



**ELECTRIC
GENERATION CO. INC.**

**EFE 6 GEOTHERMAL POWER PLANT
(22.6 MWe) PROJECT
EIA REPORT**

AYDIN PROVINCE, GERMENCİK DISTRICT, ALANGÜLLÜ QUARTER



EIA REPORT



FINAL EIA REPORT



**ÇEVRE DANIŞMANLIK MÜHENDİSLİK PLANLAMA İNŞ. SAN. TİC. LTD. ŞTİ
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PROJECT NAME	EFE 6 GEOTHERMAL POWER PLANT
PROJECT COST	TRY 315,000,000
FULL ADDRESS OF THE LOCATION SELECTED FOR THE PROJECT (Province, District)	AYDIN PROVINCE, GERMENCİK DISTRICT, ALANGÜLLÜ QUARTER
LOCATION OF THE PROJECT IN THE EIA REGULATION (Sector, Subsector)	List in Annex 1 of the "Regulation on Environmental Impact Assessment" promulgated in the Official Gazette issue number 29186 dated 25.11.2014 Article 44 - Extraction and use of geothermal resources (20 MWe or more thermal capacity) Sector: Energy Sector Subsector: Geothermal Power Plant
PROJECT'S NACE CODE	35.11.19
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CONTENTS

NONTECHNICAL SYNOPSIS OF THE PROJECT	1
CHAPTER I: DEFINITION, LOCATION AND CHARACTERISTICS OF THE PROJECT....	3
I.1. Definition, Lifetime, Service Purposes, Significance, and Necessity of the Project.....	3
I.2. Location selected for the project (Environmental Plan showing the project location, Plan Notes & Provisions and Legends thereof, Notes and Legends of Master Development Plan and Land Use Plan (approved by the relevant agency), scaled map if these plans are unavailable)..	5
I.3. Locations of technical infrastructural units, administrative and social units, and other units under the Project (individual distances to residential areas and illustration thereof on map)	6
I.4. Technical characteristics of the project (plant's main production, product type, production capacity during the operation phase of the plant, types and quantities of raw and auxiliary materials to be used in the plant, etc.).....	7
I.5. Economic characteristics of the project (relevant investment schedule, sources of finance, where from to obtain these sources, workflow diagram or timing table, cost-benefit analysis.	13
I.6. Other provisions	16
CHAPTER II: ENVIRONMENTAL CHARACTERISTICS OF THE PROJECT LOCATION AND SPHERE OF INFLUENCE (*)	17
II.1. Determination of the area to be influenced by the project (how and based on what the sphere of influence determined to be explained and the sphere of influence to be shown on map)	20
II.2. Characteristics of physical and biological environment and use of natural resources within the sphere of influence	20
II.2.1. Meteorological and climatic characteristics (activity site's general climatic characteristics, temperature distribution, precipitation distribution, humidity distribution, evaporation, distribution of number of days (foggy, snowing, snow-covered, highest snow cover thickness, etc.), wind distribution, wind speed distribution, stormy days, strong windy days - information under this heading to include monthly-seasonal-annual distributions, meteorological data to belong set for many years to cover the last years), ..	20
II.2.2. Geological characteristics (regional geology, 1/25,000-scale general geological map, stratigraphic column sections, geology of the Project site, large-scale (1/25,000 or 1/100,000, if any) geological map of the examined area and sections of the units under the Project, mass movements (landslide/debris-slide), sensitivity analysis, landslide risk map, landslide-precipitation relationship, slope stability, slide analysis; seismicity and natural disaster potential, geotechnical study report of the project, if any),	41
II.2.3. Hydrogeological characteristics (groundwater levels; safe draw off values of all kinds of currently available wells such as caissons, deep wells, artesian wells, etc; physical, chemical and bacteriological characteristics of water; current and planned use of groundwater, flow rates, distances to the project site)	50
II.2.4. Hydrological characteristics physical, chemical, bacteriological and ecological characteristics of surface water resources such as lakes, streams, and other wetlands,	

the flow rates and seasonal variations of streams in this context, floods, classification of catchment basins as oligotrophic, mesotrophic, eutrophic, dystrophic, sedimentation, drainage, coastal ecosystems of all water resources),.. 52

II.2.5. Characteristics of the geothermal source (potential of the geothermal source, levels thereof, other geothermal sources in the region and their relationship with the basin) 58

II.2.6. Other geothermal sources in the region and their utilization status (energy, tourism, heating, greenhouse cultivation, etc.)..... 60

II.2.7. Current and planned use of surface water resources, their basin feature, if any (potable water, utility water, irrigation water, power generation, aquaculture production and product types in dams, lakes, and ponds, waterway access facilities, water and/or coastal uses for tourism, sports and similar purposes, other uses) 63

II.2.8. Soil characteristics and use status (soil's structure, land use capability, classification, bearing capacity, slope stability, slipperiness, erosion, use for earthworks, natural vegetation used as pasture, meadow etc.) 64

II.2.9. Agricultural areas (whether there are agricultural areas or not, if any, agricultural development project areas, sizes of irrigated and dry agricultural lands, product patterns and their annual production quantities, role of products in national agriculture and their economic value) 67

