions

Appended lists of Central Hunting Commission Decisions are presented below.

Wild animals included in Appendix I are under protection by the Ministry of Forestry and Water Works as per article 4 of Land Hunting Law no 4915. Hunting, dead or alive retention or transport of the animals in this list is prohibited.

The birds and mammals included in Appendix List II are under protection of Central Hunting Commission as per point 1 of article 4 of Land Hunting Law no 4915. Hunting, dead or alive retention or transport of the animals in this list is prohibited.

Game animals included in Appendix List III are allowed by Central Hunting Commission to be hunted for certain periods in 2013-2014 hunting season determined by the Ministry of Forestry and Water Works as per article 4 of Land Hunting Law no 4915.

Other abbreviations

Red Data Book categories used for birds and presence statuses are explained below.

- A.1. Extinct of Nearly Extinct Birds
- A.1.1. Extinct in the wild
- A.1.2. Species with 1-25 pairs of individuals based on observations
- A.2. Species with 26-50 pairs of individuals based on observations
- A.3. Species with 51-500 pairs of individuals
- A.4. Species which is densely found in certain areas, however has no risk of extinction
- B Species which temporarily come to Turkey and have the risk of destroyed biotopes
- B.1. Species which use Anatolia as winter place but which do not reproduce in Turkey
- B.2.-B.3.- Transit species which use Anatolia as winter place with lower risk degree.

Abbreviations for the status of bird species are explained below:

- L----- Local Species
- WV-----Winter Visitors
- M-----Migratory Species
- T-----Transit Migratory Species

Abbreviations for the identification of fauna elements are explained below:

- O-----Observation
- L-----Literature
- R-----Reports

Fauna Evaluation

Amphibians

Amphibian species are the organisms which need minimum two different habitats to complete their life cycles. One of these habitats is aquatic environment. These areas are small or large scale but continuous water deposits like lakes or ponds which do not dry out

for a long time or never; riversides, especially temporary or permanent overflow puddles; under large stones, tree hollows or roots; or forest or woodlands which take a lot of rain. They are active during day or night.

Amphibian which are potentially found in the study area along the route of ETL, will be individually analyzed for each city where the line passes through taking into account the criteria that are explained in previous sections and will be presented in the following fauna table.

Reptilians

Reptile species are found in the voids in tree hollows and roots, rocky areas, under the stones, inside plant residues and soil holes, in and near water.

Reptile species which are potentially found in the study area along the route of ETL, will be individually analyzed for each city where the line passes through taking into account the criteria that are explained in previous sections and will be presented in the following fauna table.

Aves

Geographic regions of Turkey are highly favorable for a wide variety of birds. Forests, lakes, reeds and marshes, coasts, steppe, mountains, plains are favorable environments for the life and reproduction of birds.

It is possible to found local migratory bird species on seasonal basis in terrestrial and aquatic biotopes in evaluations made in the study area. Local birds in these groups reproduce near the line.

Field birds and birds which adapted to terrestrial forms are distributed in regions with steppe habitat and agricultural forms. Majority of birds have adapted to areas covered with steppe and rocky, field and bushes.

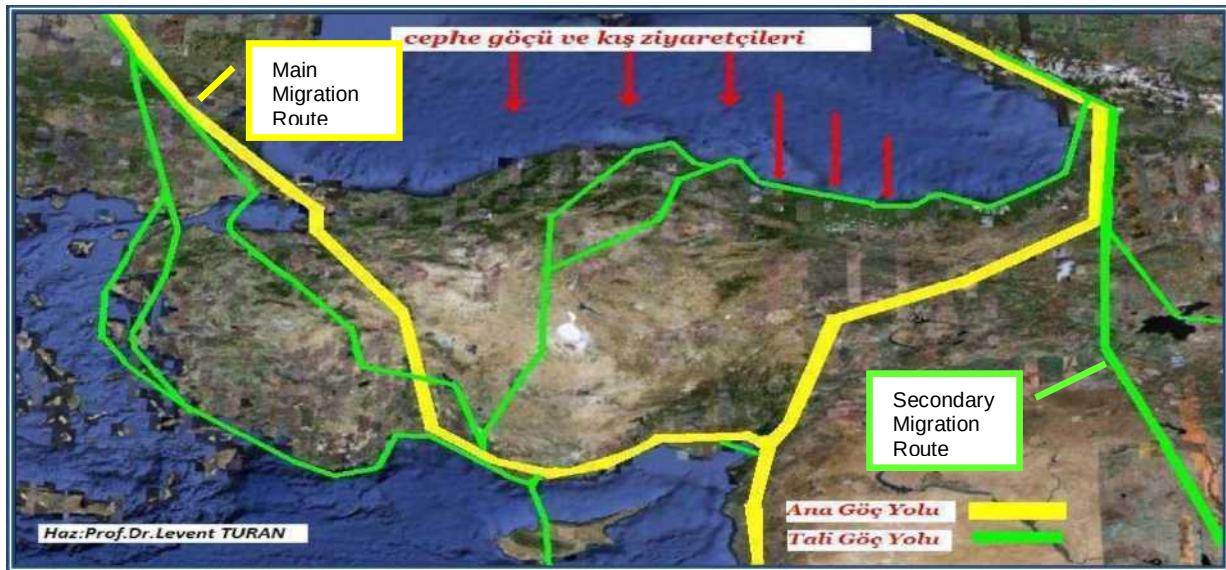


Figure 29. Map of Migration Routes of Birds in Turkey

As indicated in the figure above, the region within the project area is on the migration route of birds. However, birds can leave their habitats and find new ones due to their flying ability.

The project is not believed to have environmental effects on birds as it will not restrict their activities on feeding, circulation, habitat and reproduction areas of these species. At construction and commissioning stage, necessary measures will be taken for bird species in compliance with the provisions of national and international legislation.

Bird species which are potentially found in the study area along the route of ETL, will be individually analyzed for each city where the line passes through taking into account the criteria that are explained in previous sections and will be presented in the following fauna table.

Mammalia

Mammalia species which are potentially found in the study area along the route of ETL, will be individually analyzed for each city where the line passes through taking into account the criteria that are explained in previous sections and will be presented in the following fauna table.

Fauna Evaluation along the Route of ETL that passes through Kirikkale province

No fauna element was identified during field surveys conducted in the study area. However, based on a review of the literature and information collected from local people, the amphibian, reptile, bird and mammal species which are potentially found due to habitat adaptation are presented in **Appendix-3**.

Amphibians

2 of 3 amphibians which are found in the study area of which are potentially found in the study area due to habitat adaptation are included in the list in Appendix II, one of them is included in the list in Appendix III of Bern Convention.

All of the species that are potentially found in the study area fall into IUCN red list LC category. No long term risk is considered for the generations of the species in LC (Least Concern) category.

Reptilians

4 of 5 reptile species which are found or potentially found in the study area fall into the list in Appendix II of Bern Convention; and one fall into the list in Appendix II of Bern Convention.

Of the reptile species, *Testudo graeca* species is in VU category, and 2 of other species are in LC category of IUCN red list. VU (vulnerable) category includes species with the risk of extinction in medium term. No risk of extinction is foreseen for the species in LC (Least Concern) category.

All of reptilian species are included in the list in Appendix I according to Central Hunting Commission Decisions for 2013-2014 Hunting Period. It is prohibited to hunt, withhold dead or alive or to transport wild animals in this list.

Aves

Of 26 bird species which are found or which are potentially found in the study area due to habitat adaptation, 14 are included in Bern Convention Appendix II and 7 are included in Bern Convention Appendix III.

All of bird species fall into LC category in IUCN red list. No risk of extinction is foreseen for the species in LC (Least Concern) category.

15 bird species are included in Appendix I; 6 are included in Appendix II and 5 are included in Appendix III according to Central Hunting Commission Decisions for 2013-2014 Hunting Period.

Mammalia

Of the 8 mammal species which are found in the study or which are potentially found in the study area due to habitat adaptation, 5 are included in Appendix II and 1 is included in Appendix III of Bern Convention.

Microtus anatolicus species falls into DD category, *Myomimus roachi* species falls into VU category and the rest of the species fall into LC category of IUCN red list. VU (vulnerable) category includes species with the risk of extinction in medium term. There is not enough information of the species in DD (Data Deficient) category. No risk of extinction is foreseen for the species in LC (Least Concern) category.

4 species are included in Appendix I according to Central Hunting Commission Decisions for 2013-2014 Hunting Period.

Fauna Evaluation along the Route of ETL that passes through Ankara province

No fauna element was identified during field surveys conducted in the study area. However, based on a review of the literature and information collected from local people, the amphibian, reptile, bird and mammal species which are potentially found due to habitat adaptation are presented in **Appendix-3**.

Amphibians

Of the 4 amphibia species which are found in the study area or which are potentially found in the study are due to habitat adaptation, 2 are included in Appendix II of Bern Convention and 2 are included in Appendix III of Bern Convention.

All of the species that are potentially found in the study area fall into IUCN red list LC category. No long term risk is considered for the generations of the species in LC (Least Concern) category.

Reptilians

Of 6 reptile species which are found or potentially found in the study area due to habitat adaptation, 5 are included in Appendix II of Bern Convention and 1 is included in Appendix III of Bern Convention.

Of the reptile species, *Testudo graeca* species is in VU category, and 3 of other species are in LC category of IUCN red list. VU (vulnerable) category includes species with the risk of extinction in medium term. No risk of extinction is foreseen for the species in LC (Least Concern) category.

All of reptilian species are included in the list in Appendix I according to Central Hunting Commission Decisions for 2013-2014 Hunting Period. It is prohibited to hunt, withhold dead or alive or to transport wild animals in this list.

Aves

Of 60 bird species which are found in the study area of which are potentially found in the study area due to habitat adaptation, 41 fall into Appendix II, 13 fall into Appendix III of Bern Convention.

All bird species fall into LC category of IUCN red list. No risk of extinction is foreseen for the species in LC (Least Concern) category.

43 bird species are included in the list in Appendix I, 9 are included in the list in Appendix II and 4 are included in the list in Appendix III of Bern Convention the according to Central Hunting Commission Decisions for 2013-2014 Hunting Period.

Mammalia

Of the 8 mammal species which are found in the study or which are potentially found in the study area due to habitat adaptation, 4 are included in Appendix II and 1 is included in Appendix III of Bern Convention.

Microtus anatolicus species falls into DD category, and the rest of the species fall into LC category of IUCN red list. There is not enough information of the species in DD (Data Deficient) category. No risk of extinction is foreseen for the species in LC (Least Concern) category.

4 species are included in Appendix I according to Central Hunting Commission Decisions for 2013-2014 Hunting Period.

The Effect of the Project on Fauna Species and Measures to be Taken

Vegetative soil, bushes and herbaceous species will be destroyed temporarily due to soil stripping works around the footings of transmission posts at construction stage. Fauna species which use these areas as habitat will leave their present positions and find new habitats due to their movement ability.

The amount of excavation to develop shall be different as per pole type due to type diversity of the poles to be installed at the construction stage. The vegetation types at the point where feet of poles are found shall be locally removed during excavation operations. The excavation soil extracted from pole feet excavation operation shall be reused for the purpose of fill the excavation area thus, not only loss of soil shall be prevented but also impact of excavation wastes on the environment shall be minimized. In addition, there shall be construction machinery – induced noise, dust etc. emissions during excavation operations. Dust crystals shall accumulate on the plant species found around the carrier pole and lead to drop in their photosynthesis and respiration capacities. This effect will disappear after the end of the construction work and the development process of plant species will return to normal after a while. Upon termination of the construction phase, such effect shall vanish and development of the plant species shall turn into normal state after a certain time.

Mammal and reptile species can leave their current locations and find new habitats due to their movement ability. Furthermore, there are alternative areas in the near surrounding for these species. Since the activity will no restrict feeding, circulation, living and

reproduction areas of these species, the project is not expected to have negative impacts on environmental effects.

The primary effect and measures for amphibian species is not to intervene in their habitats. No intervention will be made on the habitats of amphibians as much as possible.

Completion of pole construction work, should the trees be situated across the route of the transmission line; tree cutting process (trimming) shall be effectuated. Some amount of tree loss shall be likely to be experienced in the number of trees which would undergo trimming operation. This loss shall affect particularly the insects, reptiles and aves (birds) which have identified the tree cavities to be habitation area. Due to non-existence of any endemic species among fauna species identified and these species are of wide – spread cosmopolitan species, the loss to be lived shall not endanger population generation.

The birds are known to use transmission line poles as locations for perching and building nests and to use the wires as perch and thus to conduct territorial defense areas and observe their hunts. These behaviors of birds are expected to bring certain problems on energy transmission lines. It will be advantageous to take measures to prevent perching birds on transmission lines. Bird deaths will be prevented by placing bird repellents and warning globes along the route of the line.

Bird repellents; possess a flexible and unbreakable properties which do not contain any chemical wastes and are recyclable and do not cause any harm to birds and people and do not get affected by UV rays and whether conditions.

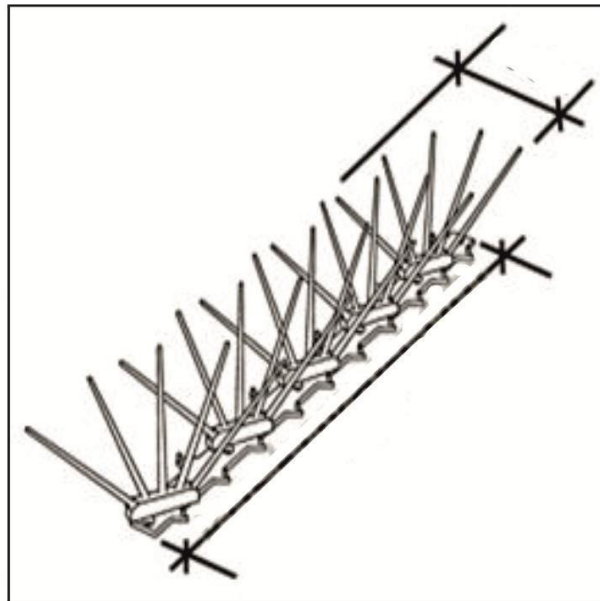


Figure 30. Bird Repellent Mechanisms

Birds can leave their habitats and find new ones due to their flying ability. Since the activity will not restrict feeding, circulation, living and reproduction areas of these species, the project is not expected to have negative impacts on environmental effects.

Electromagnetic Fields (EMF) caused by energy transmission lines have similar effects on animals and ecosystems in addition to their health effects on humans. However, naturally distributed animals in Turkey are generally mobile and do not tend to settle or live under energy transmission lines. Furthermore, it can be stated that EMF created by energy

transmission lines within the integrity of habitat will affect a small portion of the population. During academic studies, the impact of overhead transmission line induced electromagnetic influence which might occur on floral species at the operation stage has failed to be clearly put forth. Against probability of any fire, pruning of tall woody tree species found within the route of overhead transmission line shall be periodically executed by pertinent institutions, thus fire risk and loss of habitat in connected to this shall disappear.

As there will be no commercial purposes for the activity on the protected species in above mentioned fauna lists and those protected under Bern Convention and other wildlife, no risk of hunting, deliberate slaughter or retention is foreseen for these species. And no risk exists for damaging their eggs.

During the construction works, if any kind of faunal specie gets injured and / or damaged, the case shall be immediately reported to pertinent specialist staff and preventive measures to be taken and necessary operations shall be performed by contacting relevant institutions for its treatment. During the construction phase of the project, how the employees act and what they should do in such a case shall be explained and they will be kept informed.

During the construction stage of the project, provisions of national and international legislation, especially the provisions of Land Hunting Law no 4915 and decisions of Central Hunting Commission Decisions for 2013-2014 Hunting Period will be abided by. Necessary measures will be taken in the event that protected or vulnerable any flora or fauna species are identified.

In the event that any protected or vulnerable species is identified at the construction and commissioning phase of the project, necessary measures will be taken in accordance with the provisions of Environmental Law no 2872, Land Hunting law no 4915, The Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention).

VI.2.10. Lands Under Judgment and Disposal of Competent Organs of State (Military Forbidden Zones, areas allocated to certain public institutions and organizations, and areas restricted by the Cabinet Decision numbered 7/16349 published in the Official Gazette numbered 16415 and dated 25 September 1978)

As a result of the researches and surveys carried out in relation to the OHTL route planned to be established, it has been concluded that there are not "Lands Under Judgment and Disposal of Competent Organs of State (Military Forbidden Zones, areas allocated to certain public institutions and organizations, and areas restricted by the Cabinet Decision numbered 7/16349 published in the Official Gazette numbered 16415 and dated 25 September 1978).

VI.2.11. Other Properties

There is no other property under this section.

VI.3. Properties of Socio-Economic Environment

VI.3.1. Economic Properties (Main Sectors Shaping Economic Structure of The Region The Energy Is Conducted)

Economic Situation

Economic Situation of Kırıkkale:

In 2003, Kırıkkale was at 33h place among 81 cities with regard to development via Socio-Economic Development Grading study realized by State Planning Organization (DPT) Under secretariat. However, with regard to New Incentive System Study it has the 41st place at SEGE 2011 studies. According to a study in 2004, as far as socio-economic development alignment is concerned, Kırıkkale Central District is in 42nd place and is a 2nd grade developed district among districts. Generally, it is observed that the city is short of private sector investments. While the public facilities at the city center give the city an industrial outlook, there is a rural economic structure among the districts. With regard to economic indicators, in 2011 per capita income was calculated as 10.079 \$ via gross domestic product value per capita. When the socio-economic structure is taken into consideration, domestic product value per capita is thought to be higher than this number. According to the decree about “Yatırımlarda Devlet Yardımları” with numbered 2012/3305 via its publishing on Official Gazette on June 19th, 2012, the New Incentive System consists of 4 main elements and 6 regions. The city is situated in the 4th Region.

The city center of Kırıkkale is an industrial city, mostly composed of public facilities while the other district centers have a rural economic structure. In Kırıkkale, industrial production consists of big public investments and small and middle-sized private investments. The Machinery and Chemical Industry Corporation Factory (MKEK) and Tüpraş Refinery have an important impact on the economic structure of the city. At public level of the society, employment –worker and civil servants- affects the commercial life due to the incomes.

Whereas Kırıkkale industrial production depending on public sector concentrates on defense, metal and petro chemistry, in private sector production develops depending upon these industrial areas as well as agricultural machines, food and silage industry, soil, textile, wood and furniture related industries. 2 of the 5 MKEK factories, which constitute the backbone of the defense industry of the country, 1 of its 2 operations and the Scrap Directorate are situated in the city. Of the 5687 personnel of MKEK, 3157 (55%) live in this city. Also, Of the 3204 worker of MKEK, 1900 (59%) work in this city.

TÜPRAŞ Central Anatolia Refinery, which has a capacity of 5 million ton/year oil processing, and was opened on 25th October, 1986 in Hacılar town in order to meet the oil based products of many cities -notably Ankara- in the Central Anatolia, was privatized in 2005. In TUPRAŞ facility, which processes the crude oil coming through a 447 km pipeline from Ceyhan terminal of BOTAŞ, approximately 858 personnel are employed. 1st Organized Industrial Area, in which private sector businesses are situated, is founded on a 150 hectare land, and it was opened in 2001 after the infrastructure construction had been finished. In the 1st OIA, 68 of the 70 industrial parcels are allocated to entrepreneur; of these businesses, 38 of them are producing, 11 of them are not active, 9 of them are in construction situation, 10 of them are in excavation and planning situation.

In the producing businesses 1791 people are employed. When the total of the businesses in 1st OIA are active, 3000-5000 people will be employed. In the active businesses in Kırıkkale OIA, 17 businesses are in Metal Industry, 14 businesses are in Chemical, Oil, Rubber Industries, 11 businesses are in Wood Works and Furniture Industry, 8 businesses are in Food, Beverages, Alcohol Drinks, Tobacco Industries, 1 Textile, Weaving, Garment and Leather Industries and 14 businesses are in other industries.

It was planned that 2nd OIA will be constructed on a 153 hectare area near Kırıkkale-Kırşehir highway, in Keskin-Cankurtaran, 18 km close to the city center. At first stage the infrastructure work of a 66 hectare area is finished. The first stage consists of 28, and the second stage consists of 59 parcels with a total of 87 parcels. Already, 11 businesses have been appropriated lands, 2 businesses have begun production and 1 business is inactive while 4 of them are in construction and 3 are in planning stages. Thus, Kırıkkale will become an attractive industry center for public and private sector investments in the 21st century.

Besides, in Kırıkkale Organized Industry Area, which is situated near Yahşihan district on 150 hectare land as 68 industrial parcels, 38 of the businesses are actively in production, 11 of them are not active, 9 of them are in construction and 10 of them are in excavating and planning stages. The active businesses employ a total of 1791 people. When the total of the businesses in Kırıkkale OIA are active, 3000-5000 people will be employed. In order to provide an orderly and a modern place for the needs of the small-scale industry craftsman, Kırıkkale Small Industrial Estate, with a 376 workplace capacity employing a total of 732 people on a 24,5 hectare land in Yahşihan district, is built and opened for businesses' use.

Also, there are 376 workplaces –subject to Auto Craftsman Association and Chamber of Blacksmiths- present in Kırıkkale Industrial Market. In Small Industrial Estate, situated in Keskin district on 4.7 hectare land with 78 workplace capacity, 180 people are employed. Approximately 7000 workers are employed in small and middle-scale industrial facilities in our city. The registered businesses in June 2012 are 212. Due to the closeness of Organized Industrial Area and Small Industrial Estate to University of Kırıkkale, a huge contribution to the economy with regard to the scientific consultancy by the university will be possible.

Economic Status of Yahşihan District: Animal husbandry is an important source of income in the district along with irrigated farming. Bovine and ovine breeding takes place at 10 plateaus around the district. Milk and milk products are produced and put up for sale individually.

A 40 tones Soil Products Office (T.M.O.) silo, Kırmak-san and Topal Ahmet machine tool factory, iron ore crushing-screening plant along the railway and many sand quarries along Kızılırmak river are active in the district. Furthermore, there is a mill and 2 touristic social rest establishments.

Furthermore, Kırıkkale Small Industrial zone is located within district boundaries and many workshops are currently active.

Kırıkkale Organized Industrial Zone is located in administrative borders of Yahşihan and considerable contributions are expected for the District economy upon completion of ongoing factory constructions.

There are 3 Elementary Schools and 1 senior high school in Yahşihan district and there are 2 Elementary Schools in Irmak town and 1 regional primary boarding school in Kılıçlar town.

Economic Status of Province Ankara:

The MKE Corporation (Mechanical and Chemical Industry Corporation) established in Ankara, public industrial institutions such as the Sugar Mills association, Sümerbank and Etibank and their subsidiaries being in Ankara, has also encouraged the establishment of small private businesses.

The industrialization of Ankara was hindered for many years due to efforts only towards being the capital and on the grounds of air pollution due to its geographical structure. Within the process, with an environmentally sensitive awareness of industrialization, it came down until today and Ankara took its place among the industrially weighted provinces with their densities in the field of economic activities.

Small and Medium-sized Industrial Enterprises in Ankara (SMEs) account for the majority of Industry. When the number of workplaces having employed 10 and more employees is considered, the sector with most workplaces is the iron and metal works sector and the majority of companies in this field employ 25 or more employees. The second sector demanded by the private sector is the food industry and the majority of companies in the sector consist of small-sized enterprises that employ workers between 10-24 people.

As a result of the infrastructure and demand created by the defense industry, the machinery and metal industry has reached a significant level in the economy of the province. Today, 40% of the area in which industrial institutions are conducting production is the machinery and the metal industry. The central location of Ankara within the country and its convenience to defense and the potential of organizations in the sector with qualified human resources have led to the emergence of large organizations. Large-scale investments related to the defense industry such as the MKE Corporation, Turkish Aerospace Industry (TAI), Aselsan, Roketsan and Havelsan have been carried out in the province. In addition, medium-sized companies with a number of more than 50 as wells as small design and manufacturing workplaces located at technological development and organized industry zones are operating in this sector.

As the Ankara Industrial Chamber I (Sincan), Ostim and İvedik Organized Industrial Zones are hosting small and medium –sized industrial enterprises, they constitute a very important place in the provincial industry. In addition, the Survey Project Studies of the Ankara Industrial Chamber (ASO) II (Türkobası) – III (Alagöz) and Anatolian Organized Industrial Zones within the boundaries of the Metropolitan Municipality as well as those of Beypazarı, Polatlı, Şereflikoçhisar Organized Industrial Zones, Çubuk Livestock Organized Industry and Ankara Metal Workers Specialized Organized Zones have been concluded, their construction, reconstruction, infrastructure and expropriation are ongoing, in order to meet the requirements of the current industry and to accelerate the development of the provincial industry. The Polatlı II OIZ is under the establishment stage.

There are 6 Technological Development Zones (TDB) in the province consisting of ODTÜ, Ankara (BİLKENT), Hacettepe University, Gaiz Teknopark, Ankara University and the Ankara Industrial Chamber. In this region, 817 companies are available and 8.581 people are employed. The Ankara University TGB, having completed its establishment, the Ankara Industrial Chamber TGB is not yet operational.

In summary, the Industry of Ankara, which is continuing its development, and which is raising its graphic within the Turkish Industry by means of its durable structure is changing the face of Ankara and plays an active role in the formation of economic, social and cultural integration.

As of 31 December 2011, there are totally 1.843 industrial companies according to the number of manufacturing industries facilities registered to the Ankara Chamber of Industry and totally 286.860 people are employed in their workplaces.

With the major industrial move in recent years, Ankara moved away of being a city of officials, trade and agriculture and has changed to an industrial city.

According to 2011 labor force statistics, labor force participation rate within the population of 15 and over is 41,1% and this rate shows significant difference according to gender. The labor force participation rate for the male population is 70,4% as this rate is 25,6% for the female population. According to 2011 labor force statistics, among 3.590.000 people living in the province at an age of 15 and over, while 1.545,000 people thereof are employed, 1.884,000 people thereof are not involved in labor force and 161.000 people thereof are unemployed. The rate of unemployment in the province is 12,1%. While this rate is 8,4% for the male population, it is 12,3% for the female population. As of 2011, the per capita income in Ankara is \$18.009.

VI.3.2. Population (Urban and Rural Population in the Area, Population Movements; Migrations, Population Growth Rate, Other Information)

According to the 2013 date from Turkey address-based population registration system (ADNKS);

The population of Kırıkkale Province in 2013 is 274,658 and 231,831 person reside in the city center and the rest of the population which is 42,827 reside villages and towns from the district. The data regarding the district where the Project located is shown in **Table 23**.

Table 23. Kırıkkale Province Population Data

County	Province/Town			Village			Total		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Merkez	187.48	93.128	94.352	8.491	4.488	4.003	195.971	97.616	98.355
Bahşili	5.545	2.778	2.767	1.487	747	740	7.032	3.525	3.507
Balıseyh	2.24	1.137	1.103	4.393	2.226	2.167	6.633	3.363	3.27
Çelebi	1.567	809	758	1.666	838	828	3.233	1.647	1.586
Delice	2.54	1.35	1.19	7.591	3.707	3.884	10.131	5.057	5.074
Karakeçili	4.068	2.06	2.008	303	143	160	4.371	2.203	2.168
Keskin	9.667	4.705	4.962	10.387	5.317	5.07	20.054	10.022	10.032
Sulakyurt	2.417	1.402	1.015	5.356	2.631	2.725	7.773	4.033	3.74
Yahşihan	16.307	8.572	7.735	3.153	1.601	1.552	19.46	10.173	9.287
Toplam	231.831	115.941	115.89	42.827	21.698	21.129	274.658	137.639	137.019

The population of Ankara Province is 4,965,542 and 4,842,136 person reside in the city center and the rest of the population which is 123,406 reside villages and towns from the district. The data regarding the district where the Project located is shown in **Table 24**.

Table 24. Ankara Province Population Data

County	Province/Town			Village			Total		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Akyurt	26.572	13.534	13.038	629	324	305	27.201	13.858	13.343
Altındağ	363.744	182.916	180.828				363.744	182.916	180.828
Ayaş	8.295	4.331	3.964	4.792	2.32	2.472	13.087	6.651	6.436
Bala	7.542	3.857	3.685	9.855	4.997	4.858	17.397	8.854	8.543
Beypazarı	37.097	18.351	18.746	9.641	4.707	4.934	46.738	23.058	23.68
Çamlıdere	2.764	1.412	1.352	3.975	1.936	2.039	6.739	3.348	3.391
Çankaya	832.075	406.801	425.274				832.075	406.801	425.274
Çubuk	77.958	39.16	38.798	4.656	2.318	2.338	82.614	41.478	41.136
Elmadağ	42.674	21.809	20.865	1.182	576	606	43.856	22.385	21.471
Etimesgut	425.947	215.283	210.664				425.947	215.283	210.664
Evren	1.885	937	948	1.126	540	586	3.011	1.477	1.534
Gölbaşı	109.261	55.432	53.829	1.382	697	685	110.643	56.129	54.514
Güdül	2.591	1.276	1.315	6.065	2.932	3.133	8.656	4.208	4.448
Haymana	8.97	4.857	4.113	22.088	11.058	11.03	31.058	15.915	15.143
Kalecik	8.73	4.426	4.304	4.918	2.394	2.524	13.648	6.82	6.828
Kazan	41.442	21.34	20.102	1.866	945	921	43.308	22.285	21.023
Keçiören	840.809	415.085	425.724				840.809	415.085	425.724
Kızılcahamam	16.504	8.245	8.259	8.131	3.972	4.159	24.635	12.217	12.418
Mamak	559.597	282.464	277.133				559.597	282.464	277.133
Nallıhan	12.125	5.979	6.146	18.174	8.954	9.22	30.299	14.933	15.366
Polatlı	101.012	50.646	50.366	18.337	9.416	8.921	119.349	60.062	59.287
Pursaklar	119.593	60.21	59.383				119.593	60.21	59.383
Sincan	479.454	244.408	235.046				479.454	244.408	235.046
Şereflikoçhisar	28.453	14.48	13.973	6.589	3.207	3.382	35.042	17.687	17.355
Yenimahalle	687.042	335.924	351.118				687.042	335.924	351.118
Toplam	4.842.136	2.413.163	2.428.973	123.406	61.293	62.113	4.965.542	2.474.456	2.491.086

VI.3.3. Social Infrastructure Services in the Area (Education, health, cultural services and the availability of these services)

The education data of Ankara and Kırıkkale Provinces are given in Table 25-26.

Table 25. Education Data of Kırıkkale Province– 2013 (TUIK)

Age	Gender	Illiterate	Literate	Unknown	Total
'6-13'	Erkek		16.727	14	16.741
	Kadın	1	16.016	26	16.043
'14-17'	Erkek	2	9.548	7	9.557
	Kadın	7	9.104	10	9.121

Age	Gender	Illiterate	Literate	Unknown	Total
'18-21'	Erkek	18	10.826	36	10.88
	Kadın	31	10.107	44	10.182
'22-24'	Erkek	19	6.872	37	6.928
	Kadın	53	6.455	76	6.584
'25-29'	Erkek	43	9.972	108	10.123
	Kadın	62	9.059	73	9.194
'30-34'	Erkek	37	9.573	77	9.687
	Kadın	60	9.441	46	9.547
'35-39'	Erkek	40	8.98	28	9.048
	Kadın	66	9.296	37	9.399
'40-44'	Erkek	32	9.48	29	9.541
	Kadın	98	9.455	61	9.614
'45-49'	Erkek	31	9.916	54	10.001
	Kadın	178	9.336	58	9.572
'50-54'	Erkek	38	8.451	54	8.543
	Kadın	298	7.991	75	8.364
'55-59'	Erkek	50	7.329	75	7.454
	Kadın	633	6.804	85	7.522
'60-64'	Erkek	87	5.756	60	5.903
	Kadın	1.291	5.321	76	6.688
'65 +'	Erkek	984	10.516	128	11.628
	Kadın	7.045	7.443	281	14.769
	Total	11.204	239.774	1.655	252.633

In the center of Yahşihan district, there are 3 Primary School and 1 High School. There are 2 Primary School in Irmak Town and 1 Regional Primary Boarding School in Kılıçlar Town.

Table 26. Education Data of Ankara Province– 2013 (TUIK)

Age	Gender	Illiterate	Literate	Unknown	Total
'6-13'	Erkek	4	294.469	379	294.852
	Kadın	8	278.91	398	279.316
'14-17'	Erkek	36	152.537	301	152.874
	Kadın	46	144.135	364	144.545
'18-21'	Erkek	491	165.153	2.673	168.317
	Kadın	568	149.751	2.698	153.017
'22-24'	Erkek	439	120.456	5.245	126.14
	Kadın	814	116.85	6.082	123.746
'25-29'	Erkek	657	200.958	14.436	216.051
	Kadın	1.408	206.17	6.798	214.376
'30-34'	Erkek	731	215.592	8.521	224.844
	Kadın	1.478	220.071	4.984	226.533

Age	Gender	Illiterate	Literate	Unknown	Total
'35-39'	Erkek	608	196.726	5.346	202.68
	Kadın	1.304	199.389	3.842	204.535
'40-44'	Erkek	489	179.686	3.821	183.996
	Kadın	2.061	180.656	3.87	186.587
'45-49'	Erkek	556	166.403	4.115	171.074
	Kadın	3.584	165.825	5.106	174.515
'50-54'	Erkek	718	141.106	5.382	147.206
	Kadın	5.788	136.04	5.685	147.513
'55-59'	Erkek	1.023	113.887	5.805	120.715
	Kadın	9.646	106.679	5.816	122.141
'60-64'	Erkek	1.124	79.83	4.707	85.661
	Kadın	13.087	73.571	5.184	91.842
'65 +'	Erkek	8.514	131.89	9.064	149.468
	Kadın	57.381	128.716	14.32	200.417
	Toplam	112.563	4.265.456	134.942	4.512.961

Health

Health Condition in Kırıkkale

The distribution of health institutions by city center and districts in Kırıkkale Province is given in **Table 27**. There are Hospitals, Health Centers, Health Houses, Public Health Laboratories, Family Planning – Maternal and Infant Health Centers, Tuberculosis Dispensary under the name of Health Institutions.

Table 27. The Distribution of Health Institutions by Districts in Kırıkkale Province

	Hospital	Health Center	Health House	Public Health Lab.	Vocational School of Health	Tuberculosis Dispensary	Health Center	Maternal and Infant Health Center
Merkez	3	19	3	1	1	1	-	1
Delice	1	4	12	-	2	-	-	-
Sulakyurt	1	5	7	-	1	-	-	-
Keskin	1	5	5	-	1	-	-	1
Bahşili	-	2	1	-	-	-	-	-
Yahşıhan	-	4	2	-	-	-	-	-
Balıseyh	-	3	5	-	-	-	1	-
Karakeçili	1	1	-	-	-	-	-	-
Çelebi	-	1	1	-	-	-	-	-
Total	7	44	36	1	5	1	1	2

Health Services in Ankara

Total 32 hospitals, 224 health care centers, 58 emergency stations, 3 mouth and dental health centers, 32 maternal and infant health and family planning center, 3 community health centers, 9 tuberculosis control dispensary are founded in Ankara. Years of construction, number of beds, dates of issue, m² units of building layout areas and total closed areas of hospitals in Ankara province are given in **Table 28**.

Ankara is located also provide services to region provinces from the points of health sector. Particularly the people living in the Ankara province, also nearby provinces and distant provinces many people come from the city of Ankara for treatment.

Table 28. Amount of Beds and Area in State Hospitals in Ankara

HOSPITAL	Date of Issue	Number of Beds	Closed Area(m ²)	Land (m ²)	Closed Space Per Bed (m ²)
Numune Training Research Hospital (TRH)	1881	1,110	96,542	49,616	87
Ankara TRH	10.05.1905	679	61,747	63,169	91
Atatürk TRH	19.02.2004	521	56,000	70,000	107
Dışkapı Yıldırım Beyazıt TRH	17.05.1905	1,027	82,831	54,147	81
Atatürk Chest Diseases TRH	06.05.1905	610	27,112	112,923	44
Dr.Sami Ulus Pediatrics TRH	1965	423	19,039	9,340	45
Dışkapı Pediatrics TRH	1972	215	10,004	12,000	47
Dr. Z.T.B Gynecological Diseases TRH	1943	540	34,929	19,348	65
Etlik Maternity TRH	22.06.1990	420	23,166	222,112	55
Yüksek İhtisas TRH	17.05.1905	493	33,111	21,379	67
Onkoloji TRH	15.09.1990	646	49,929	164,078	77
Keçiören TRH	01.09.2005	293	26,000	23,000	89
Ulucanlar Eye Diseases TRH	06.06.1995	101	7,604	1,602	75
Physical Medicine and Rehabilitation TRH	21.05.1968	270	17,500	9,040	65
Gazi Public Hospital	1943	164	12,919	20,700	79
Occupational Diseases Hospital	17.11.2001	106	6,600	4,738	62
Ulus Public Hospital	01.01.1956	160	16,092	4,710	101
Ayaş Public Hospital	29.06.1995	21	1,970	7,379	94
Beypazarı Public Hospital	1961	75	4,714	7,118	63
Çubuk Public Hospital	1975	63	5,192	16,760	82
Elmadağ Public Hospital	1992	50	3,500	9,584	70
Etimesgut Public Hospital	1990	64	11,230	45,514	175
Gölbaşı Public Hospital	29.05.2006	56	7,389	6,814	132
Güdül Public Hospital	1997	57	2,300	10,500	40
Haymana Public Hospital	10.04.2000	50	6,000	14,186	120
Kalecik Public Hospital	1942	25	2,242	3,000	90
Kazan H.Eriş Public Hospital	12.02.1989	27	2,331	17,500	86
Kızılcahamam Public Hospital	1964	68	6,161	11,668	91
Nallıhan Public Hospital	12.07.2007	68	9,900	34,800	146
Polatlı Duatepe Public Hospital	2000	302	30,624	24,563	101
Sincan Public Hospital	1989	169	13,825	35,600	82
Ş.Koçhisar Public Hospital	29.11.1983	50	5,800	7,068	116
TOTAL		8,923			

Reference: Bilkent Integrated Health Campus Project Prefeasibility Report, 2009

The total number of bed is 8,923 (Institutions and organizations of the Ministry of Health) and the average closed area per bed is 85.1 m² in Ankara province.

Table 29. Ankara Province Health Information

HOSPITALS	2008		2009		2010	
	Number	Number of Bed	Number	Number of Bed	Number	Number of Bed
University Hospitals	9	4,489	9	4,489	9	5,130
Public Hospitals	32	8,222	33	9,280	34	9,576
Other Public Hospitals	1	217	1	217	1	217

Private Hospital	24	1778	26	1839	24	1778
Total	66	14,706	69	15,825	72	16,826
HEALTH PERSONELS		2008		2009		2010
Specialist Physician	Prsn	8,570		8,989		8,540
Practicing Physician	Prsn	4,018		3,220		3,331
Resident Physician	Prsn	4,972		5,157		4,712
Dentist	Prsn	2,119		2,150		2,553
Pharmaceutics	Prsn	2,229		2,490		3,423
Health Officer	Prsn	7,929		8,492		8,399
Nurse	Prsn	10,268		10,543		15,363
Midwife	Prsn	3,056		3,113		3,046

Reference: Turkish Statistical Institute Health Data Base

Social and Cultural Facilities

The social facilities located in Kırıkkale province are shown in **Table 30**.

Table 30. Social Facilities in Kırıkkale Province

EXCURSION AREAS	SOCIAL FACILITIES AND NATURAL BEAUTIES
M.K.E.K Swimming Pools Kırıkkale Tüpraş Refinery Swimming Pool	Kısık mevki Halil İbrahim Aydoğdu Park (Hasandede)
Hacılar Municipality Park (Hacılar)	Bahşili Celal Bayar Park
Ahıllı Municipality Family Park (Ahıllı)	Hacılar Park
Celal Bayar Park (Bahşili)	M.K.E.K Swimming Pool
Kılıçlar Excursion Area (Kılıçlar)	Refinery Swimming Pool
Kısık Mevki, Hasandede Park (Hasandede)	Cultural Park
Karababa Excursion Area (Koçubaba)	Keskin-Koray Aydın Recess Park
Deliklitaş Orman İçi (Balışeyh)	TÜPRAŞ Şahin Hill
Kızılırmak Yeşil Vadi Project Area	TÜPRAŞ Kızılırmak Picnic Area
	Silahsan Gun Museum
	Belediye Gun Müzesi

As being a capital city, Ankara has many social and cultural facilities.

Table 31. Ankara Province Cultural Institutions

Cultural Status	Sayısı
Library	43
Museum	5
Cinema	124
Theater	24
Art Gallery	50

There are Altınpark Expo Center and Atatürk Cultural Center for exhibitions. State Opera and Ballet Stage and Presidential Symphony Orchestra are two important cultural activities.

Mogan Park in Gölbaşı district is a significant recreational facility. Mogan lake area which is the biggest part of the Mogan-Eymir system located in the south part of the city and protected environment with Protected Area Status has been released to the urban use in 2004. As being natural living area, the area has some bird watching areas. As being a park, Gölbaşı has a significant potential in the south of the city with many recreational facilities and social facilities

VI.3.4. Project Zone and Urban and Rural Land Utilization in its Vicinity (Distribution of Settlement Areas, current and planned utilization areas, and the industrial zones, houses, tourism areas, etc. in this context)

380 kV ACWA Power Kırıkkale Overhead Transmission Line starts from ACWA Power Kırıkkale NGCCPP planned to be established within boundaries of Kırıkkale Province, Yahşihan County, Kılıçlar Municipality and passes through the Ankara Province, Kalecik, Çubuk, Pursaklar, Yenimahalle Counties and ends up in Bağlum SS situated in Keçiören County

Starting point of the line, ACWA Power Kırıkkale NGCCPP, is situated around 2 km to southwest of Hacıbalı Village. The line takes place on a flatland up to Bağlum SS. There are rural settlements places along the route. Settlements in the vicinity of the route is shown in the scheme given in **Figure 6**. Çubuk-2 Dam takes place at a 900 m distance (northwest) from the line within the boundaries of Ankara Province.

Within route of transmission line and the study area and/or its periphery surroundings, National Parks, wetlands, Natural Monuments, Nature Conservation Areas, Wildlife Conservation Areas, Areas of Biogenetic Reserves, Biosphere Reserves, Natural Sites and Monuments, Archaeological, Historical and Cultural Sites, Special Areas of Conservation, Tourism Areas and Centers do not exist within its scope.

Furthermore, many mine zones are situated around the line route. However, a route as distant from these zones as possible was determined during route studies and no interaction is expected with mine zones.

Soil types commonly seen along the OHTL route are; brown soils, reddish brown soils, bare rock and debris, colluvial soils and brown forest soils. According to overhead transmission line route Land Classification Map, mainly dry farming (fallowing) and pasture lands are located along the line route, and also irrigated farming and bare rocks and debris areas are present (See: **Appendix-3**). Based on land use capability class, class I, II, III, IV, VI and VII lands are located on the line route.

Meteorological and Climatic Properties:

Central Anatolia Region, where provinces Ankara and Kırıkkale located in, has continental climate features. Summers are hot and dry and the winters are cold and snowy. The rainiest season is spring. Day and night, summer and winter seasons have major temperature differences. The hottest month is July-August and the coldest month is January.

Meteorological and climatic characteristics was created using data of Ankara and Kırıkkale Weather Stations which are the nearest meteorological stations in the area of the transmission line route. Location data of the stations are presented below. Meteorological bulletin is given in **Appendix-6**.

Table 32. Meteorology Station Information

Station Name	ANKARA	KIRIKKALE
Latitude	39	39
Longitude	32	33
Height	891 m	747 m
Data Dates	1970-2011	1960-2012

Meteorological Data of Ankara Province

Wind: Wind data in the province according to the long term data is given in **Table 33**.

Table 33. Average Wind Speed and Direction of Ankara Meteorology Station

Meteorological Elements	MONTHS											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Av. Wind Speed (m/s)	1.9	2.0	2.1	2.1	2.1	2.2	2.5	2.4	2.0	1.8	1.7	1.8
The maximum wind speed (m/s)	22.0	26.5	29.2	22.9	22.2	26.7	20.0	18.0	24.4	22.0	21.7	18.7
The maximum wind direction	SSE	SSE	N	SE	SSE	WSW	SE	WNW	SW	SW	SW	SSW
Total no. of N wind blowing	1051	799	969	975	990	1023	1160	1125	1084	1266	1206	982
Avg. N wind speed	1.5	1.6	1.8	1.7	1.9	2.2	2.4	2.1	1.7	1.4	1.4	1.5
Total no. of NNE wind blowing	2270	2151	2097	1759	1782	2275	2801	2504	2072	2605	2308	2383
Avg. NNE wind speed	2.0	2.0	2.0	2.0	2.0	2.4	2.7	2.6	2.0	1.7	1.7	1.8
Total no. of NE wind blowing	6468	5719	5228	4834	5491	6254	7976	8932	6926	7086	6556	6469
Avg. NE wind speed	2.1	2.2	2.2	2.2	2.2	2.4	2.8	2.8	2.2	2.0	1.9	2.1
Total no. of ENE wind blowing	4869	4270	4244	3932	5413	5886	7614	6815	5943	5712	5140	4907
Avg. ENE wind speed	2.0	2.0	2.0	2.0	2.1	2.2	2.5	2.5	2.1	1.9	1.8	1.9
Total no. of E wind blowing	1616	1216	1629	1255	1767	1724	1659	1610	1473	1328	1310	1596
Avg. E wind speed	1.6	1.6	1.8	1.7	1.9	1.9	2.0	2.0	1.7	1.6	1.4	1.5
Total no. of ESE wind blowing	775	571	744	649	876	848	822	700	654	546	501	802
Avg. ESE wind speed	1.4	1.6	1.8	1.7	1.9	1.7	2.0	2.0	1.6	1.4	1.4	1.4
Total no. of SE wind blowing	675	621	840	861	838	632	762	781	613	439	463	798
Avg. SE wind speed	1.6	1.8	2.0	2.0	1.9	1.9	1.9	1.9	1.6	1.4	1.4	1.4
Total no. of SSE wind blowing	638	613	731	730	574	396	297	276	330	363	488	543
Avg. SSE wind speed	1.8	1.9	2.0	2.0	1.9	1.6	1.8	1.5	1.6	1.4	1.6	1.5
Total no. of S wind blowing	715	909	780	680	543	381	247	251	391	488	561	646
Avg. S wind speed	1.7	2.1	1.9	1.8	1.8	1.5	1.5	1.4	1.4	1.5	1.6	1.7
Total no. of SSW wind blowing	1126	1147	1356	1145	953	654	529	538	762	812	1060	1176
Avg. SSW wind speed	1.6	1.9	1.8	1.8	1.6	1.6	1.6	1.5	1.4	1.3	1.6	1.5
Total no. of SW wind blowing	3170	2787	3175	3505	2428	1741	1371	1436	2001	2458	2447	3081
Avg. SW wind speed	1.6	1.9	1.9	2.0	1.9	1.8	1.8	1.7	1.7	1.5	1.5	1.6
Total no. of WSW wind blowing	4053	3697	4447	4402	4089	3008	1887	2097	3139	3511	3513	3883

Meteorological Elements	MONTHS											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Avg. WSW wind speed	1.6	1.8	2.1	2.1	2.0	2.0	2.0	2.0	1.9	1.7	1.6	1.6
Total no. of W wind blowing	1583	1744	2309	2635	2588	1948	1223	1425	1628	1479	1476	1655
Avg. W wind speed	1.5	1.7	2.1	2.1	2.2	2.1	2.2	2.0	2.0	1.6	1.4	1.5
Total no. of WNW wind blowing	668	764	960	982	1165	1262	953	866	1023	913	766	693
Avg. WNW wind speed	1.4	1.6	1.9	1.8	2.1	2.1	2.2	2.1	1.7	1.4	1.4	1.5
Total no. of NW wind blowing	410	492	679	692	696	917	851	785	769	536	576	427
Avg. NW wind speed	1.3	1.5	1.8	1.8	2.0	2.1	2.2	2.0	1.8	1.4	1.4	1.5
Total no. of NNW wind blowing	561	499	694	704	692	891	914	787	773	744	551	514
Avg. NNW wind speed	1.6	1.8	1.9	1.8	1.8	2.2	2.3	2.1	1.8	1.4	1.3	1.4

Reference: General Directorate of Meteorology 2012

Pressure: Pressure values are presented in **Table 34**.

Table 34. Long Term Average Pressure Data of Ankara Meteorology Station (hPa)

Meteorological Elements	MONTHS												YEARLY
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Average Pressure (hPa)	914.9	912.9	912.0	910.9	912.0	911.7	910.7	911.4	913.9	916.0	916.3	915.6	913.2
Maximum Pressure (hPa)	935.1	929.6	933.2	923.9	921.3	921.0	918.9	918.8	923.1	926.7	927.6	932.6	935.1
Minimum Pressure (hPa)	887.9	892.8	891.6	897.7	901.3	900.5	899.3	903.4	902.2	904.1	898.6	891.6	887.9
Average Steam Pressure (hPa)	8.8	9.1	10.2	10.4	11.1	11.9	12.8	12.6	11.0	10.5	10.0	10.4	10.7

Reference: General Directorate of Meteorology 2012

Humidity: The average relative humidity value was measured as 60.8% and the lowest value was 4% in September in Ankara Province. Long term relative humidity data is given in **Table 35**.

Table 35. Long Term Relative Humidity Data of Ankara Meteorology Station (%)

Meteorological Elements	MONTHS												YEARLY
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Minimum relative hum.(%)	28	15	12	12	9	9	6	5	4	6	15	23	4
Average relative hum. (%)	76	70.8	63.4	60	56.9	52.3	46.2	46	50.2	61	70.2	76.4	60.8

Reference: General Directorate of Meteorology 2012

Temperature: The average temperature value is 12,0°C and the lowest value was -3°C in January of Ankara Province. Long term temperature data are given in **Table 36**.

Table 36. Long Term Temperature Data of Ankara Meteorology Station (°C)

Meteorological Elements	MONTHS												YEARLY
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Average Temperature	0.3	2.1	6.2	11.3	16.1	20.2	23.6	23.3	18.7	13.0	6.7	2.3	12.0
Average High Temperature °C	4.3	6.7	11.9	17.1	22.2	26.6	30.3	30.2	26	19.7	12.4	6.2	17.8
Average Low Temperature °C	-3	-2	1.1	5.7	9.7	13.1	16.1	16.1	12	7.4	2.2	-1	6.45
Maximum Temperature °C	16.6	19.9	26.4	30.6	33	37	40.8	40.4	36	32.2	24.4	19.8	29.8
Minimum Temperature °C	-21.2	-21.5	-19.2	-6.7	-1.6	5.0	6.8	7.2	2.5	-3.4	-8.8	-17.2	-6.5

Reference: General Directorate of Meteorology 2012

Evaporation: In Ankara Province long terms evaporation value is 1166.6 mm and maximum evaporation value is 18.0 mm in June and August.

Table 37. Long Term Evaporation Data of Ankara Meteorology Stations (mm)

Meteorological Elements	MONTHS												YEARLY
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Average Open Surface Evaporation (mm)			0.9	89.5	149.7	190.2	245.8	226.0	153.9	87.2	22.7	0.7	1166.6
Maximum Open Surface Evaporation (mm)			7.0	12.0	12.0	18.0	15.2	18.0	11.8	10.0	8.0	2.8	18.0

Reference: General Directorate of Meteorology 2012

Precipitation: Rain and snow values are given in **Table 38**.

Table 38. Long Term Precipitation Data of Ankara Meteorology Station

Meteorological Data	MONTHS												YEARLY
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Average precipitation value (mm)	39.2	33.4	36.7	50	50.3	35.3	15.5	12	17.5	33.2	35.4	42.5	401
Maximum Precipitation (mm)	27.9	26.9	22.1	29.4	42.5	88.9	62.6	35.6	32.2	46.2	36	36.7	88.9
Number of snowy days	9.2	7.2	5.1	1.1	0					0.1	2	5.9	30.6
Number of hailing days	0.1	0.5	0.5	0.8	1	0.3	0	0.1	0.1	0.1	0.2	0.1	3.8
Avg. Number of hoarfrost days	7.1	5.7	3.5	0.9	0				0	1	5.1	7.9	31.2
Avg. Number of thunder stormy days	0.1	0.4	0.8	2.9	7.2	6.3	3.5	2.6	2	1.5	0.5	0.2	28

Reference: General Directorate of Meteorology, 2012

Meteorological Data of Kırıkkale Province

Temperature: According to Kırıkkale Meteorological Station data, the average temperature value measured is 12.6°C, the lowest and highest value is -22.4°C and 41.8 °C respectively Long term temperature data are given in **Table 39**.

Table 39. Long Term Temperature Data of Kırıkkale Meteorology Station (°C)

Meteorological Elements	MONTHS												YEARLY
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Average Temperature	0,4	2,1	6,8	12,2	16,9	21,2	24,6	24,1	19,5	13,6	6,9	2,5	12,6
Maximum Temperature °C	17,0	20,8	30,4	32,0	34,4	37,6	41,8	40,3	37,0	33,0	24,8	19,0	41,8
Minimum Temperature °C	-22,4	-21,6	-19,8	-6,8	0,4	4,6	7,4	7,2	2,7	-5,0	-9,7	-18,0	-22,4

Precipitation: According to Kırıkkale Meteorological Station data, average precipitation measured is 373,5 mm.

Table 40. Long Term Precipitation Data of Kırıkkale Meteorology Station

Meteorological Elements	MONTHS												YEARLY
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Average precipitation va (mm)	41,6	31,4	34	45,8	49,2	34,8	10,9	8,2	13,4	27,9	30,5	45,8	373,5
Maximum Precipitation (mm)	36,5	36	30,2	33	35,8	100,6	52,7	26,1	29,4	39,2	40	34,6	100,6

Humidity: According to Kırıkkale Meteorological Station data, the average relative humidity value was measured as 62%.

Table 41. Long Term Relative Humidity Data of Kırıkkale Meteorology Station (%)

Meteorological Elements	MONTHS												YEARLY
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Average relative hum. (%)	77,5	73,1	65,1	61,2	58,9	52,4	47	46,9	51,1	61	71,8	78,1	62

Wind: According to Kırıkkale Meteorological Station data, maximum wind speed is measured as 28,1 m/s in W (west) direction in March.

Table 42. Average Wind Speed and Direction of Kırıkkale Meteorology Station

Meteorological Elements	MONTHS												YEARLY
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Av. Wind Speed (m/s)	1,7	1,9	2,1	2,1	1,9	2,1	2,6	2,3	1,8	1,5	1,4	1,6	1,9
The maximum wind speed (m/s) and direction	22.6 SW	25.9 SSW	28.1 W	27.7 SSW	24.3 WSW	28.0 W	24.4 W	23.0 WNW	23.9 S	22.0 WSW	22.6 NNW	22.6 N	28,1 W

Besides from the data given above, wind speed and blowing numbers according to the directions are given in detail below.

Table 43. Long Years Wind Speeds (m/s)

DIRECTIONS	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	YEARLY
N	2,1	2,4	2,8	2,3	2,6	3	3,7	3,2	2,6	1,9	1,8	2,1	2,5
NNE	2,1	2,3	2,5	2,3	2,3	2,8	3,2	3,2	2,5	2,1	1,9	1,9	2,4
NE	1,7	1,8	2,1	2,1	2,1	2,4	3,1	2,7	2,1	1,8	1,5	1,6	2,1
ENE	1,6	1,8	2	1,9	2	2,2	2,7	2,7	2	1,7	1,5	1,5	2,0
E	1,3	1,4	1,5	1,4	1,5	1,5	1,8	1,7	1,4	1,2	1,1	1,2	1,4
ESE	1,1	1,2	1,3	1,3	1,4	1,4	1,6	1,6	1,4	1,2	1	1,1	1,3
SE	1	1,1	1,2	1,2	1,3	1,3	1,3	1,3	1,2	1	1	1	1,2
SSE	1	1,2	1,3	1,4	1,3	1,3	1,5	1,4	1,3	1,1	1	1,1	1,2
S	1,5	1,8	1,9	2	1,7	1,6	1,4	1,5	1,5	1,5	1,5	1,4	1,6
SSW	2	2,4	2,5	2,4	2,1	1,9	1,7	1,7	1,7	1,9	1,9	2,1	2,0
SW	1,9	2	2,1	2,1	1,9	1,9	1,8	1,6	1,6	1,6	1,6	1,8	1,8
WSW	1,7	1,9	2,2	2,3	2,2	2,1	1,9	1,9	1,9	1,6	1,5	1,6	1,9
W	1,7	1,9	2,2	2,3	2,4	2,4	2,2	2,1	2	1,7	1,6	1,6	2,0
WNW	1,6	1,9	2,2	2,3	2,4	2,4	2,5	2,3	2,1	1,8	1,5	1,5	2,0
NW	1,6	1,7	1,8	1,9	2	2,2	2,5	2,2	1,8	1,4	1,7	1,5	1,9
NNW	2,2	2,7	2,4	2,4	2,5	2,8	3	3	2,5	2	2,1	2	2,5

Table 44. Long Years Wind Numbers According to Directions

Meteorological Elements	MONTHS												YEARLY
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
N	1148	1095	1399	989	1542	2073	2340	2243	1662	1413	1169	1189	18262
NNE	1049	932	1146	1166	1330	1944	2947	2487	1679	1513	1163	985	18341
NE	3636	3464	4467	3943	5096	6260	9170	8514	6459	5532	4146	3503	64190
ENE	3435	3309	3691	3540	4658	4890	6170	6692	5541	5499	3952	3652	55029
E	3422	3497	3698	3309	3823	3739	4031	4424	4641	4220	4000	3285	46089
ESE	895	835	752	753	809	923	839	881	988	757	796	798	10026
SE	1129	901	936	823	1073	896	762	750	1017	1191	1119	1262	11859
SSE	741	582	445	524	506	359	269	260	437	420	495	682	5720
S	2207	1845	1850	1699	1481	1106	697	564	953	1250	2095	2035	17782
SSW	3501	3258	2983	2897	2014	1019	626	600	1092	1811	2562	3450	25813
SW	5695	4798	5004	4829	3689	2263	1566	1337	1889	2545	3641	5589	42845
WSW	1683	1721	2214	2422	1983	1520	739	819	1394	1693	1709	1865	19762
W	1871	1960	2272	2726	2533	2315	1538	1311	1592	1725	1709	1758	23310
WNW	498	513	796	837	928	1040	691	657	961	723	556	695	8895
NW	518	716	858	813	891	1200	1189	1029	830	627	531	714	9916
NNW	414	528	631	518	623	970	859	700	621	415	548	506	7333

According to the tables given above, dominant wind direction is NE (Northeast) with 64,190 blowing numbers.

The graphs according to meteorological bulletin are given below;

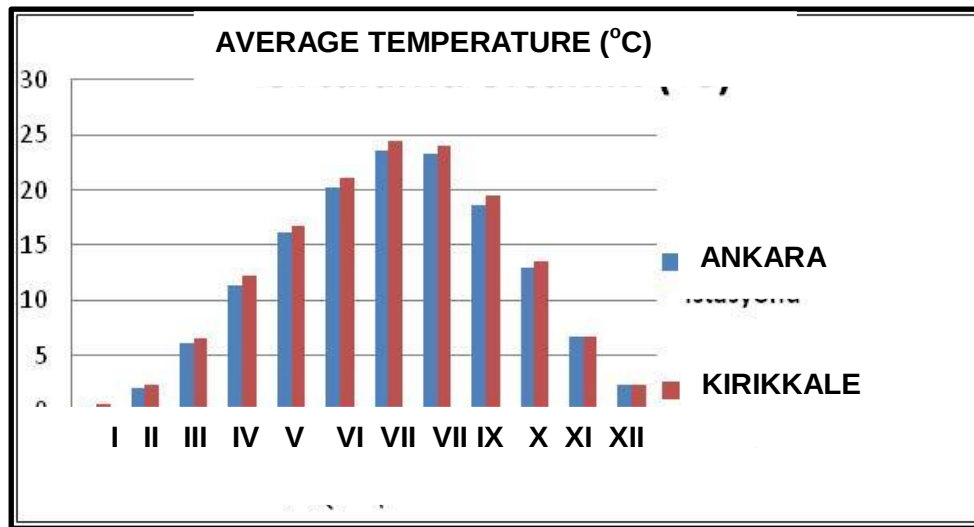


Figure 31. Average Temperature Data of Ankara and Kirikkale

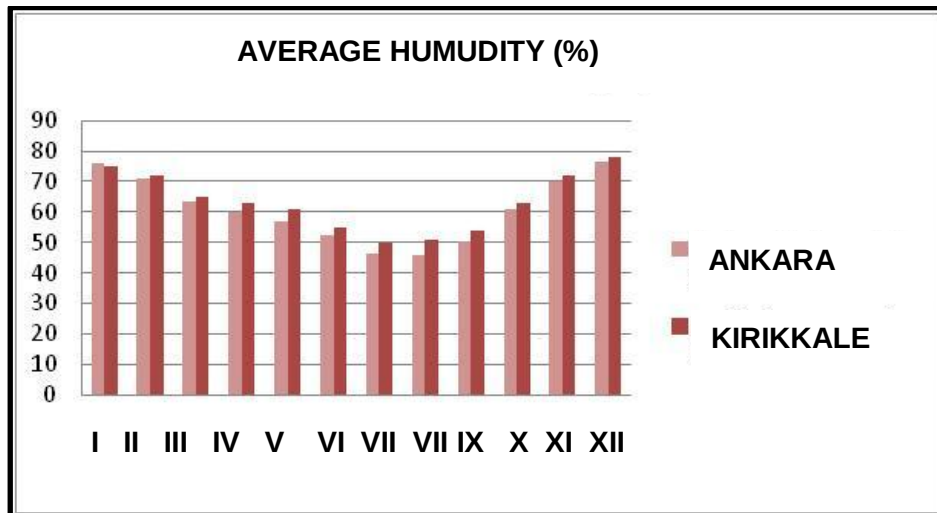


Figure 32. Average Humidity

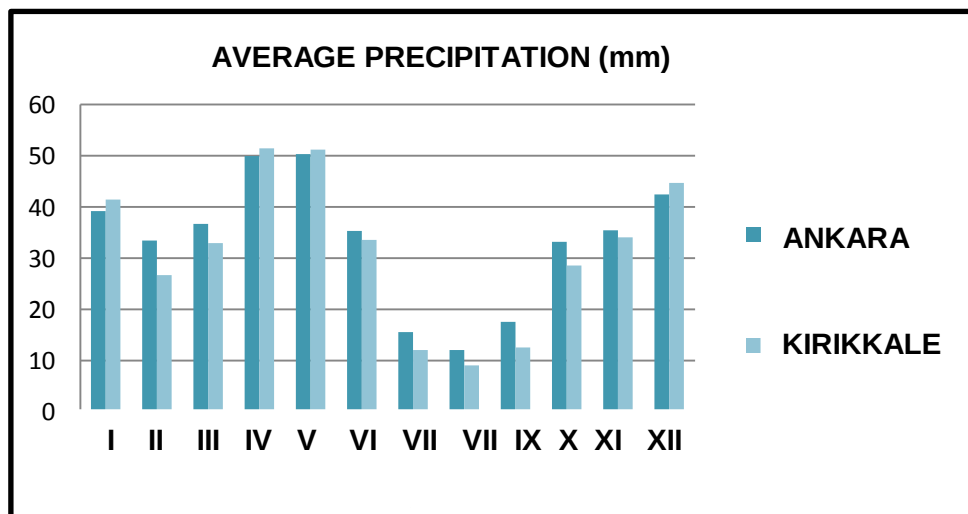


Figure 33. Average Precipitation Amount

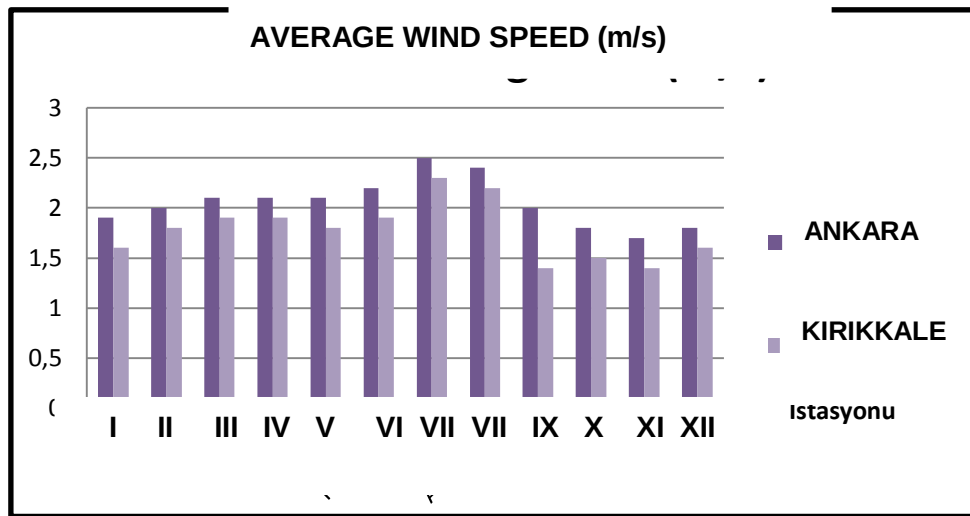


Figure 34. Average Wind Speed

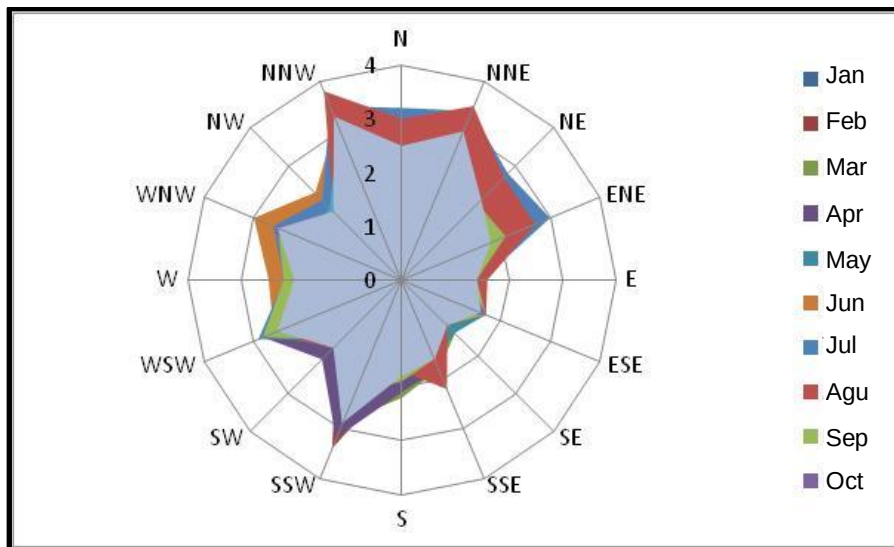


Figure 35. Kırıkkale Wind Speed Graph

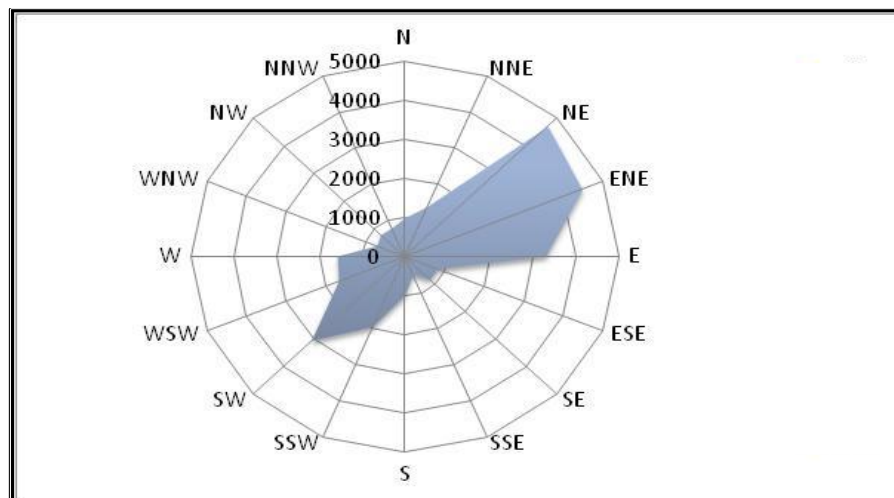


Figure 36. Kırıkkale Wind Rose

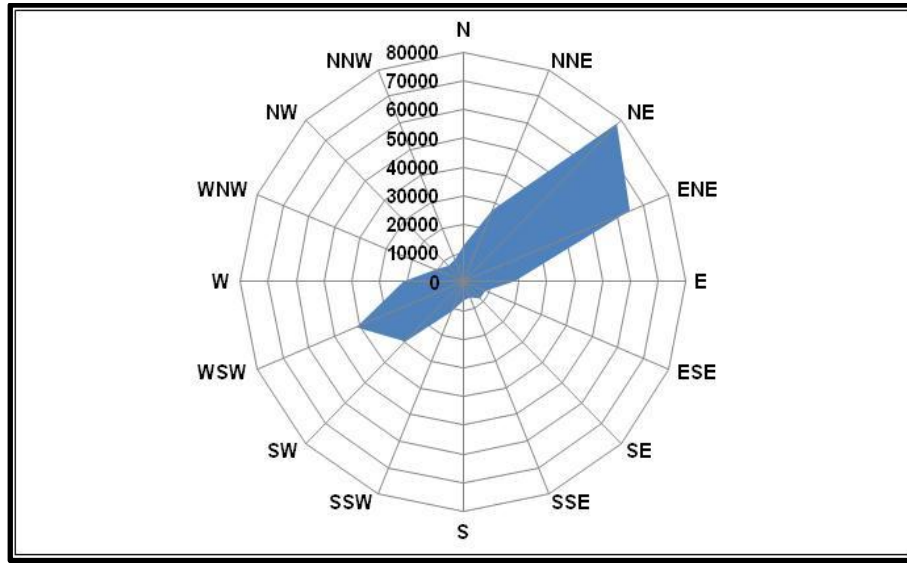


Figure 37. Ankara Wind Rose

SECTION VII: IMPACT OF THE PROJECT ON THE ZONE DEFINED IN CHAPTER IV AND THE MEASURES TO BE TAKEN

VII.1. Land Preparation along the Line Route, Activities during the Construction and Erection Phase, Their Impacts on Physical and Biological Environment and the Measures to be Taken

Various measures shall be developed with regards to the activities that will take place along the OHTL route during the phases of land preparation, construction and operation of the installation and in relation with the impacts of these activities on the physical and biological environment and also in order to prevent and/or minimize these impacts. Measures to be taken and the procedures to be followed are given under following titles.

VII.1.1. Places and Surface Area and Amount of Excavation to be made in the Scope of the Works to be Carried out for Land Preparation, Places to Transport and Deposit the Excavated Material, Aim of it Use, and Transportation, Storage and Use of Inflammable, Explosive, Dangerous and Toxic Materials among the Materials to be Used during Excavation

At the first place, points of intersection and pole support locations shall be determined and field applications shall be made in the field following the studies and delivery activities of the planned OHTL project in the scope of the works to be carried out for land preparation. During application, 1 central stake, 4x4 = 16 support stakes, 1 cantilever stake, 2 directional stakes (forward and backward) and 1 alignment stake (forward line stake) shall be driven and then the construction phase shall be initiated directly after these procedures. There is no construction activity other than pylon construction in the course of the field activities. Consequently no excavated material shall be generated other than the excavated material produced by pylon construction.

Along the overhead transmission line route, 31 some poles, 1 end pole and 310 carrier poles shall be constructed.

4 pits shall be excavated for each pole in the course of the excavation work during pole construction. Sizes and depth of the pits where pole supports shall be seated vary depending on the pole type. However, pits of 3m x 3m x 3m size on average shall be excavated for each pole support.

Quantity of excavation for one pit is: This shall be: $3\text{m} \times 3\text{m} \times 3\text{m} = 27 \text{ m}^3/1 \text{ pit}$.

And since 4 pits shall be excavated for one pole; $27 \text{ m}^3/1 \text{ pit} \times 4 \text{ pit}/1 \text{ pole} = 108 \text{ m}^3/1 \text{ pole}$.

There are totally 342 poles in the scope of the project and therefore; $108 \text{ m}^3/1 \text{ pole} \times 342 \text{ poles} = 39,936 \text{ m}^3$ of excavated material shall be produced.

For 342 poles to be installed along the line route, $39,936 \text{ m}^3$ of excavation shall be carried out and, out of that, $33,242.4 \text{ m}^3$ (90% of it) shall be utilized for backfilling of poles and remaining $3,693.6 \text{ m}^3$ of top soil (vegetable) shall be spread on the surface at the pole supports. Consequently, no excavation refuse production is foreseen during the course of land preparation and construction phases.

Excavators shall be used in general during excavation works and thus no blasting shall be performed. Consequently, there shall be no usage of inflammable, explosive, dangerous or toxic materials.

The most important impact on environment during the excavation process shall probably be the deterioration of the soil quality during soil stripping and removal of vegetation from the land surface which corresponds to the excavation area. However, the pits which shall be excavated for foundation preparation shall be filled by using the material that is produced during excavation and the stripped soil shall be spread over them, and thus, land shall be restored to its original condition as close as possible.

The excavated material, excavation refuse tails, waste or any other material which shall be produced during excavation shall not be dumped to places which are regarded as forests.

Chemicals and oils that will be used during construction phase will be moved and stored in accordance with the relevant national and international standards. Chemicals will be handled and managed according to their Material Safety Data Sheet and international best practices. Storage areas will be prepared with capable of sealing of the floor, authorized persons access, locked and at least 100m away from the nearest water source. Temporary construction sites during construction properly will be left completely restored when the progress is done

In the course of all these excavation works, actions shall be taken in accordance with the provisions of "Regulation on Control of Excavated Soil, Construction and Demolishment Waste" which became effective by being published in the Official Gazette dated 18.03.2004 and numbered 25406.

VII.1.2. Places to Transport or Aims of Use of the Excavated Refuse Soil, Stone, Sand and similar Materials,

After the pits that have been excavated for pole supports are filled with concrete and steel components, the remaining spaces shall be filled by using the soil obtained from excavation. No excavation refuse shall be generated since 33,242.4 m³ of the produced excavated material, corresponding to about 90%, shall be utilized as backfilling material and remaining 3,693.6 m³ shall be spread on surface at the pole supports.

Excavation refuse to be generated during the course of excavation works shall not be dumped into flowing or dry stream beds under any circumstances. The entire excavation refuse to be generated shall be used for backfilling of pole pits.

VII.1.3. Processes Related Construction of Service Roads for Transmission Lines; Materials to be Used,

Currently available service roads shall be used as far as possible during the entire course of the construction works of the 380 kV ACWA Power Kirikkale Overhead transmission Line. In cases where any property or agricultural land shall exist on the road that is to be used for passageway purposes, alternate access routes shall be sought to the pole construction site.

When, during the course of construction of the line, available roads fall short of needs and road construction becomes obligatory, service road shall be constructed in such a way to cause the least damage to agricultural lands and which can meet the needs of the local population as far as possible. Taking necessary permission from the owner of the land phase of the opening of the service roads loss-damages will be paid to land owner.

Existing roads are planned to be used for OHTL line construction activities and the following points will be observed in the case of the opening of the service road;

- By use of drainage channels, sediment transport to streams will be prevented.
- Losses will occur in areas of private property will be paid by the contractor.
- Usage of lands with visual value will be avoided
- Usage of areas with high ecological and cultural value will be avoided
- Usage of surface water areas will be avoided.
- After construction phase, if closure of service roads is requested, used lands will be restored as previous landscape.

During creek crossings to be made along the line route, action shall be taken by considering the horizontal vertical distances that are set forth in Article 44 of Electricity High Current Installations Regulation.

VII.1.4. Activities Regarding Construction of Transmission Lines,

Activities in relation with Overhead transmission Line project are listed below.

a.) Study and Design

consist of the following phases

- Approximate route of the line is drafted on maps to scale of 1/25.000, accuracy of the approximate route is investigated in the field, and, resulting from these studies, the final route is determined by carefully examining the below mentioned issues.
 - Possibilities of ease for installation, maintenance and operation,
 - Areas of swamp, gully and subject to landslides,
 - Regions like forests, orchards, groves,
 - Military zones, airfields,
 - Places like state hatcheries, poplar growing institutes, etc.,
 - Status of parallelism with Telecom line and with the current OHTL,
 - Special environmental protection zones,
 - Highways, State Railways, dams, ponds, irrigation channels, State Hydraulic Works service roads,
 - Improved regions,
 - Mining and coal regions
- Preparation of the EIA Report, its presentation to Ministry of Environment and Urban Planning and approval of the EIA Report by the Ministry,
- Approval of the Plan-Profile,
- Preparation of confiscation plan for ownership and right of way.

b.) Manufacturing

The selected poles are manufactured based on their types to make them ready for erection.

c.) Assembly

The assembly process includes lower-assembly, upper-installation, wire drawing and acceptance test procedures. Detailed explanation of concerned procedures is given under title **Chapter.III.3.**

d.) Wire Drawing

Upon completion of lower and upper assembly works, conductor wires will be drawn between the poles. Wire drawing machine shall be used during such operation

e.) Acceptance Tests

Following completion of all construction works, the line shall be examined and shall be handed over to TEİAŞ General Directorate.

During the construction phase of the project, any damages will be borne by the contractor.

VII.1.5. Processes of Dust Emission like Crushing, Grinding, Transportation and Storage during Construction,

OHTL Land Preparation and Construction Works

Emissions in the field during the course of OHTL land preparation and construction works shall originate only from the excavation works to be performed for foundation pits of the poles and from the exhaust gasses of the vehicles which will operate in the field.

No crushing, grinding, etc., operations shall be carried out in the course of land preparation and construction works of the project. By virtue of the fact that no long distances exist between the poles, materials like sand and gravel shall not be deposited at certain places but necessary amounts of materials shall be transported to erection places of the poles. Consequently, no storage area shall be created and there shall be no dust emissions due to storage. However, insignificant amounts of dust emission shall take place during transportation of construction materials.

As an outcome of investigations made, it was established that it will take around four hours to complete the necessary excavation procedures that are required for one pole support. Foundation excavations of the poles to be constructed along the OHTL shall not be made at the same time. Consequently, the calculations regarding the dust emission to take place during excavation activities are carried out by considering the excavation to be made for one pole.

A total of 27 m³ of excavation material shall be obtained from one support pit.

27 m³ x 1.4 ton/m³ = 37.8 tons of excavated material shall be obtained.

It is assumed that excavation activities for one support pit takes 4 hours on average;

$37.8 \text{ ton}/4 \text{ hours} = 9.45 \text{ tones/hour}$ of dust emission shall take place as a result of one hour of excavation.

Pole support pits shall be excavated by excavators and the excavated material that is ripped out by the excavator shall be dumped just next to the pole.

In calculation of quantities of dust emissions to take place during excavation of support pits, the uncontrolled emission factors were used which are given in the Industrial Air Pollution Regulation, Annex-12, Table 12.6, which became effective by being published in the Official Gazette dated 3 July 2009 and numbered 27277.

Dust quantities to be generated during excavation of one support pit are given below.

Dust quantities during excavation shall be: $9.45 \text{ ton/hour} \times 0.025 \text{ kg/ton} = 0.23625 \text{ kg/hour}$

Dust quantities during dumping of the material that is obtained after excavation shall be: $9.45 \text{ ton/hour} \times 0.010 \text{ kg/ton} = 0.0945 \text{ kg/hour}$

The total amount of dust to be generated in the course of excavation of one support pit shall be: $0.23625 \text{ kg/hour} + 0.0945 \text{ kg/hour} = 0.33075 \text{ kg/hour}$.

In relation with the hourly total mass flow rate of dust to take place during the excavation works to be carried out in the scope of the project; in the Control of Industrial Air Pollution Regulation, Annex-12, which became effective by being published in the Official Gazette dated 3 July 2009 and numbered 27277, under title of "Calculation of Contribution Values of Plants to Air Pollution and Air Quality Measurement", it is set forth that "For existing or to-be built plants, the hourly mass flow rate of emissions discharged to the atmosphere from chimneys or from outside the chimneys shall be determined by performing measurements at the chimney for existing plants, and, for emissions which are discharged from outside the chimneys and for the to-be built plants, it shall be determined by using emission factors."

According to this, when it is considered that the pole support pits shall not be excavated at the same time during the construction works, it has been concluded that the above mentioned emission values shall be very much smaller than the value of 1 kg/hour that is indicated in the relevant regulation.

Emission Quantities from Vehicles

A small amount of emission shall take place by virtue of the construction machinery usage during excavation activities in the scope of the project, which are mainly CO, NO_x, SO_x and PM.

Fuel to be used during the activity shall only be diesel fuel that is required to operate vehicles. Refueling shall be performed at licensed fueling stations located in the vicinity of the project route. Emission quantities to originate from vehicles to be used during construction activities of each pole are given in the below table.

Table 45. Emission Factors Originating From Diesel Vehicles (kg/ton)

POLLUTANT	DIESEL
Carbon Monoxides	9.7
Hydrocarbons	29
Nitrogen Oxides	36
Sulphur Oxides	6.5
Dust	18

Reference: Basics of Air Pollution and of Its Control [*Hava Kirliliğinin ve Kontrolünün Esasları*], Ayşen Müezzinoğlu, 2000

Assuming that the 10 units construction equipment which are planned to be used during the construction phase will operate at the same time, the maximum quantity of fuel to be consumed by one vehicle is foreseen to be 20 lt/hour and the respective mass flow calculations are given below

Density of diesel fuel = 0.8654 kg/lt,
20 lt/hour-vehicle x 0.8654 kg/lt x 10 vehicles = 173.08 kg/hour= 0.173 ton/hour

Carbon Monoxides : 9.7 kg/ton x 0.173 ton/hour = 1.6781 kg/hour
Hydrocarbons : 29 kg/ton x 0.173 ton/hour = 5.017 kg/hour
Nitrogen Oxides : 36 kg/ton x 0.173 ton/hour = 6.228 kg/hour
Sulphur Oxides : 6.5 kg/ton x 0.173 ton/hour = 1.1245 kg/hour

Since the mass flow rate calculated for the construction equipment to operate in the concerned project have very small values and by considering that these vehicles shall operate at a point intermittently and at most for 3 to 4 hours in a day, the emissions are not expected to have an adverse impact on the current air quality.

During the activities, provisions of the Control of Industrial Air Pollution Regulation shall be respected, which became effective by being published in the Official Gazette dated 3 July 2009 and numbered 27277.

VII.1.6. Quantity and Properties of the Solid Waste to be Generated in the Scope of the Project and Its Disposal,

During the land preparation and construction phases of the project, domestic solid waste generation from the crew of 120 employees is calculated below. Municipal waste quantity per person is assumed as 1.14 kg/person-day.²

Table 46. Solid Waste Amount

Phase	Personnel (1)	Waste Quantity Per Person (2)	Total Solid Waste Amount (kg/day) (3) = (1) x (2)
Lower Assembly	20	1.14 kg/person-day	22.8
Lower Assembly and Upper Installation Together	40		45.6
Upper Assembly and Wire Drawing Together	40		45.6
Wire Drawing	20		22.8

²Tuik 2012 Municipal Solid Waste Results

The solid waste to be generated during the land preparation and construction phase of the project shall be carried to waste containers of Municipalities in the vicinity of construction sites locations. And the solid waste accumulating in containers shall be collected and disposed by relevant municipalities by certain intervals.

Furthermore, construction waste (iron, metal, etc.) and packaging waste (cement paper, machinery and equipment covers, paper, styropor, etc.) to be generated during construction and erection activities of the OHTL shall be assured to be recycled by delivering them to licensed recycling companies.

As it is indicated in Article 18 of the "Control of Solid Waste Regulation", which became effective by being published in the Official Gazette dated 14.03.1992 and numbered 20814 and lastly modified and remained effective by means of the Official Gazette dated 05.04.2005 and numbered 2577, the employees shall be warned during all phases of the project that the solid waste originating from employees is forbidden to be dumped in sea, lakes and similar receiving environments and onto streets and they shall be made to obey both this restriction and to all provisions of the "Control of Solid Waste Regulation".

The packaging and packaging waste which is likely to be generated during the construction phase of the project shall be disposed of in accordance with provisions of the "Control Of Packaging Waste Regulation" which became effective by being published in the Official Gazette dated 24.06.2007 and numbered 26562. Packaging waste will be collected separately from other waste and sent to licensed firms for recycling.

Furthermore, maintenance, repair and cleaning of vehicles to operate in the land preparation and construction phase shall not be performed on the lands situated on the project route and these operations shall be got to be made at the authorized services and/or at refueling stations closest to the route. Consequently, no waste oil generation shall also take place at the project site. Provisions of the Control of Waste Oil Regulation, which became effective by being published in the Official Gazette dated 30.07.2008 and numbered 26952, and of the Regulation On Amendment of the Control of Waste Oil Regulation, which became effective by being published in the Official Gazette dated 30.03.2010 and numbered 27537, shall be respected.

Furthermore, solid waste generation shall also take place during operation phase of the OHTL due to maintenance of the installation. Maintenance teams will inspect the line at certain times of the year along the route of the line, they will make maintenance and repair on the line, damaged materials will be replaced by new ones and the used materials will be kept at the warehouses of General Directorate of Turkey Electricity Transmission Corporation to be utilized again or they shall be disposed of.

Surface water sources are situated at some places in the vicinity of the line route and of the examination corridor. No tails, solid wastes, etc. shall be dumped into the concerned surface water sources under any circumstances, stream beds shall not be modified and no pollution shall be allowed due to the activities.

The Regulation on Waste Management General Principles, dated 05.07.2008 and numbered 26927 shall be respected during activities.

During the construction, it is planned to employ 120 people. Since it is more than 49 people, temporary infirmary unit will be established according to occupational health and safety legislation. Temporary infirmary will be able to deal with outpatient treatments. Depending on the material used for the temporary infirmary unit will consist of medical waste. Medical waste will be not mixed with other types of wastes.

First-aid equipments will be available for small injuries that may occur during construction activities. For injuries and health problems in large scale, nearest hospitals will be used. For this reason, small amount of medical waste such as band-aid, bandage, etc may occurs. According to Medical Waste Control Regulation Article 13, these wastes will be collected in special impermeable liners and sent to licensed medical storage/disposal site.

Medical waste collection, storage and disposal will be performed comply with 25883 dated 07.22.2005 published in Official Gazette "Medical Waste Control Regulation" (modified in the Official Gazette dated 30.03.2010 and numbered 27537).

VII.1.7. Quantities of Water to be Used in the Scope of the Project, Places and Ways to Obtain It, Treatments and Receiving Environments for the Waste Water to be Generated by Using These Waters and How to Deliver them To these Receiving Environments and Properties of these Waters,

During the land preparation and construction phases of the project, water usage from the crew of 120 employees is calculated below. Water quantity per person is assumed as 150 lt/person-day.³

Table 47. Water Usage Amount

Phase	Personnel (1)	Water Usage Per Person (2)	Total Water Quantity (m ³ /day) (3) = (1) x (2)	Total Wastewater Quantity (m ³ /day) (4) = (3)*
Lower Assembly	20	150 lt/person-day (0,15 m ³ /person-day)	3	3
Lower Assembly and Upper Installation Together	40		6	6
Upper Assembly and Wire Drawing Together	40		6	6
Wire Drawing	20		3	3

* It is assumed that 100% of the water to be used by the personnel employed for OHTL shall return as waste water

The water to be used by the employees shall be provided by purchasing from the market and/or it shall be provided on a daily basis from potable water sources (fountain, etc.) in the vicinity.

Construction site locations to be established during construction of the line have not become definite yet. If available houses will not be used to establish the construction site, then, watertight septic tank shall be prepared at the site area.

Domestic liquid waste to accumulate in the watertight septic tank will be collected by sewage truck from their locations and it shall be discharged to the infrastructure plant or to the treatment plant to be designated by the municipality which is responsible for the location of the construction site.

³ Provincial Bank, Waste Inventory

A protocol for collection of liquid waste shall be signed with Municipalities which will collect the liquid waste to be generated during construction activities. Related Provincial Environment and Urban Planning Directorates shall be notified upon signing of respective protocols with the municipalities.

Furthermore, regarding concrete production for construction activities of the line, pre-mixed concrete (the concrete which is prepared at the concrete plant and taken directly to the pole location by mixer vehicles) shall be used for poles when access is possible. In-situ cast concrete production will be undertaken for poles which do not have access possibilities. No waste water shall be generated since the water to be used either for pre-mixed concrete or for in-situ cast concrete production will remain in the structure of the material. The water required for pre-mixed concrete is not included in the quantity of water that shall be used in the construction phase of the project since it will be provided at place of concrete preparation by the concrete supplier company. The settlements, fountains or surface water sources to obtain this sort of small quantity of water which will likely to be used in this scope has not become definite for the time being and it shall be determined at the implementation phase of the project. If the water to be used shall be provided from any surface water source located within the activity region, the State Water Works Regional Directorates shall be informed about the water source to be used and permission shall be obtained.

Furthermore, following completion of concrete productions at the pole where activity has been undertaken, washing of the returning mixer vehicles shall not be allowed to be made in or near the project region and this operation shall be assured to be performed at the concrete supplier company's own site (at the concrete plant).

If water needs shall be met from the underground water, underground water use permission certificate shall be obtained from relevant State Water Works Regional Directorates.

In every phase of the activity, provisions of the "Water Pollution Control Regulation", which became effective by being published in the Official Gazette dated 31 December 2004 and numbered 25687, and of the Aquaculture Resources Law and Regulation no 1380 shall be fulfilled and necessary measures shall be taken.

VII.1.8. Procedures Regarding Grounding to be Made on Overhead transmission Lines,

Ground of the OHTL shall be made in accordance with the "Erection Technical Specifications" of TEİAŞ General Directorate.

According to this, grounding resistance at the poles with grid foundation is measured prior to placing any grounding components. No grounding is required if grounding resistance is less than 20 ohms.

For all concrete and grid foundations with initial ground resistance greater than 20 ohms, a grounding rod or plate is installed at the centre point of the pole location and this rod or plate is connected to two opposite supports on the diagonal. No other grounding is implemented if ground resistance falls below 20 ohms as a result of this operation.

Counterweights (wire cables arranged in circular shapes which are used when satisfactory grounding is not provided) are supplemented if ground resistance is greater than 20 ohms. This supplementation continues until 20 ohm grounding resistance is obtained or until counterweights are placed to all supports. Resistance measurement shall be made by

means of rod or grounding wire plate which is disconnected from the resistance and no chlorides or conductivity salts shall be used.

VII.1.9. The Sources And The Level of the Noise to be Generated by the Works in the Course of Land Preparation and Plant Construction,

Construction phase will be composed of 2 parts. In the first part excavation of the foundation trenches for carrier poles and concreting and the second part includes establishment of energy transmission poles. The list of the machinery-equipment which will be used during the first part of the construction phase and which is indicated to be sources of noise is given below.

Table 48. List of Machinery to be Used During First Part of Construction Phase

Noise Source	Quantity
Land Vehicle	2
Truck	2
Concrete Pump	1
Transmixer	2
Pumper	1
Excavator	1
Dipper	1

The OHTL Project is not included in the List of Annex-1 and Annex-2 of the Regulation On Permissions and Licenses to be Obtained Pursuant to the Environmental Law. However, calculations were carried out in order to determine the noise to be generated during the activities and in order to develop relevant measures.

The “Regulation on Noise Emission in Environment Created by Equipment Used in Open Space” (Phase II after 3rd of January 2006), issued by Ministry of Industry and Commerce (30/12/2006, OG 26392), was taken as the basis to calculate the sound power of machinery and equipment which are anticipated to be used in the construction phase.

Furthermore, reflective and absorbing surfaces located within the impact zone of the source were not taken into consideration in calculations for the construction phase of the project. By considering worst possibilities in the said calculations, the machinery to be used for construction activity were assumed to operate simultaneously and at the same place.

Engine power of the truck to be used in the scope of the project is 249 HP. By assuming that 1 HP is 0.746 kW, engine power of the truck is obtained as: 249 HP x 0.746 kW = 186 kW. When the values given in the “Regulation on Noise Emission in Environment Created by Equipment Used in Open Space” are considered, and since, in sound power calculation, $P = 186 \text{ kW} > 55 \text{ kW}$, the formula of “ $L_w: 82+11 \log P$ ” was used.

$$L_w = 82 + 11 \log 186 = 107 \text{ dB}$$

Sound power levels of other equipment which will operate in the scope of the project were calculated individually according to the method given above for truck by basing on engine power values indicated in catalogues of the vehicles. Machinery will operate for short

durations and not continuously. By considering worst possibilities in calculations, all machinery were assumed to operate simultaneously and at the same place.

The sound power level in each octave band of distribution of the total sound power level of each noise source for the 4 octave bands between 500 and 4000 Hz is calculated as follows pursuant to the truck example.

$$L_{w(i)} = 10 \log \frac{10^{L_w/10}}{4} \text{ and } L_p = L_w + 10 \log(Q/A)$$

Basing on the formula, the sound power level of the truck is given in **Table 49** and the sound pressure level which will develop according to distance is given in **Table 50**. In the concerned formulae;

$$A = 4 \pi r^2$$

Q= orientation coefficient

(Hemispherical distribution of sound source on ground level, Q=1)

r = Distance from source (m)

Table 49. Sound Power Level

Noise Source	Lw (dB)	Sound Power Level (dB)			
	Total	500Hz	1000Hz	2000Hz	4000Hz
Truck	106.96	100.94	100.94	100.94	100.94
2 Trucks	109.97	103.95	103.95	103.95	103.95

Table 50. Sound Pressure Level Based on Distance

Noise Source	Distance (m)	Lp (dB)
2 Trucks	10	72.96
	43	60.30
	50	58.99
	100	52.96
	375	41.48
	550	38.16
	750	35.46
	850	34.38
	900	33.88
	1000	32.96

Atmospheric absorption values according to each frequency for truck are calculated by the formula $A_{atm} = 7.4 \times 10^{-8} \times f^2 \times r / \phi$ and they are given in **Table 52**. In the concerned formula;

A_{atm} = Drop in sound pressure level by atmospheric retouch (dBA)

f = Frequency of transmitted sound

r = Distance from source (m)

ϕ = Relative humidity of air (average of relative humidity values of provinces which the line crosses is 72%)

Table 51. Weight Coefficients According to Frequency

MHz	500	1000	2000	4000
A-Weight Coefficients	-3.2	0	+1.2	1

Calculation of A-Weight Coefficients of Atmospheric absorption values is presented in **Table 51**.

Table 52. Atmospheric Absorption (dBA)

Distance (m)	Atmospheric Absorption			
	500Hz	1000Hz	2000Hz	4000Hz
10	-3.1970161	0.0119355	1.2477419	1.1909677
43	-3.1871694	0.0513226	1.4052903	1.8211613
50	-3.1850806	0.0596774	1.4387097	1.9548387
100	-3.1701613	0.1193548	1.6774194	2.9096774
375	-3.0881048	0.4475806	2.9903226	8.1612903
550	-3.0358871	0.6564516	3.8258065	11.5032258
750	-2.9762097	0.8951613	4.7806452	15.3225806
850	-2.9463710	1.0145161	5.2580645	17.2322581
900	-2.9314516	1.0741935	5.4967742	18.1870968
1000	-2.9016129	1.1935484	5.9741935	20.0967742

A-Weight Atmospheric Absorption values are replaced in $L = L - A_{atm}$ formula and calculated for each frequency and as a result A-Weight Sound Pressure Levels are found in 4 different frequencies. A-Weight Sound Pressure Levels in 4 different frequencies are added by $L_t = 10 \log \sum 10^{L_{pi}/10}$ formula and total sound level at each receiving point of vehicles is found. Calculation results made for truck is given in **Table 53**.

Table 53. Sound Pressure Level for Truck

Distance (m)	Sound Level (dBA)				Total Sound Level (dBA)
	500Hz	1000Hz	2000Hz	4000Hz	
10	69.77	72.95	71.72	71.77	77.72
43	57.11	60.24	58.89	58.47	64.84
50	55.80	58.93	57.55	57.03	63.49
100	49.79	52.85	51.29	50.05	57.19
375	38.40	41.04	38.49	33.32	44.60
550	35.12	37.50	34.33	26.65	40.81
750	32.49	34.57	30.68	20.14	37.72
850	31.43	33.36	29.12	17.14	36.46
900	30.95	32.81	28.38	15.69	35.89
1000	30.06	31.77	26.99	12.87	34.83

Sound levels of equipment which will be involved in excavation, backfilling and erection activities during Line Construction are calculated according to the calculation examples given above for truck and the Sound Power Levels are given in **Table 54**, the Total Sound Levels, which take account of correction factors, are given **Table 55**.

Table 54. Sound Power Levels

Noise Source	Sound Power Level (dB)				
	Total	500Hz	1000Hz	2000Hz	4000Hz
Land vehicle (2)	107.55	101.53	101.53	101.53	101.53
Truck (2)	109.97	103.95	103.95	103.95	103.95

Noise Source	Sound Power Level (dB)				
	Total	500Hz	1000Hz	2000Hz	4000Hz
Concrete Pump	104.00	97.98	97.98	97.98	97.98
Transmixer (2)	102.61	100.99	100.99	100.99	100.99
Pumper	102.30	96.28	96.28	96.28	96.28
Escavator	107.14	101.12	101.12	101.12	101.12
Dipper	103.22	97.20	97.20	97.20	97.20

Table 55. Total Sound Levels

Noise Source	Distance (m)	Sound Level (dBA)				Total Sound Level (dBA)
		500Hz	1000Hz	2000Hz	4000Hz	
Land Vehicle	10	67.34	70.53	69.29	69.35	75.29
	43	54.68	57.82	56.47	56.05	62.42
	50	53.38	56.50	55.12	54.61	61.07
	100	47.37	50.42	48.86	47.63	54.77
	375	35.97	38.61	36.07	30.90	42.17
	550	32.70	35.08	31.91	24.23	38.39
	750	30.06	32.14	28.26	17.72	35.29
	850	29.01	30.94	26.69	14.72	34.04
	900	28.52	30.38	25.96	13.27	33.46
	1000	27.64	29.35	24.57	10.44	32.40
Truck	10	69.77	72.95	71.72	71.77	77.72
	43	57.11	60.24	58.89	58.47	64.84
	50	55.80	58.93	57.55	57.03	63.49
	100	49.79	52.85	51.29	50.05	57.19
	375	38.40	41.04	38.49	33.32	44.60
	550	35.12	37.50	34.33	26.65	40.81
	750	32.49	34.57	30.68	20.14	37.72
	850	31.43	33.36	29.12	17.14	36.46
	900	30.95	32.81	28.38	15.69	35.89
	1000	30.06	31.77	26.99	12.87	34.83
Concrete Pump	10	63.79	66.98	65.74	65.80	71.74
	43	57.51	54.27	52.91	52.50	60.81
	50	56.20	52.95	51.57	51.06	59.47
	100	50.16	46.87	45.31	44.08	53.26
	375	38.60	35.06	32.52	27.35	41.06
	550	35.22	31.53	28.36	20.68	37.44
	750	32.46	28.59	24.71	14.17	34.49
	850	31.35	27.39	23.14	11.17	33.29
	900	30.84	26.83	22.41	9.72	32.74
	1000	29.89	25.80	21.02	6.89	31.72
Tranmixer	10	66.80	69.99	68.75	68.81	74.75
	43	54.14	57.28	55.93	55.51	61.88
	50	52.84	55.96	54.58	54.07	60.53
	100	46.83	49.88	48.32	47.09	54.23
	375	35.43	38.07	35.53	30.36	41.63
	550	32.16	34.54	31.37	23.69	37.85
	750	29.52	31.60	27.72	17.18	34.75
	850	28.47	30.40	26.15	14.18	33.50

Noise Source	Distance (m)	Sound Level (dBA)				Total Sound Level (dBA)
		500Hz	1000Hz	2000Hz	4000Hz	
	900	27.98	29.84	25.42	12.73	32.92
	1000	27.10	28.81	24.03	9.90	31.86
Pumper	10	62.09	65.27	64.04	64.09	70.04
	43	49.43	52.56	51.21	50.80	57.16
	50	48.12	51.25	49.87	49.35	55.81
	100	42.12	45.17	43.61	42.38	49.51
	375	30.72	33.36	30.81	25.64	36.92
	550	27.44	29.82	26.65	18.98	33.13
	750	24.81	26.89	23.00	12.46	30.04
	850	23.75	25.68	21.44	9.46	28.78
	900	23.27	25.13	20.70	8.01	28.21
	1000	22.38	24.09	19.31	5.19	27.15
Excavator	10	66.93	70.12	68.88	68.94	74.88
	43	54.27	57.41	56.06	55.64	62.01
	50	52.97	56.09	54.71	54.20	60.66
	100	46.96	50.01	48.45	47.22	54.36
	375	35.56	38.20	35.66	30.49	41.76
	550	32.29	34.67	31.50	23.82	37.98
	750	29.65	31.73	27.85	17.31	34.88
	850	28.60	30.53	26.28	14.31	33.63
	900	28.12	29.97	25.55	12.86	33.05
	1000	27.23	28.94	24.16	10.03	31.99
Dipper	10	63.02	66.20	64.97	65.02	70.96
	43	50.36	53.49	52.14	51.72	58.09
	50	49.05	52.17	50.80	50.28	56.74
	100	43.04	46.09	44.54	43.30	50.44
	375	31.64	34.28	31.74	26.57	37.85
	550	28.37	30.75	27.58	19.90	34.06
	750	25.74	27.82	23.93	13.39	30.96
	850	24.68	26.61	22.37	10.39	29.71
	900	24.20	26.05	21.63	8.94	29.13
	1000	23.31	25.02	20.24	6.12	28.07

By using formula: $L_{day} = L_{eg} = 10 \log \sum_{i=1}^n 10^{L_{pi}/10}$ it is calculated for different receiving

points when all the vehicles are working at the same time. Sound levels according to distances originating from vehicles are given in **Table 56** and graph in **Figure 38**.

Table 56. Sound Levels According to Distances Originating From Vehicles in the First Part of the Construction Phase

Distance (m)	L day
10	82.81
30	70.13
35	69.98
50	68.78
100	62.49
375	49.94

Distance (m)	L day
550	46.18
750	43.10
850	41.85
900	41.28
1000	40.23

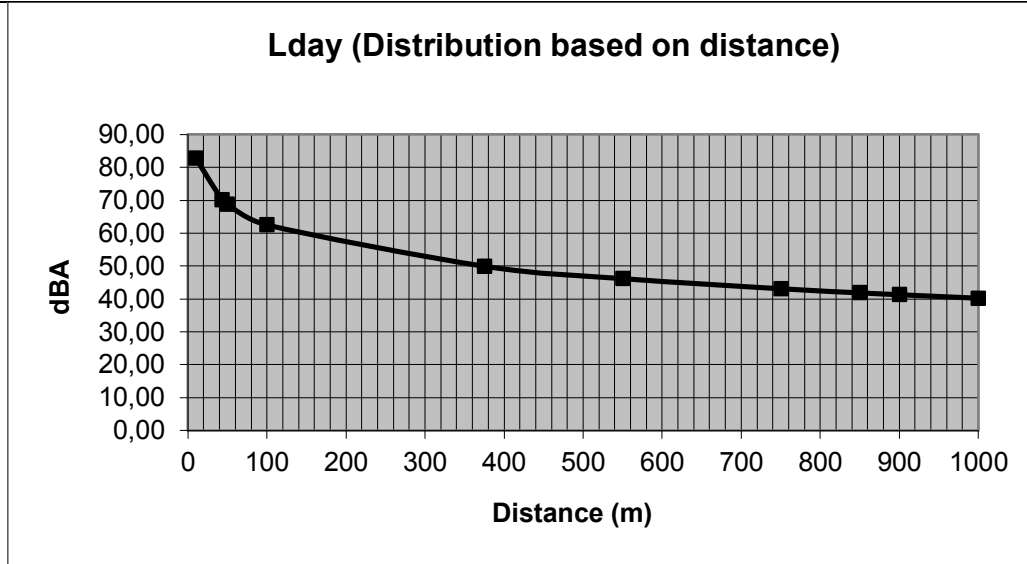


Figure 38. Sound Levels According to Distances Originating From Vehicles in the First Part of the Construction Phase Graph

Table 57. List of Machinery to be Used During Second Part of Construction Phase

Noise Source	Quantity
Land Vehicle	2
Wire Drawing Machine	1
Crane (20 tones capacity)	1

Sound power levels of these machines are given in **Table 58**.

Table 58. Sound Power Levels

Noise Source	Sound Power Level (dB)				
	Total	500Hz	1000Hz	2000Hz	4000Hz
Land Vehicle	104.54	101.53	101.53	101.53	101.53
Wire Drawing Machine	104.79	101.78	101.78	101.78	101.78
Crane (20 tones capacity)	106.91	100.89	100.89	100.89	100.89

Total sound values of the vehicles according to receiving distances considering atmospheric absorption and A-Weight correction factors are presented in **Table 59**.

Table 59. Total Sound Values

Noise Source	Distance (m)	Sound Level (dBA)				Total Sound Level (dBA)
		500Hz	1000Hz	2000Hz	4000Hz	
Land Vehicle	10	67.34	70.53	69.29	69.35	75.29
	30	57.81	60.96	59.66	59.43	65.63
	50	53.38	56.50	55.12	54.61	61.07
	100	47.37	50.42	48.86	47.63	54.77
	375	35.97	38.61	36.07	30.90	42.17
	550	32.70	35.08	31.91	24.23	38.39
	750	30.06	32.14	28.26	17.72	35.29
	850	29.01	30.94	26.69	14.72	34.04
	900	28.52	30.38	25.96	13.27	33.46
	1000	27.64	29.35	24.57	10.44	32.40
Wire Drawing Machine	10	64.58	67.77	66.53	66.59	72.53
	30	55.05	58.20	56.89	56.66	62.86
	50	49.03	52.16	50.78	50.26	56.72
	100	44.61	47.66	46.10	44.87	52.01
	375	33.21	35.85	33.31	28.14	39.41
	550	29.94	32.32	29.15	21.47	35.63
	750	27.30	29.38	25.50	14.96	32.53
	850	26.25	28.18	23.93	11.96	31.28
	900	25.76	27.62	23.20	10.51	30.70
	1000	24.88	26.59	21.81	7.68	29.64
Crane	10	66.71	69.89	68.65	68.71	74.65
	30	62.72	59.50	58.19	57.96	66.07
	50	57.52	54.28	52.90	52.38	60.80
	100	53.07	49.78	48.23	46.99	56.18
	375	41.51	37.97	35.43	30.26	43.98
	550	38.13	34.44	31.27	23.59	40.35
	750	35.38	31.51	27.62	17.08	37.40
	850	34.26	30.30	26.06	14.08	36.20
	900	33.75	29.74	25.32	12.63	35.65
	1000	32.80	28.71	23.93	9.81	34.63

A-Weight Sound Levels during the day in the construction site is given in **Table 60** and graph in **Figure 39**.

Table 60. Sound Levels According to Distances Originating From Vehicles in the Second Part of the Construction Phase

Distance (m)	L day
10	79.08
30	69.84
50	64.70
100	59.41
375	47.01
550	43.30
750	40.28
850	39.05

Distance (m)	L day
900	38.49
1000	37.46

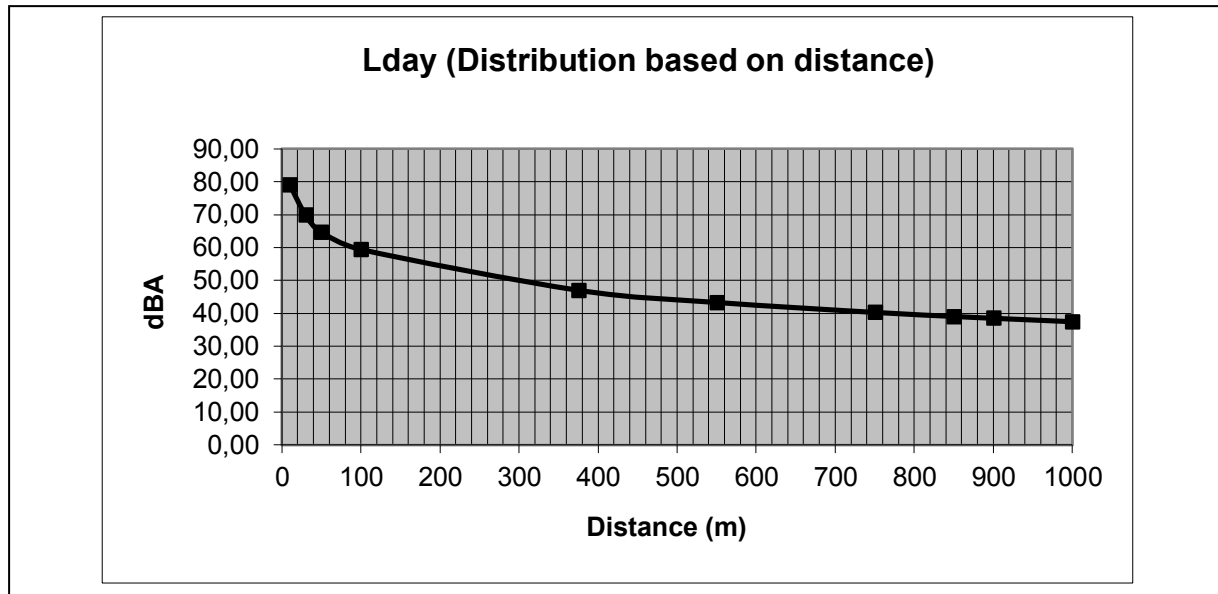


Figure 39. Sound Levels According to Distances Originating From Vehicles in the Second Part of the Construction Phase Graph

In the course of the activities that are to be realized in the scope of the project, the issued which are indicated the Environmental Noise Criteria (Article 23) For construction sites in the Regulation On Assessment and Management of Environmental Noise shall be observed and it shall be made sure that the limit values given in the regulation are not exceeded. Concerned values are given below.

Table 61. Regulation On Assessment and Management of Environmental Noise, Table 5: Environmental Noise Limit Values For Construction Site

Sites	L _{day}
Building	70
Road	75
Other Sources	70

In conclusion;

As seen the above tables and figures, in the 1. Part after 35 m and in the 2. Part after 30 m, the noise level is below 70 dBA.

Also, above calculations made with assumption of all vehicles are working at the same time in order to figure out the worst case. Infect, all vehicles will not work at the same time. All construction activities will continue only during day time.

As a result, noise levels during construction phase will be under 70 dBA which is the limit mentioned in Table 5 of Environmental Noise Assessment and Management Regulation.

Furthermore, construction of one of the poles to be used in OHTL shall be completed in approximately 4 hours. In this context, when the short duration of construction activity is considered, it is concluded that the impact on settlements of the noise originating from construction shall be of a short duration as well.

In the framework of the "Regulation On Assessment and Management of Environmental Noise" Article 25 (b), the vibration which shall be caused by piling and similar vibration generating operations at construction sites and the vibrations which shall be caused by heavy construction equipment shall not be able to cause and harm on buildings around them when it is considered that all activities shall be undertaken away from settlements.

Noise shall vary throughout the day during the course of the activities but noise generation shall be limited as the activities shall be carried out during daytime.

In the course of the activities, necessary measures shall be taken to minimize noise generation by taking into account the "Conditions To Be Observed By Highway Vehicles" that are indicated in Article 9 of the concerned regulation and the "Conditions To Be Observed by Equipment Used In Open Space" that are indicated in Article 13 of the concerned regulation.

Furthermore, provisions of the "Work Health and Safety Regulation" shall be respected which establish the measures to be taken to improve health and safety conditions, which became effective by being published in the Official Gazette no 25311 dated 09 December 2003.

VII.1.10. Natural Vegetation Species to Be Eliminated for the Purpose of Providing Necessary Land for Land Preparation and Construction Site and on How Much Area These Works Will Be Performed

Unique adverse effects for the vegetation species at the stage of land preparation and construction is to the ditches to be opened by stripping the vegetative soil cover (topsoil) at the places which might coincide with the pole feet. The natural vegetation species which might be probably removed at this stage have been provided **in the list of flora given in Appendix-3.**

4 each foot ditches shall be opened as per pole and the surface area of every each ditch shall be $3\text{m} \times 3\text{m} = 9\text{m}^2$. Since 4 each ditches shall be opened as per pole; excavation Works shall be realized on a $4 \times 9 = 36\text{m}^2$ surface area. Since it is planned to use 342 poles within the scope of the Project;

The excavation operations shall be accomplished on a $342\text{ poles} \times 36\text{m}^2 = 12,312\text{m}^2$ surface area, approximately.

The soil excavated from these areas shall be re-used in filling upon placement of the pole feet into the ditches dug. Thus, the vegetation species shall be exposed to a short – term biomass loss in process of construction and Taking into account that these sections are very small areas, a situation like complete eradication of the flora species will not happen.

%90 of the material arisen from the excavation to be made for 342 each poles to be erected along the route of line shall be recycled in the works of filling and remaining 10% ($3.693,6\text{m}^3$), being the topsoil (vegetal soil) shall be recycled by being laid into the pole feet.

During the construction phase, biomass and habitat losses are expected during digging for the legs of poles. However, considering the dimensions of legs, there will be very small excavation works and vegetation soil which will be scraped before excavation will be preserved separately for reuse in landscape works in order to compensate habitat losses as much as possible. Therefore, biomass and habitat losses will not cause major environmental damage.

Upon completion of erecting the poles, the vegetation above the topsoil shall form again the vegetation used to exist previously by means of seeds, rhizome, onions etc. contained in the topsoil.

VII.1.11. Agricultural Land Size to Be Disposed for the Purpose of Acquisition of Land Required for the Land Preparation and Construction Area, Their Land Use Capabilities, Agriculture Product Types and Agricultural – Purpose Land Use Permit

Soil types commonly seen along the OHTL route are; brown soils, reddish brown soils, bare rock and debris, colluvial soils and brown forest soils. Information about soil types are given in **Section VI.2.4.**

As a result of the survey and cadastral archive studies land usage status of the OHTL route, 80 km of the route passes through agricultural land (private property), 37 km forest area and 1 km zoned area. Based on land use capability class, class I, II, III, IV, VI and VII lands are located on the line route.

Upon completion of construction works on the agricultural areas staying below the overhead transmission lines along the OHTL Route where easement shall be constituted, farming shall be likely kept on being carried out.

In process of preparing foundation, concrete laying, pole erection and wire drawing to be realized during installation of line, existing roads shall be used to the extent possible. In cases when agricultural lands were entered, the damage caused therein shall be borne by the undertaker.

The ownerships of the lands shall become definite following preparation of expropriation, easement and forestry permits and TEİAŞ General Directorate shall costs of land to the shareholders by effectuating the expropriations pursuant to Expropriation Law in direction of expropriation plan, by means of expropriation commission for both ownership and constitution of easement as well.

For non – farming purpose use of the farming areas contained in the scope of Project pursuant to the provisions of "Soil Conservation and Land Use Law" taken effect upon having been published in the Official Gazette numbered 25880 and dated 19 July 2005, necessary permits shall be obtained from the Ministry of Agriculture and Rural Affairs and/or Ankara and Kırıkkale Provincial Directorates of Food, Agriculture and Animal Husbandry.

VII.1.12. Types and Numbers of Trees Which Shall Be Cut During Preparation of Land Required for Construction, Precaution to Be Taken for Forest Areas, Measures to Be Taken Against Forest Fires

Forest properties of the Overhead Transmission Line route are presented in **Section VI.2.7** in detail. .

As a result of route land studies of the areas which are specified to be forest in Land Classification Map (**Appendix-2**), they were not physically in quality of normal forest. These areas being in quality of coppice forest are the systems which have lost their properties in general due to destruction.

In case of lumbering and/or trimming requirement, related permits will be taken according to 6831 numbered Forestry Law considering the type and the quantity of trees to be cut.

During construction phase, certainly, waste disposing to forest lands will be prohibited. Waste will be stored regularly and sent to licensed companies for disposal or recycle. Domestic waste will be taken by vehicles of local municipalities.

Fire prevention and fire fight trainings will be provided to workers in order to minimize fire origin damages. Uncontrolled fire makings will be strictly prohibited. In case of fire, first actions will be taken by workers and the local fire-fighting station will be informed.

In order to prevent dust formation at pole areas during construction phase, small-scale irrigation shall be implemented.

Overhanging wires will be audit regularly in order to prevent fires and renewal Works will be done for wires that pose fire risk.

If TEİAŞ maintenance team detects prolongation trees during regular audits, Forest Management Institution will be informed for trimming.

VII.1.13. Starting from Land Preparation, Where and How the Construction Site and Other Technical/Social/Infrastructural Requirements Would Be Installed For Personnel Who Shall Work in the Tasks to Be Performed Until Opening of the Units for Activity

The construction buildings shall be set up in order to satisfy the social needs of the employees who shall function during construction phase of the overhead transmission line. These construction buildings shall be met by the buildings to be built on the empty lands within the areas close to the settlements in general or the residences to be rented from the settlement locations.

The construction areas needed shall be selected by the company which shall accomplish the construction of the transmission line. For this reason, precise information cannot be provided regarding the place of construction sites in the ESIA report.

The places and localities where said construction site buildings would be built and/or rented prior to construction of the planned overhead transmission line shall be notified in writing to Provincial Environment and Urbanization Directorates prior to construction.

Other than above – mentioned ones within scope of Project, there is no infrastructural facilities in the region.

VII.1.14. Determining the Effect of Intensity and Propagation Effects of Material on Cultural and Natural Assets Found Beneath and Above the Ground (Traditional Provincial Texture, Archeological Remnants, Natural Values Required To Be Preserved) On Line Route and Its Immediate Vicinity and Precautions That Will Be Taken

380 kV ACWA Power Kırıkkale Overhead Transmission Line starts from ACWA Power Kırıkkale NGCCPP planned to be established within boundaries of Kırıkkale Province, Yahşihan County, Kılıçlar Municipality and passes through the Ankara Province, Kalecik, Çubuk, Pursaklar, Yenimahalle Counties and ends up in Bağlum SS situated in Keçiören County.

There are farming, zoned area and forestry areas across the line route and within survey corridor.

Within route of transmission line and the study area and/or its periphery surroundings, National Parks, wetlands, Natural Monuments, Nature Conservation Areas, Wildlife Conservation Areas, Areas of Biogenetic Reserves, Biosphere Reserves, Natural Sites and Monuments, Archaeological, Historical and Cultural Sites, Special Areas of Conservation, Tourism Areas and Centers do not exist within its scope.

At the implementation stage of Project (land preparation and construction), whenever any cultural and natural assets are come across, following procedure will be implemented.

- In case of archaeological find during construction works, all the construction activities in the area will be stopped.
- Responsible engineer will be alerted and the engineer will notify the nearest museum directorship, village headman or the local administrators within at the latest three days.
- The village headman, the local administrator receiving such notification or the relevant authorities that are directly notified of such property shall take the necessary measures to protect and secure such property. The village headman shall notify the nearest local administrator as of the situation and the measures taken on the same day. The local administrator and other authorities shall notify in writing the Ministry of Culture and Tourism and the nearest museum directorship within ten days.
- Upon receiving this notification, the Ministry and Museum Director shall instigate due proceedings as soon as possible in line with the provisions of this law.
- In this process, immovable cultural and natural property to be protected and conservation sites shall not be interfered with physically or by any way of construction.
- Construction will continue when allowed by the responsible authority.

VII.1.15. Harmful and Risky Operations to Human Health and Environment Among the Works To Be Maintained Starting From Land Preparation Up To Commissioning the Units for Activity

In process of land preparation and construction endeavors of Project, occurrence probability of construction machinery use – produced work-related accidents, post-falling injury and death events during pole erection and wire drawing might be in question.

At all stages of Project, the provisions of Labor Code numbered 4857, Labor Health and Safety Law numbered 6331 and the regulations and statues issued and to be issued in connection with these laws shall be abided and necessary measures shall be taken to

reduce all probable accidents and risks down to the lowest level possible. Moreover, at all phases of Project, obedience to the articles of TEİAŞ Work Safety Regulation numbered 37-265 and dated 5 February 2010 specified below shall be ensured.

Key articles of said regulation are being presented below;

Article - 74 No element shall be available at least within a 5 meter – safety distance from the protection wire drums in motion in process of protection wire drawing.

Article - 75 Prior to climbing the pole during team works to be accomplished on the single – circuit line, it must be first checked if line potential was cut off. As for the operations to be carried out across joint circuit and multi – circuit lines, it must be checked that the energized line - other than lines energized - on which work shall be performed was ceased prior to climbing the pole and marking and marking and sign flags is accomplished and under potential working rules are to be followed.

Article - 76 The team member climbing the pole shall be equipped with personal protective materials such as the parachute – type safety belt, safety shoes, helmet etc. and a tool box. The safety belt shall be secured to the sound points so as to hamper fall throughout working process.

Article - 77 In operations to be carried out across overhead transmission lines, grounding shall be made from both sides of the working locality using Stanka (isolated maneuver rod) grounding hardware.

Article - 78 Materials and tools shall not be strictly thrown and be lifted and lowered using a monolingual reel – type roller rope system. Small hand tools (pliers, screwdriver; tools etc.) shall be carried in the tool bag attached to employee's belt.

Article - 79 If more than one person is to climb a pole to work; second person shall not start climbing using the same climbing axis before first person reached up.

Article - 80 At the moments when lifting and haulage vehicles are being used or moved nearby energized or de-energized conductors, it shall be ensured that these vehicles do not violate safety distances to the conductors.

Article - 81 In categorization of the working area, dimensions of apparatus, maneuverability facilities of the construction machinery and vehicles and probability of breakage of lines shall be considered.

Article - 82 Even if an operation being too close to the electrical facilities is not related to electricity, work permit shall be taken and the power of such facility shall be cut off. If cease of energy was impossible, work shall be commenced after having taken the precautions in Article – 45 for low voltage facilities and Article 54 for medium voltage and high voltage facilities.

Article – 83 In non – electrical operations in the vicinity of OHTL under potential, approach distances specified in Heavy Current Facilities Regulation shall be observed and tools suitable to the characteristics of facility shall be employed and all necessary measures shall be taken to prevent personnel to directly or indirectly violate these distances.

Article – 84 During chopping the trees nearby overhead transmission lines, necessary measures shall be taken for the trees cut to fall over OHTL. When deemed necessary, prior to cutting, power of OHTL shall be interrupted. In the event cutting trees on road side, the

measures which would prevent long – term traffic disruption shall be taken and the pieces of trees chopped up shall be removed from the bottom of the line as soon as possible.

Article - 241 In order to ensure safety of employees from TEİAŞ, necessary Personal Protective Equipments and Work Safety Supplies shall be provided by the unit superiors from every workplace.

Article - 242 Personal Protective Equipments and Work Safety Supplies provided shall be always kept in usable state and be checked by the Team Leader or SS Responsible Operation Technician.

Article 243 - Personal Protective Equipments (PPEs) belong to the person. The employees are obliged to the Personal Protective Equipments and Work Safety Supplies.

Article - 244 Personal Protective Equipments and Work Safety Supplies shall be strictly checked before beginning to work. Those which are damaged or not usable shall be replaced with new ones by issuing minutes. Moreover, 244 Personal Protective Equipments and Work Safety Supplies which have completed their shelf life (even if never used) shall be replaced by the new ones.

Article - 245 244 Personal Protective Equipments and Work Safety Supplies shall be in compliance to TSI, TSIQ) or international standards.

Article - 246 One of the safety helmets, helmets or hats being suitable for the qualification of the job shall be selected and worn at all places where head is to be protected.

Article - 247 In order to protect the eyes from the radiation, light, heat, particles, dust, snow, and dangerous environments, a cage, canopy, mask or goggles suitable for the eye shall be certainly used.

Article - 248 Those who shall work at the locations where gas and dust leakages which might be harmful for the human health are found the masks which prepare the working environment by supplying properly filtered or fresh air shall be employed.

Article - 249 The person working in the places where there is sound and noise above 85 db shall strictly use headphones or earplugs to protect its ears.

Article - 250 When working, the employees shall wear the gloves which protect their hands against effects like electrical strikes, welding arcs, crushing, substance sting, heat, chemical, acids, bases etc.

Article - 251 At places where electricity is available or likely to be available, Stanka gloves provided they are appropriate for the voltage levels.

- a) When opening or closing the circuit breaker and interrupters,
- b) When replacing the fuse,
- c) When checking with voltage Detector whether or not there is potential,
- d) When hooking up the grounding circuit,
- e) When working on alive circuits at laboratory,
- f) Energized location shall not strictly be touched with Stanka gloves.

Article - 252 Maintenance and control of isolated gloves;

- a) Gloves shall be frequently (as specified by company they were bought from) cleaned.

- b) In buying the gloves, their year of manufacture and shelf life shall be checked carefully and their follow ups shall be carried out.
- c) Gloves shall not come in contact with oil.
- d) Whether or not there is hole, crack and tear in the gloves shall be tested with a test method.
- e) Rubber gloves shall not be in contact with sharp object.
- f) When using gloves, the employees shall not wear rings which would damage the gloves.
- g) Isolated gloves shall be preserved by being powdered properly.

Article - 253 Parachute – type belt shall be used against fall in the operations at higher locations (Pole, tower, scaffolding, power transformer, etc.).

Article - 254 When removing and handling heavy and rollable materials, appropriate safety footwear shall be worn at the places where there is the possibility of sharp stinging objects and the shoes made of rubber or similar material at places where people handle acids, bases, similar chemicals and isolated shoes at places where electric strike might happen and boots when working in wet ground.

Article - 255 TEİAŞ – supplied jackets, pants, overalls or work clothes shall be put on during operation to protect the body against external effects. The features sought for with these protectors are as follows;

- a) Absolute heat and flame - resistant Work Safety Wear in the operations at places close to voltage places or places where there is / might be Arch risk,
- b) Acid and chemical - resistant aprons, jackets, pants or overalls in dealing with chemicals and battery rooms,
- c) Work Garments appropriate for the personnel functioning at electrical installations, operations, maintenance, repair works and workshop.

Article - 256 During the high voltage maneuver, together with other protective garments, Isolated Portable Carpet shall be used and collected and removed in roll at the end of such maneuver.

Article - 257 When working on the pole or building, a tool bag bearing the tools used properly shall be used.

Article - 258 Whenever a need for manual control happened during maneuver of devices which open and close the circuit and making grounding operation also across High Tension, Voltage level – compatible Isolated Stanka must be employed.

Article - 259 During operation of fuse replacement across Medium Tension, Fuse Replacement Clamp should be used.

Article – 260 During operation across High Tension and Medium Tension, when so required, whether or not voltage is applied to the circuit must be checked by a Voltage Detector.

Article - 261 In order to secure working area operations across HT, Grounding must certainly be made.

- a) When making the grounding, exposed sections of conductor shall not be touched with bare hands and Stanka grounding equipment shall be strictly used.
- b) When the grounding is being accomplished, firstly, the contact with earth is ensured then the conductor. The grounding process shall be separately performed as per phase.

- c) The conductor cross-section of the protection grounding shall be in cross-section to bear short-circuiting current.
- d) The clips of grounding equipment shall be of screwed type.
- e) The grounding equipments shall be seamless, flexible (flexible and multi-wire) and covered by transparent isolation.

Article - 262 Limit of safety at the working area; shall be made visible by painted, fluorescent or reflective cloth or plastic Work Area Warning Signs (Warning tapes) and flags.

VII.1.16. Flood Prevention and Drainage Related Procedures (Streams Shall Not Be Covered, Commitment of Not Dumping Excavation, Rubbles and All Kinds of Waste Materials into Stream Beds and Dam Lakes)

During the construction and operational phase of the Project, discharge of any liquid / solid waste, debris, excavation waste, etc. of seasonal – flow and flowing streams contained within the project area shall not take place and flow of streams shall not be intervened. In this context; relevant provisions of Premiership Circular (2006/7) dated 09 September 2006 and numbered 26284 shall be followed.

In direction of the measures taken, filling of river beds are not in question, in cases of intense precipitation conditions which might be experienced, formation of any flood, overflows or ponding shall not happen and ongoing water removal and discharge through stream beds shall be maintained.

The excavated soil which shall arise from in process of construction of poles shall be in no ways thrown into stream beds inside and outside of the study corridor and the flows of available flowing and dry stream beds shall not be hampered and their flow directions shall never be altered.

The excavated soil came out during opening the pole locations shall be re-used to fill ditches of the poles following their erection.

VII.2. Project Operating Phase Activities, Their Impacts on Physical and Biological Environments and Measures to Be Taken

VII.2.1. Characteristics of Basic Structures across Line Route (Poles, Isolators, Conductors, Towers etc.), Features, Dimensions and Capacities of Other Units

Along the overhead transmission line route, 31 some poles, 1 end pole and 310 carrier poles shall be constructed.

The poles to be used across the transmission line exhibit diversity according to the type of land and even type of conductor to be employed. It has been planned to be 380 kV Overhead transmission line. Pole types, pole numbers and line properties are selected according to “Electrical Heavy Current Facilities Regulation; Official Gazette No. 24246 dated 30 November 2000” by the Ministry of Energy and Natural Resources.

VII.2.2. What Kind of Operations Shall Be Carried Out for Line Route Maintenance, Materials to Be Used, Types and Amounts, Characteristics, Dimensions of Wastes to Come Out, and How They Shall Be Disposed

After commissioning of the line, the maintenance of line shall be accomplished by the line maintenance team who shall wander along the line route at certain times of the year.

The maintenance of the transmission lines has been performed by the line maintenance teams and the materials and their specifications used by such teams are provided in the following table.

Table 62. Transmission Line Maintenance Materials

MATERIAL NAME	CHARACTERISTIC
Aluminum Ladder	Aluminum
Grounding Cable	Braided Copper
Line Rifle	Metal-Braided Copper
Helmet	Fiberglass
Tools Set	Metal
Safety Belt	Braided Linen
Crane	Metal
Trifor	Metal
Pulley Tackle	Metal
Grabbing	Metal
Hydraulic Press	Metal
Hydraulic Scissors	Metal
Treadle	Metal
First Aid Stretcher	Metal+ Linen Cloth
Line Trolley	Metal

Damaged materials identified during line maintenance to be carried out upon commissioning of the line at certain periods shall be replaced with new ones and old ones shall be stocked at the depots belonging to relevant TEİAŞ Transmission Establishment and Operation Group Directorate.

The wires gotten loose and/or broke along the line shall be fixed and the parts discarded during this operation which cannot be reused by the institution shall be stocked from the depots and delivered to recycling firms which have acquired environment permit and environment license from the Ministry of Environment and Urbanization.

VII.2.3. Electric and Magnetic Field Intensities Generated From the Line, Impacts, Comparison with National and International Standards, Evaluation of Possible Impacts on Human Health and Environment, Specification of Precautions That Shall Be Taken, Evaluation According to the Nearest Residential Area

Electromagnetic radiations incorporate radio waves, micro waves, infrared rays, visible light, ultraviolet rays, x-rays, gama-rays and cosmic rays depending on wave lengths, frequencies and energies.

Primary radiation types are divided into two groups as ionizing radiation and non-ionizing radiation.

Ionizing radiation is an type of ionization where atoms around are directly or indirectly ionized by way of transferring its energy while penetrating through substance.

Radiation arising from base stations having fixed telecommunication devices not having ionizing effect, radio and television transmitters and electrical transmission lines, substation and electrical home appliances (microwave oven, razors, hair drying machine etc.) is included in electromagnetic radiation group referred as non-ionizing radiation.

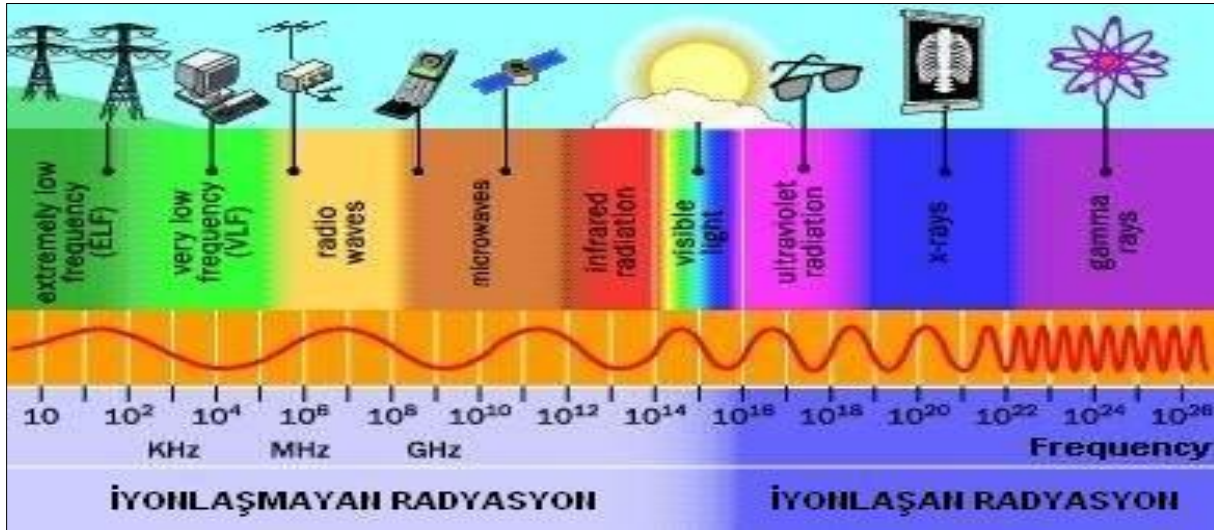


Figure 40. Comparison of Radiation Values By Factors Confronted During Daily Life

It is possible to divide effects of electromagnetic waves emitted from overhead transmission lines as "magnetic" and "electrical". Magnetic field is proportional with current passing through cable and electric field is proportional with voltage.

Electrical fields are generated by voltage and they get more powerful when voltage increases. Power of electrical field is measured as Volt/meter(V/m).

Magnetic field is a force to which other load particles applied intermediately by loaded particles. It creates circle and continuous field during current. Size of magnetic field and direction vary as to current intensity. Size of magnetic field is defined as Gauss (G).

Several researches have been conducted in the issue of effects of electrical field and magnetic field over biological life. In this research, evaluation of effects over human health has been realized in few steps. These steps are fully determination of biological effects, how these effects human health and their frequencies.

Although there are both electrical and magnetic fields around electrical tools and energy transmission and distribution lines, the recent researches have focused magnetic fields over potential human effects.

Thus, vast majority of studies conducted in relation to electrical and magnetic fields have become intensive in the issue of cancer researches. Some risk factors have been designated as to research results conducted and cancer risks have been revealed as to different effects.

For example, if risk factor is 2, this shows possibility of contracting cancer twice when compared with control group. Proven potential risk factors have been provided below.

Table 63. Relative Risks Factors Likely to Cause Cancer

Factor (Cancer Type)	Relative Risk	Reference																		
Smoking (Lung Cancer)	10 - 40	Wyner and Hoffman, 1982																		
Workers Working with Benzene)	1.5 -20	Sandier and Collman, 1987																		
Asbestos Professional Contact (Lung Cancer)	2-6	Fraumeni and Blot,1982																		
Prenatal X-rays (Child Cancer)	2.4	Harvey and et al.,1985																		
Environmental Tobacco Smoke- Second Hand	2-3	Fielding and Phenow,1988																		
Hair Paint (Leukaemia)	1.8	Cantor et al., 1988																		
Transmission Lines (Child Cancer)	1.3	Wertheimer and Leeper,1979 Savitz and et																		
Sakarine (Bladder Cancer)	1.5-2.6	IARC,1987																		
Excessive Alcohol (Mouth Cancer)	1,4-2,3 ³	Tuyns,1982																		
Electric Works (Leukaemia)	1.4-1.9	Savitz and Calle,1987																		
Coffee (Bladder Cancer)	1.3-2.6	Morison and Cole, 1987																		
Chloride Surface Water (Bladder Cancer)	1.3-2.3	Subcommittee on Disinfectants By-																		
⋮ <table><tr><td>Relative Risk</td><td>Coefficient</td></tr><tr><td><u>Power</u></td><td></td></tr><tr><td>1,0-1,2</td><td>Never</td></tr><tr><td>1,2-1,5</td><td>Weak</td></tr><tr><td>1,5-3,0</td><td></td></tr><tr><td>Moderate</td><td></td></tr><tr><td>3,0-10,0</td><td></td></tr><tr><td>Powerful</td><td></td></tr><tr><td>10,0 Above</td><td></td></tr></table>		Relative Risk	Coefficient	<u>Power</u>		1,0-1,2	Never	1,2-1,5	Weak	1,5-3,0		Moderate		3,0-10,0		Powerful		10,0 Above		• Relation of Cause-Effect is generally considered to be approved. • Alcohol raise mouth cancer risk up to 1,5 in connection with heavy cigarette smoke.
Relative Risk	Coefficient																			
<u>Power</u>																				
1,0-1,2	Never																			
1,2-1,5	Weak																			
1,5-3,0																				
Moderate																				
3,0-10,0																				
Powerful																				
10,0 Above																				

Reference: Electrical Fields and Magnetic Fields, Volume II, TEAŞ Department of Environment, April 2001

Values in this table are a result of statistical studies and it can be easily inferred from the values in table that potential risk hard to be segregated from one another and effects surpassed or increased other effects.

As seen at above table, electrical and magnetic field do not have significant adverse effects over human life comparing other magnetic field sources. Magnetic field intensity reveals itself in variable levels in home appliances working with electricity used daily by us.

"Regulation on measures required to be taken in respect with protecting public health and environment from adverse effects of non-ionizing radiation" have become effect by being published in the Official Gazette numbered 27651 and dated 24.07.2010. Definition has been made in a way that 15000 V/m (15kV/m) limit values may not be exceeded for electrical field arising from overhead transmission lines desired in 50 Hz frequency in referred regulation and 2000 mG (200µT) limit values may not be exceeded. "Regulation of Electrical Force Current Installations" effectuated by being published in the Official Gazette numbered 24246 and dated 30 November 2000 has put some limitations to distances of overhead transmission lines to settlement places, roads and facilities and has bound permit installation of lines with these conditions. These distances have been complied during determination of the said project routes.

Limit values specified for electrical and magnetic fields of 50/60 Hz have been provided below with support of United Nations Environmental Program (UNEP) and cooperation of International Radiation Protection Association-International Non-Ionized Radiation Committee (IRPA/INIRC), World Health Organization (WHO), Environmental Health Department and IFC Overhead transmission lines Projects;

Table 64. Limit Values For The 50/60 Hz – Electrical Magnetic Fields

Frequency		Electric Field (V/m)	Magnetic Field Alan (μT)
Community	50 Hz	5000	100
	60 Hz	4.150	83
Workers	50 Hz	10.000	500
	60 Hz	8.300	415

Reference: ICNIRP (1998) : “Exposure limits Guidelines of electric, magnetic and electromagnetic fields (up to 300 GHz) ”, “IFC (2007) : Energy Transmission and Distribution Projects Environmental, Health and Safety Guidelines”

Also, IFC Energy Transmission and Distribution Projects Environmental, Health and Safety Guidelines presents below minimum working distances according to voltage with the contribution of ICNIRP.

Table 65. Voltage versus Minimum Working Distances

Voltage (kV)	Minimum Working Distances (m)
2.1-15	0.6
15.1-35	0.71
35.1-46	0.76
46.1-72.5	0.91
72.6-121	1.01
138-145	1.06
161-169	1.11
230-242	1.5
345-362	2.13*
500-552	3.35*
700-765	4.5*

Reference: ICNIRP (1998) : “Exposure limits Guidelines of electric, magnetic and electromagnetic fields (up to 300 GHz) ”, “IFC (2007) : Energy Transmission and Distribution Projects Environmental, Health and Safety Guidelines”

Maximum magnetic field intensity has been determined as 800 mG in another study conducted for 500 kV transmission lines. This value is below 1.000 mG that public can be continuously exposed designated by IRPA/INIRC.

When effects of overhead transmission line to be installed within the framework this project are compared with the values of "Electrical and Magnetic Fields Arising from High Voltage Electrical Transmission Facilities" provided in the table below, it may be stated that it is below the values accepted for magnetic field. Table 66 presents the technical specifications of TEİAŞ.

Table 66. High Tension – Electricity Transmission Facilities – Induced Electrical and Magnetic Spaces (Just Below Overhead Power Line, Just Above Underground Power Line, Approximate Measurement Range at Fence of the SS)

Facility Type	Electrical Area (kV/m)	Magnetic Field (mG)
154 kV OHTL	0.3-1	9-14
154 kV Underground OHTL	3-4	25-27
154 kV GIS SS	3-5	35-39
154 kV SS	0.1-2	30-140

380 kV OHTL	1-3	35-60
154 kV SS	1-6	25-69

OHTL: Overhead Transmission Line SS: Substation GIS: Gas Insulated Compact Type Substation

Reference: Electrical Fields and Magnetic Fields, TEAŞ Department of Environment, April 2001

First and sole comprehensive study in respect with identifying electrical field and magnetic field levels arising from high voltage electrical transmission facilities in Turkey was carried out by TEAŞ and TUBITAK National Meteorology Institute in January, 2001(revoked). It is seen that effects 380 kV voltage overhead transmission lines are below international reference standard values according to the results of researches conducted in relation to intensities of electromagnetic fields emitted by overhead transmission lines. Having regard to the foregoing, it is forecast that locals shall not be get affected in terms of health from electrical and magnetic fields arising from OHTL extended from distance of settlement places to the extent possible.

The provisions of "Working At Powerful Current Facilities" Article 60 and "Accessing Current Installations" Article 59 specified in the Provisions relating to Operating Safety included in 7 Chapter "Electrical Force Current Facilities Regulation" effectuated by being published in the Official Gazette numbered 24246 and dated 30.11.2000 for human health and public within the scope of the said project against all kinds of risky and dangerous approaches shall be compiled and measures shall be taken. Foreigners shall be prevented to access facilities by complying with the requirements specified in relevant articles.

All grounding works to be made for overhead transmission line shall be performed according to "Installation Technical Specification" issued by TEİAŞ General Directorate and measures to be taken for electromagnetic compatibility of control systems and reducing effects of high frequency interventions shall be made in compliance with "Regulation on Grounding of Electrical Facilities" numbered 24500 and dated 21/08/2001 of the Ministry of Energy and Natural Resources.

Electrical field cause electrical breaking off air over conductor surface and revealing of loaded particles and this is what called "corona" Corona noise is a crackling noise arising from conductors. Corona noise occurs at dry and wet air but, in light rain, corona noise may be a lot bigger than rain itself. Banded conductor transmission lines create very little corona noise and this noise is impossible to be head beyond expropriation area.

When electric and magnetic fields consisting of 380 kV voltage overhead transmission lines are compared with both national and international limit values, it is seen that they remain below limit values designated.

Apart from this, while designating final route of line, clearance distances specified in Regulation of Electrical Force Current Installations" shall be adhered to. Horizontal and vertical distances included in 44th Article of Electrical Force Current Facility" have been provided in the following tables which is set for 380 kV by TEİAŞ. During the construction of the OHTL below distances will be provided.

Table 67. Vertical Distances Required For Safe Approach (for 380 kV)

Place where Conductors Pass Through	Vertical Distances (m)
The places where only pedestrians pass, water over which there is no traffic	6
Places such as suitable meadow, fields, pastures etc. for access of vehicles	7
Village and inter-city roads suitable for accessing of vehicles	8

Place where Conductors Pass Through	Vertical Distances (m)
International Highways	9
Water and canals over which there is traffic	6
Non-electric railways	8
Operating Lines	3.5
Electrical Lines	2.5
Structures	5
Tree	3

Table 68. Horizontal Distances Required For Safe Approach (for 380 kV)

FACILITY	Horizontal Distance of Facility to Its Edge
Railway and Highway	All dimensions of pole over-ground is + 2 or over highway and railway expropriation limit (those that is the biggest out of these
Tree	3
Buildings	4

VII.2.4. Impacts of Energy and Electromagnetic Field and Corona Noise Which Might Develop Across Transmission Line on Ecosystem

Corona noise appears across High Tension Overhead transmission lines. To reduce corona noise on Overhead transmission lines, the designs have been developed and projected in a way to reduce the level of corona effects and corona noise at a large scale.

The electric field leads appearance of charged particles due to electrically fragmented air on the surfaces of conductors and this is called to be "corona." Corona noise is a conductor – induced crackling noise. Corona noise takes place in dry and wet weather conditions; however the corona noise might even be greater than the rain itself when it is a light rainfall. Bundled – conductor type transmission lines produce little corona noise and it is difficult to hear such noise beyond the easement and permitted area.

Different studies on the impacts of overhead transmission lines – induced electromagnetic field and the corona noise which might be developed on the ecosystem have been conducted in EU countries and United States of America.

During studied carried out, its effects on the flora and fauna found in the proximal surrounding of the overhead transmission lines have been investigated and in consequence of these studies, it has been seen that there was not any measurable harms.

Today, it is seen that there are bird nests on top of existing electric poles. This shows that the animals do not get harmed due to electricity transmission lines – induced electromagnetic field and corona noise.

As for the studies carried out on the flora, it has been observed that the leaves of trees closer to the transmission line have undergone damage due to effect of electromagnetic field and the corona impact and the leaves of trees at locations where corona was intense.

To decrease the impact to occur, some values have been defined in the Regulation for "Electrical Heavy Current Installations" taken effect upon having been published when the

overhead transmission lines were being planned in the Official Gazette numbered 24246 and dated 30 November 2000. Provided that the horizontal and vertical distances contained in Article 44 of such regulation are taken as base, permission is being granted for the establishment of the line.

The regulation – specified approximate limits shall be observed to minimize the impacts of overhead transmission lines – induced electromagnetic field and the corona noise might form on the ecosystem.

VII.2.5. Impacts of Line to Communication – Related Facilities (Lines of Communication, Radio, TV Transmitters etc.)

Along the courses of overhead transmission line, many jumps over are being made like settlements, forestry areas, agricultural areas, and roads, lines of communication, streams and flowing waters. When said jumps are being projected, their dimensions and types are being determined considering the horizontal and vertical distances contained in Article 44 of “Electrical Heavy Current Installations”.

Along the planned OHTL, there are communication lines, OHTL, highway, express way, village road, and stream jumps.

Concerning said jumps, necessary permits shall be obtained from pertinent institutions during phase of expropriation, easement and forest permit procedures.

When the final transmission line evaluated within the scope of Project was being determined, the clearance distances specified in the Electrical Heavy Current Installations Regulation shall be observed.

VII.2.6. Impacts of Line on Water lands Within Zone (The beds available in within Project area must be maintained and commitment regarding in no ways intervention would take place to these stream beds)

The most important surface water resources identified within OHTL route and ESIA Survey Corridor totally in 5 km in width is Kızılırmak River and Çubuk-2 Dam. Kızılırmak River stands at a 300 meter - distance from OHTL starting Pole (S1). There are crossovers planned over the river along the route of OHTL. During Planning studies, guard band defined as the distance of 200 m from right and left hand of the Kızılırmak River has been respected / shall be followed. Çubuk-2 Dam stands at a 1000 m to the route and 1400 m to the nearest some pole (S19).

There is not any surface water in nature of wetland at the points where the poles will be erected.

The streams showing seasonal flow across the line; are streams of Asmalı, Çırınçak, Erikli, Büyükçökek, Gürebağları, Köklüce, Tarla, Uzunuyu, Tatlının, Kavaklı, Sondede, Taşlıgeçit, Dolaşan, Yılğın, Kara, Ovazın, Damla, Gürleğen, İncekavak, Kisin, Sudere, İnce, Akyokuş, Katıağaç, Armutlu, Kiriğin, Damlaağaç.

As for the streams showing continuous flow; are the streams of Kırmı, Taşocağı, Bayamlı, İğdeköy, Kamanlı, Mendek, Bekirin, Tahirinsazak, Kırkelma, Danışman.

During both construction phase and operation phase of Project, there will be no fluid / solid waste discharge into above – mentioned dry and flowing streams. Other than this, since

OHTL projects do not have much burden in terms of environment, development of an adverse effect on the surficial water sources in the vicinity is not in question.

When the locations and transport lines across the line passing through irrigation areas where the overhead transmission line are found are being selected, it shall be ensured that they would not coincide with the canals, flumes or discharge canals and necessary measures shall be taken for them not lead to cuts in the irrigation system and the approvals from DSI 5th Regional Directorate shall be obtained at the stage of selecting pole locations.

In case where road crossing is provided on the surficial water sources passing through Project area, in its vicinity or boundary, passage shall be ensured by making an art structure in appropriate cross – section and regarding this matter, permission shall be obtained from DSI 5th Regional Directorate.

At locations where overhead transmission line goes through stream bed, warning plates and signs in adequate number shall be posted.

During both construction phase and operation phase of Project, there shall happen no fluid / solid waste, rubbles, excavation soil etc. discharge into above – mentioned dry and flowing streams. Current widths of stream beds situated across the course where the line goes through shall not be intervened and corrosive materials, excavation and rubbles to be produced during such activity shall in no ways be dumped into stream beds and interventions hampering water flow shall not be made. In this context, Premiership Circular numbered 2006/27 regarding applications to be carried out in the stream beds shall be observed at every stage of activity. Other than this, since OHTL projects do not have much burden in terms of environment, development of an adverse effect on the surficial water sources in the vicinity is not in question. Seafood Law and Regulation numbered 1380 taken effect upon having been published by Official Gazette numbered 25687 and dated 31 December 2004 amended by a change numbered 26786 and dated 13 February 2008 and final amendment numbered 27537 and dated 30 March 2010 shall be fulfilled and necessary measures will be taken.

During the every stage of the project, the requirements of “Water Pollution Control Regulation” and “Fishery Law and related regulations”

VII.3. Project Environmental Cost – Benefit Analysis

The disposal of wastes to develop at the construction phase of OHTL installation shall be accomplished within the framework of relevant regulations. Adverse impacts which would emanate from the wastes are not expected. The probable impact of noise emissions that shall develop during operations to the settlements shall decrease due to they shall be carried out in working hours. In addition, personal lands on the route of transmission line shall be expropriated and costs of such land pieces shall be met.

During the construction phase, biomass and habitat losses are expected during digging for the legs of poles. However, considering the dimensions of legs, there will be very small excavation works and vegetation soil which will be scraped before excavation will be preserved separately for reuse in landscape works in order to compensate habitat losses as much as possible. Therefore, biomass and habitat losses will not cause major environmental damage.

Upon realization of said project, it shall be ensured that the electrical energy to be generated from ACWA Power Kirikale Natural gas Combined Conversion Plant planned to

be established within the boundaries of Kırıkkale, Town of Yahşihan, Kılıçlar Municipality to Bağlum substation and then its transmission to interconnection system. By the use of interconnection system, the project will play important role for supply of uninterrupted energy demand of Turkey.

The most of the environmental effects that are mentioned above are temporary and short term environmental effects. Corona effect, which is the permanent effect, is acceptable considering the social and environmental benefits of the Project. Also, researches Show that electromagnetic fields of 380 kv OHTL are below the international limits. Considering all these aspects, it is expected that electromagnetic fields generated by OHTL which is far away settlements as possible will not cause negative impacts of local people and other living species. As a result, although project has some environmental effects, the environmental cost is acceptable considering social and environmental benefits.

SECTION VIII: POSSIBLE AND ONGOING EFFECTS IN DECOMMISSIONING (POST-OPERATION) PHASE AND THE MEASURES TO BE TAKEN AGAINST THESE IMPACTS

Renewal of line is in question when the economic life of Project has expired considering the requirements on that day, it shall be replaced, in the event of its relocation, existing poles shall be removed from where they were by Turkish Electricity Transmission Inc., General Directorate and maintained at the depots belonging to Turkish Electricity Transmission Inc., General Directorate so as to be re-evaluated.

In case when the line was relocated or the line was removed, prior to land abandonment, the land shall be improved and ensured that it regains the appearance of existing topography in the vicinity upon being re-arranged. Particularly, it shall be converted into a state in compliance to new objectives and new planning.

Wastewater will be collected in the appropriate sealed, indoor, ventilated septic pits in case of establishment of construction site area. After that, wastewater will be sent to Municipality wastewater infrastructure.

Solid wastes, scrap materials and construction waste separately collected will be taken by the municipality or a licensed recycling plant. Any waste on the construction site shall not be left. Hazardous waste such as oil, paint and etc. will be collected in sealed, and labeled metal containers.

All the measures identified for the construction phase (irrigation, covered up trucks, speed limit, etc.) will be applied to decommissioning stage.

Natural vegetation studies with the selected plants will be performed on perpendicular slope and non-vegetated surfaces after the completion of the construction work (seeding and mulching if necessary). In order to prevent damage to flora by the vehicle and human traffic, only usage of service roads will be allowed for transportation.

Following the closure of the line, service roads will be closed according to needs of local people or local municipality. A limited amount of noise and dust during these studies will be generated. However, these effects will not be significant with environmental point of view.

These effects will be minimized as much as possible accordance with provisions of the Environmental and Social Management and Monitoring Plan.

SECTION IX: ALTERNATIVES OF THE PROJECT (In this Section, Site Selection and Comparison of Technology and Measures to be Taken Shall be Performed and Order of Preference shall be Made)

OHTL routes shall be approximately designated over the map with 1/25.000 scale by TEİAŞ General Directorate and connection points are of high importance in this point. (SS, OHTL). Route designated then shall be examined again by considering topographical and geographical conditions on the area.

In this examination, route has been designated by considering distance of OHTL to settlement locations, transition route that shall enable the line to be short to the extent possible, facility-maintenance-operation possibilities, swamp-flood bed-land sliding exposed areas, areas such as forest-orchard-poplar, military areas, air fields, state producing farms, personal lands, communication lines (telephone, e-mail), Special Environmental Protected Areas, Highways, State Railways, dams, ponds, irrigation channels, zoning areas, mines, coal areas.

TEİAŞ has evaluated options in the determination process of the most appropriate line route, especially considering existing mines throughout the area and not to intersect with them.

In case it is determined that the line passes from the abovementioned areas in the examinations conducted, other alternatives, if any, are considered. Final form of the route shall be designated with the survey conducted again by the contracting firm (survey-distribution) by considering the criteria specified hereinabove and shall be submitted to TEİAŞ for approval.

In general, in planning phase of overhead transmission line;

- Line route shall be designated as alternative over Topographical Map with 1/25.000 Scale,
- Land studies shall be commenced over designated route/routes,
- Route shall be finalized during land studies and route plan shall be planned,
- Prepared Route Plan shall be submitted to TEİAŞ.
- Permitting studies (EIA, forest, agriculture etc.) shall be commenced by considering route plan approved by TEİAŞ.

Consederating the project type, location and purpose, the selected route is the most appropriate alternative for 380 kV ACWA Power Kırıkkale Overhead Transmission Line route.

SECTION X: MONITORING PROGRAM

X.1. Monitoring Program Recommended for Construction of the Activity, Monitoring Program Recommended for Operating the Activity and Post-Operation and Emergency Response Plan

EIA report prepared for the project of installation of 380 kV ACWA Power Kırıkkale Overhead Transmission Line envisaged within the scope of the Project and positive and negative, bio-physical and social-economic impacts of all components of the project during construction and operating phase have been examined hereof.

Purpose of auditing and monitoring program to be realized peculiar for the project is to ensure full compliance with the issues and commitments required to be complied in ESIA report prepared by considering the plans, permits, conditions and requirements approved hereof and impact reducing measures relating to the project.

Monitoring and inspection program shall be conducted in 3 ways for OHTL project. These are monitoring programs under the supervision of TEİAŞ and monitoring processes within the scope of ESIA prepared for IFC-EBRD-KEXIM and monitoring under the supervision of the Ministry of Environment and Urbanization as per Turkish EIA Regulation.

In 18th Article of EIA Regulation, "The project owner or authorized representative" shall be liable for communicating monitoring reports relating to commencement, of investment, construction, operation and post-operation to the Ministry with other permits and licenses as per relevant legislation after taking the decision of ""Environmental Impact Assessment Is Positive" or "Environmental Impact Assessment Is Not Necessary". The statements of "This information shall be dispatched to the Governorship so as to inform the public by the Ministry" are included hereunder. In addition to this, monitoring study should be conducted in commencement and construction period of the project following obtaining EIA Positive Certificate of the project pursuant to "Communiqué of Certificate of Competence" effectuated by being published in the Official Gazette numbered 27436 and dated 18/12/2009. Hence, the project-related monitoring program be established and Final EIA Report Monitoring Form shall be filled in periods to be designated by EIA Commission and shall be submitted to the Ministry of Environment and Urbanization. Monitoring programs will be created separately for the construction and operation periods.

Monitoring program prepared within the scope of ESIA prepared for IFC-EBRD-KEXIM has been submitted in Environmental and Social Management and Monitoring Plan document. The plan was prepared as a priority to ensure compliance with performance requirements.

Table 69. Monitoring Program

Phase	Subject	What are the parameters to be monitored ?	How Shall Parameters Be Monitored/What are the types of Monitoring Equipment?	What is frequency of measurements/What is continuous measurement?	Institution in charge with
CONSTRUCTION PHASE	Cultural and historical values	New cultural assets to be encountered in the project area	Visual	In case of encountering culture asset, this shall be monitored by Protection Authorities of Cultural and Natural Assets.	Provincial Directorate of Culture and Tourism
	Dust - particulate matter	Dust resulting from movement and exhaust of excavation and construction machinery Complaints of the public	Visual observations Negotiations to be made in nearby settlements	Weekly/upon complaint when construction is heavy and during excavation	TEİAŞ Provincial Directorate of Environment and Urbanization
	Noise	Noise level (dBA) Complaints of the public	Negotiations to be made in nearby settlements Audio meter (noise level audio meter) and noise level measurement	Weekly visual observations On the public's complaints	TEİAŞ Provincial Directorate of Environment and Urbanization
	Waste water resulting from construction sites	Pollution, turbidity and odour likely to occur in water and soil on cesspool area on construction site	Visual (whether waste waters are discharged to the areas permitted or not)	Weekly (sudden checks)	TEİAŞ Municipality
	Excavation, solid and hazardous wastes resulting from construction areas and sites	Odour Visual pollution	Visual	Weekly (sudden checks)	TEİAŞ The Contractor Municipality Provincial Directorate of Environment and Urbanization
	Habitat & Ecosystem	Visual damages and disturbance Visual pollution	Visual	Weekly (sudden checks)	TEİAŞ The Contractor Municipality Provincial Directorate of Environment and Urbanization
	Wastes resulting	Waste oils, batteries, expired tires	Investigation and control of	During failure or periodic	The Contractor

Phase	Subject	What are the parameters to be monitored ?	How Shall Parameters Be Monitored/What are the types of Monitoring Equipment?	What is frequency of measurements/What is continuous measurement?	Institution in charge with
	from Vehicle Park	and scrap electronic equipment	Vehicle Inspection documents	maintenance	
	Health and Security	Health and safety training documents Training attendance documents Construction safety equipment used by workers on construction site (helmet, gloves, shoes, safety belt, etc.).	Visual	At the beginning of each work phase Daily	TEİAŞ
	Landscaping	Waste (excavation, solid, liquid, etc.). Excavated roads/areas	Visual	During the closure of construction site	TEİAŞ
OPERATING PHASE	Noise	Noise level Public complaints	Negotiations made with residents in nearby settlements Sound level meter	In the case of a complaint (if necessary)	TEİAŞ
	Health and Security	Technical training (operation and maintenance) Protective equipment and clothing (whether they are used by employees or not)	Visual	During operation (in appropriate periods)	TEİAŞ
	Habitat & Ecosystem	Visual damages and disturbance Visual pollution	Visual	During operation (in appropriate periods)	TEİAŞ
	Fire risk	Cable Head Insulators Cable connection ports Primary and secondary controls	With technical tests (insulation test, direct contact test, thermal camera test etc.) and standard maintenance studies conducted by control teams	Once in every six/ in case of maintenance, control and failure times	TEİAŞ
DECOMMISSIONING PHASE	Dust - particulate matter	Dust resulting from movement and exhaust of construction and dismantling machinery	Visual Negotiations to be made in nearby settlements	In times when dusting is intensive during construction (dismantling) period/excavation period Upon complaint	TEİAŞ Provincial Directorate of Environment and Urbanization
	Noise	Noise level (dBA)	Measurement of noise level with audio meter Negotiations to be made in nearby settlements	On the public's complaints	TEİAŞ Provincial Directorate of Environment and Urbanization
	Habitat & Ecosystem	Visual damages and disturbance	Visual	Weekly (sudden checks)	TEİAŞ

Phase	Subject	What are the parameters to be monitored ?	How Shall Parameters Be Monitored/What are the types of Monitoring Equipment?	What is frequency of measurements/What is continuous measurement?	Institution in charge with
		Visual pollution			Municipality Provincial Directorate of Environment and Urbanization
	Solid and hazardous wastes resulting from construction (dismantling) areas and construction sites (waste oil, battery)	Visual pollution (odor, waste etc.)	Visual	Weekly	TEİAŞ Municipalities Provincial Directorate of Environment and Urbanization

Table 70. Mitigation Plan

Phase	Subject	Mitigation Measures	Responsible Institution
CONSTRUCTION PHASE	Cultural and historical values	- In case of coinciding any cultural asset, the construction studies will be stopped immediately and the Cultural and Natural Assets Protection Committee will be informed. - Until the response is taken, any action will not be done at the site. - After taking the positive response (no cultural assets) the construction studies will continue.	The Contractor
	Dust - particulate matter	- Wetting will be done in the dry seasons - Loading and unloading will be carried out with care and without scattering. In order not to lead to scattering, loading/unloading works will be performed in an area allocated for loading/unloading and water sprays will be used in loading/unloading area. Moreover, the workers are warned being careful. While loading/unloading, a limit drop height will be applied for the dusty materials. In addition, wind direction and strength will be taken into account while loading and unloading. - The trucks will be covered and speed limitation will be applied. Speed limit on trucks is 30 km/hr (at project site) and 50 km/hr (outer of the project site – within the city) - Only Vehicles with valid emission stickers will be permitted - In the case of storing vegetable soil at the site, it will be ensured to be covered with canvas or with the matter having particle size greater than 10 mm	The Contractor
	Noise	- All construction works will be done between 7am and 7pm. If it is required to work after 7 pm, local authorities and public will be informed about these working hours. - People, living at the population centers around, will be informed about the working durations - The continuous work-site noise (day times) will be ensured to be under 70 dBA according to the Turkish Evaluation of Environmental Noise Regulation. To satisfy this; - The construction machines will not be worked together at the same time in the case of increasing noise level. If it is not possible to reduce the number of working machine at the site temporarily, sound absorbing barriers will be used. - New machines and equipments (with the maximum noise level of 120 dBA) will be used as much as possible because of resulting higher level of noise of vehicles with age.	The Contractor
	Waste water resulting from construction sites	Wastewater will be collected in the appropriate sealed, indoor, ventilated septic pits in case of establishment of construction site area	The Contractor
	Excavation, solid and hazardous wastes resulting from construction areas and sites	- Solid wastes (like metal and wood originated from the usage of construction materials) and packaging wastes (plastic, paper, glass etc.) will be systematically and separately collected and it will be ensured to be taken by related Municipality or a licensed recycle firm. - Organic domestic wastes due to the workers/personnel will be collected separately than the other types of wastes and it will be ensured to be taken by related Municipality and disposed to the Solid Waste Landfills. - Hazardous wastes such as oil, dye (used for painting building, metal and wood surfaces	The Contractor

Phase	Subject	Mitigation Measures	Responsible Institution
		etc.) will be collected separately in leak proof, metal and labeled containers and it will be ensured to be taken by a licensed firm ensured by the Contractor	
	Habitat & Ecosystem	- After top soil works, removed soil will be laid back to its original form. - In case of damage to fauna species, expert staff will be notified immediately and precautions will be taken. For treatment relevant parties will be contacted and necessary process will be implemented. In the construction phase staff will be trained by expert personnel about how to behave and what they should do in such cases	The Contractor
	Wastes resulting from Vehicle Park	- Maintenance of the vehicles will not be done at the project site unless there is an emergency situation - Waste oil due to construction machines and vehicles will be collected in rustles barrels and will be sent to a licensed firm by the contractor. - The barrels will be placed onto an impermeable ground to protect from rain and sun and all necessary precautions (cover the barrels, placing warning signs etc.) against fire will be taken - Batteries, tires and similar items due to construction machines and vehicles will be sent to a licensed firm and will be ensured to be disposed	The Contractor
	Health and Security	- All necessary protective equipments (hard hat, safety belt, protective clothes, gloves, glasses etc.) will be provided to the workers - Proper notification signs will be placed to maintain the security of the public and local people - The personal will be trained in "labor health and occupational safety" issues	The Contractor
	Landscaping	After completion of the construction works: - The work-site will be reassembled. - Service roads will be closed - No hazardous, solid, liquid, construction wastes will be left at the site.	The Contractor
OPERATING PHASE	Noise	The regulated limit values (Ldaytime:70 dBA, Lnight:60 dBA) will not be exceeded being in accordance with the Environmental Noise Evaluation and Control Regulation.	TEİAŞ
	Electro-Magnetic Field	- Values would be well below the limits established The Turkish Standards Institute, "People-Low Frequencies exposure to electromagnetic fields (0 Hz-10 Hz)" standards - In this context the value of the magnetic field of each material to be tested	TEİAŞ
	Habitat & Ecosystem	- Bird Repellents used on poles will be controlled in regular periods. - Trees and vegetation close to OHTL will be monitored in order to prevent any hazardous condition.	
	Health and Security	The personal will be selected from the people having trained in first aid, electric safety, working at high levels for the maintenance for the OHTL	TEİAŞ
	Fire risk	The OHTL which will be established as to the fire safety elements in the "Electric Intensive Current Plant Regulation" shall be controlled regularly and all equipment shall be controlled, maintained, tested, rehabilitated and renewed	TEİAŞ

Phase	Subject	Mitigation Measures	Responsible Institution
DECOMMISSIONING PHASE*		The plants likely to be hazardous come near to line will be determined and pruning	
	Dust - particulate matter	- An amount of dust generation is expected during the demolishing of the OHTL period as being during the construction phase of the OHTL. - All the mitigations (watering, covering the trucks, speed limitation etc.) listed in the construction phase of dust-particulate matter issue are also valid in this phase.	The Contractor**
	Noise	- The continuous work-site noise (day times) will be ensured to be under 70 dBA (according to the Turkish Environmental Noise Evaluation and Control Regulation. In the case of increasing noise level, sound absorbing barriers will be used. - All construction works will be done between 7am and 7pm - People, living at the population centers around, will be informed about the working durations	The Contractor**
	Solid and hazardous wastes resulting from construction (dismantling) areas and construction sites (waste oil, battery)	- Solid wastes, junk materials and construction wastes will be collected separately and they will be ensured to be taken by the municipality or a licensed firm - The contractor will control the collection of the wastes separately and ensure them to be taken by the municipality and the licensed firms. - Wastes such as oil, dye will be collected in separate, impermeable, metal and labeled containers and will be ensured to be taken by a licensed recycle firm	The Contractor**

* **Decommissioning Phase**, has been evaluated in the face of the completion of facility's economic life and the demolishing the substation come to order. After the completion of economic life of the substation, in case of taking decision on the continuation of the facility , studies will be conducted for the new substation in accordance with the subjects determined with the scope of EIA Regulation

** Valid in the case of handing over of the proposed works to subcontractors. Otherwise, responsibilities defined for contractor will belong to TEİAŞ

Monitoring program and its components may be revised for resultant deficiencies and new studies during the works. Interaction diagram pertaining to monitoring program is given below.

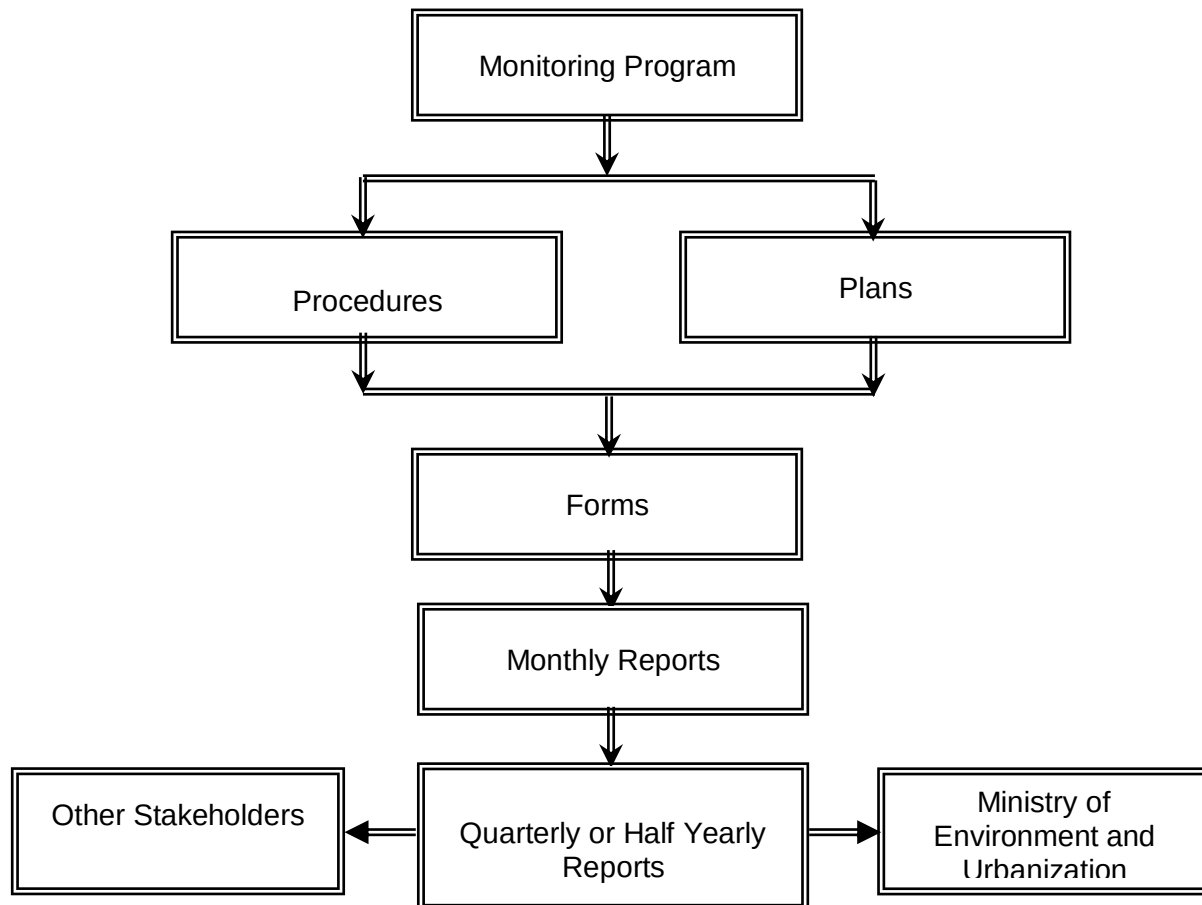


Table 71. Interaction Chart

AUTHORITIES AND RESPONSIBILITIES

A) The Ministry of the Environment and Urbanization)

It is competent to demand revision of the program and renewal if necessary, in respect with sufficiency, compliance of the studies, and the studies to be conducted within the program and monitoring program pursuant to the regulation published subject to this law and the Law on Making Amendment in the Law of Environment numbered 5491 and the Law on Environment numbered 2872 and Communiqué of Certificate of Competence issued as per this regulation and Regulation of Environmental Impact Assessment published in the Official Gazette numbered 26939 and dated 17/07/2008.

B) Project Owner (TEİAŞ General Directorate)

As per 18th Article of EIA Regulation numbered 26939 and dated 17/07/2008, "The project owner or authorized representative" shall be liable for communicating monitoring reports relating to commencement, of investment, construction, operation and post-operation to the Ministry with other permits and licenses as per relevant legislation after taking the decision of "'Environmental Impact Assessment Is Positive" or "Environmental Impact Assessment Is Not Necessary".

C) The Firm Conducting EIA Monitoring Work

The firm preparing EIA report is liable for preparing report to the Ministry of Environment and Urbanization in period appropriate to monitoring periods to be designated by EIA commission as well as keeping records relating to all matters specified in EIA report deemed as final.

The firm preparing EIA report shall coordinate the studies relating to the reports prepared hereof with project owner. (Institution/Organization Executing OHTL Construction on behalf of TEİAŞ General Directorate)

It is competent to demand revision of the program and renewal of the studies with compliance and competence in the studies to be conducted within the program and monitoring program.

Post Operation of the Project

Poles after project operation phase shall be taken from their places by TEİAŞ General Directorate and shall be stored in warehouses of TEİAŞ General Directorate for re-evaluation. In the case of displacement or removal of the line, land reclamation works shall be conducted prior to abandoning the site and the land shall be arranged and shall be adapted to existing vicinity topography. It shall be transformed optimally for new objectives and new plans.

Emergency Action Plan

Heavy construction machines shall be used in the works to be conducted within the scope of the project of 380 kV ACWA Power Kırıkkale Overhead transmission line. Work accidents may occur because of recklessness of personnel and non-compliance with safety instructions, failure to use safety equipment. In order to minimize work accidents, qualified personnel shall be employed and personnel shall be trained in the issue of work safety.

There are some considerations that may adversely affect worker health and work safety in each of activities. All kinds of measures shall be taken within the framework of relevant bylaws and regulations hereof. In addition to this, it shall be complied with Labor Law numbered 4857 and dated 22/5/2003 in the issue of Worker safety and the legislations issued based on this law during activity of entire construction. The nearest health units shall be employed for the requirements relating to health. Emergency Action Plan shall be prepared for the objective of reviewing the studies to be conducted in this respect by specialist team. Emergency Action Plans (ACE) shall also incorporate the following issues;

- Occupational health and safety and first aid plans,
- Protection-safety against sabotage and attacks and security plan
- First aid team ready for 24 hours against accidents likely to occur
- All kinds of measures shall be taken against fire by considering emergence of fire.
- All kinds of equipment and fittings against fire shall be made in compliance with the regulations and laws in force.

Emergency Response Plan prepared for the purpose of protection of worker health and work safety within the scope of the project shall gain functionality and effectiveness in emergencies such as natural disaster, fire and sabotage. The considerations needed to be present in Emergency Action Plan to be used in construction phase of the project have been listed below;

- Allocation of Emergency Action Team (AEE)
- Duty definitions of AEE
- Creating subordinate levels within AEE (rescue, first aid, response etc.)
- Determination of coordination issues within relevant institutions/organizations and within its own body of AEE
- Determination of principles of daily work of personnel to be employed within AEE

All equipment and vehicles needed by AEE in case of any response shall be kept ready especially during the project. Emergency Response Plan coordination priorities have been provided in **Figure 41**.

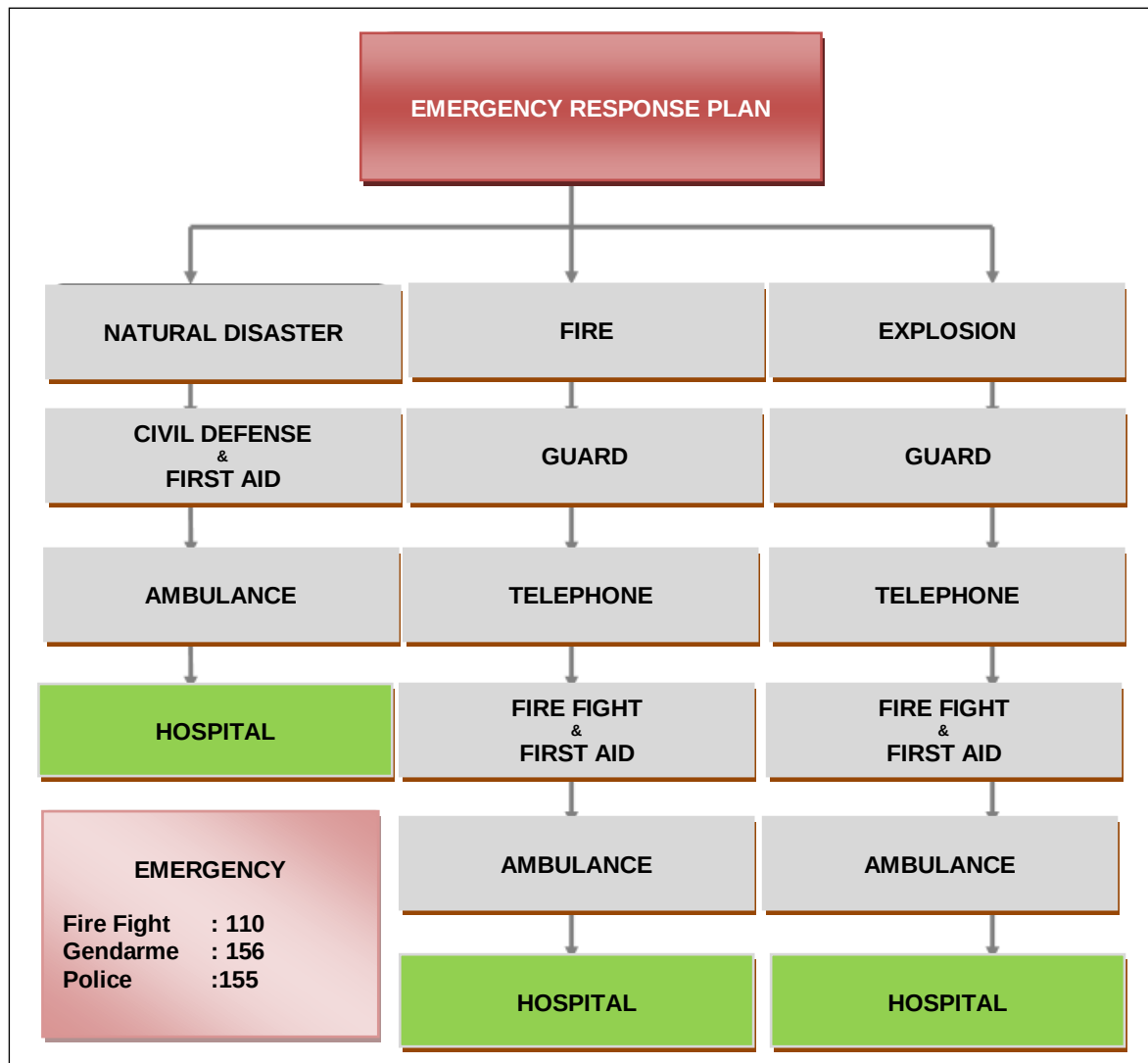


Figure 41. Emergency Response Plan

SECTION XI: PARTICIPATION OF THE PUBLIC

Pursuant to 9th article of EIA Regulation numbered 26939 and dated 17 July 2008 for Overhead transmission line Project;

Two separate Public Participation Meeting shall be held for informing the public and obtaining their views and offers relating to the activity as one is at Ankara Province, Çubuk County on 12.08.2013 and one is at Kırıkkale Province Yahşihan County on 13.08.2013.

Announcements stating subject, date, place and time of the meeting have been published in newspapers broadcasting in local and national level for Public Participation Meeting. Announcement text has been dispatched with mail for making announcements to village head men units and relevant sub-governorships.

Participation of authorities of Provincial Directorate of Environment and Urbanization, commission members comprised for the project by the Ministry of Environment and Urbanization, authorities of TEİAŞ General Directorate as the project owner, authorities of ELTEM-TEK Electrical Installation Engineering Services, Telecommunications, Mining, Consulting, Construction, Trade Co. executing the work of EIA Engineering Services as well as head men of village and neighborhood unit in the vicinity of settlement locations is expected.

Brochures of Public Participation Meeting where explanations relating to transmission line in the scope of the project are handed over to participants in the meetings and visual presentation shall be made with projector and detailed information shall be provided regarding the meeting and questions directed by participants shall be answered.

More detailed information is provided in Stakeholder Participation Plan in relation to process of Public participation. In addition to this, Stakeholder Participation Plan kept updated by being renewed when necessary shall be in accessible state for all stakeholders expected to be affected from the said project.

SECTION XIII: NON-TECHNICAL SUMMARY OF THE INFORMATION PROVIDED UNDER THE ABOVE HEADINGS

This document contains Environmental and Social Impact Assessment (ESIA) studies of “380 kV ACWA Power Kırıkkale Overhead Transmission Line” project which is planned to transmit energy that will be generated at ACWA Power Kırıkkale NGCCPP within the boundaries of Kırıkkale Province, Yahşihan County, Municipality of Kılıçlar to Bağlum Substation situated in Ankara Province Keçioren District. The length of 380 kV OHTL is 119 kilometers and approximately 14.5 kilometers hereof is inside the boundaries of Kırıkkale Province and the rest being more or less 104.5 kilometers is situated within the boundaries of Ankara Province.

Said overhead transmission line; shall be established by ACWA Power Electricity Operation and Management Industry and Trade Co. and be transferred to TEİAŞ together with its property rights.

Nontechnical Summary is prepared for the project which is available for stakeholders at the addresses mentioned in Stakeholder Engagement Plan.

Potential environmental and social positive and/or negative impacts of the project transmission line have been designated and it has been reviewed by having regard to technology alternatives with the place selected as well as measures to be taken for minimizing the same to the extent that shall not harm environment and social life and preventing its adverse impacts monitoring of implementation of the project and studies to be maintained with controls have been described in detail.

SECTION XIV: REFERENCES

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