II.2.10. Forest areas (forest area amounts, tree species and quantities in these areas and surface areas covered by these species, closure and characteristics of such areas, current and planned protection and/or use purposes, if the project site is not a forest area, distance of the project site and units to the closest forest area, 1/25,000-scale stand map)..... 68

II.2.11. Protected areas (national parks, natural parks wetlands, natural monuments, nature reserve areas, wildlife protection areas biogenetic reserve areas, biosphere reserves, natural sites and monuments, historical, cultural sites, special environmental protection zones, special environmental protection areas, touristic areas and tourist attractions, areas covered by the pasture law, the distance of the project to protected areas on a 1/100.000-scale map shown clearly and colorfully) 69

II.2.12. Flora and Fauna (species, endemic species, particularly endemic plant species, animal species that live naturally in the area, species protected by national and international legislation, rare and endangered species and their locations in the area, their distributions in the region, endemism statuses, abundance, the names and populations of hunting animals and the decisions taken by the Central Hunting Commission for these animals, information on who identified each species at what time and by which method (use of literature-current sources, observation, etc.), Collins Bird Guide, Book of Important Bird Areas in Turkey, Book of Important Natural Areas in Turkey, IUCN, Bern Convention, CHC Resolutions, status according international treaties such as CITES, how the species will be affected by the project, illustration of vegetation types in the project site on a map, protective measures to be taken for the creatures to be affected by the project and works ((during construction and operation phases), performance of fauna works during the vegetation period and indication of this period, control by using Turkish Plants Data Service (TÜBİVES) for flora..... 70

II.2.13. Whether or not there are mines and fossil fuel sources in or near the project site (if any, reserve amounts, current and planned operating conditions, annual production and their significance for the country or local uses and their economic values)	78
II.2.14. Livestock and aquaculture (species, feeding areas, annual production amounts, their significance for the national economy and their economic values, fishery within the sphere of influence, fishing grounds).....	79
II.2.15. Places with high landscape value and recreation areas	80
II.2.16. Lands under the under the authority and possession of the competent bodies of the government (prohibited military zone, areas allocated to public institutions and organizations for specific purposes, etc.)	80
II.2.17. Current pollution load of the project site and the sphere of influence (determination of the current pollution load in terms of air, water, soil and noise, what kind of studies were carried out between which dates when doing this work, work methods, indication of meteorological conditions during the work period)	80
II.2.18. Other provisions	86
II.3. Characteristics of Social-Economic Environment.....	87
II.3.1. Economic characteristics (the main sectors that constitute the economic structure of the region, distribution of local workforce to these sectors, role and significance of the production of goods and services by the sectors for the national economy, other information); Income distribution of income in the region to lines of business, maximum, minimum and average income per capita by lines of business); Unemployment (unemployed population in the region and ratio to active population),....	87
II.3.2. Population (urban and rural population in the region, population movements; migration, population growth rates, average household population, other information) ..	89
II.3.3. Urban and rural land uses (distribution of residential areas, current and planned use areas, industrial zones, residences, touristic areas in this context, etc.); Social infrastructure services in the region (education, health and cultural services and the availability of these services),	96
II.3.4. Other provisions	97
CHAPTER III ENVIRONMENTAL IMPACTS OF THE PROJECT DURING CONSTRUCTION AND OPERATION PHASES AND THE MEASURES TO BE TAKEN (**)	98
(In this chapter, impacts of the project on the physical and biological environment and the legal, administrative and technical measures to be taken to prevent, minimize and recover these impacts are explained separately and in detail for headings III.1 and III.2.).....	
III.1. Impacts of the project on the physical and biological environment during the preparation of the land and the construction phase, and the measures to be taken	98
III.1.1. Where and how much excavation and vegetable soil will occur within the scope of the works for during the preparation of the land, excavation and vegetable soil amounts, materials to be used, explosives, information about the blasting, if any, its impacts and measures to be taken, where to transport excavated waste soil, stones, sand, etc. and vegetable soil, where to store the same, the volume of the area, and the purposes for which it is used, excavation material arrangement and restoration plan, opinions to be taken and characteristics of temporary storage area	98

III.1.2. Transportation, storage and use of flammable, explosive, hazardous, toxic and chemical substances to be used during the preparation of the land as well as for the erection of the units, instruments and machines to be used for this work; types and properties of fuels to be used in these instruments and machines, emissions to be formed, measures to be taken,.....	99
III.1.3. Transportation infrastructure plan within the scope of the project, distances of project site to highways, access roads to highways, measures to be taken to prevent damage to existing roads to be used for transportation and precautions to be taken in terms of traffic safety (opinions to be taken in this regard, permits)	101
III.1.4. Impacts on the physical environment during the drilling regarding the use of the geothermal source, number of wells to be opened and information on how many of these are to be used for reinjection, installation of drilling equipment, the effect of actions to be taken when creating the necessary infrastructure around the wells and on the roads for to the wells to the surface morphology in this area,	104
III.1.5. Potential impacts on groundwater during the drilling of geothermal well and construction of other units, measures to be taken to prevent groundwater and drilling fluids from mixing with each other passing through potential aquifers	106
III.1.6. Amount of drilling mud, how it is to be disposed of after use, actions to be taken to clean out this mud and separate it from liquid	106
III.1.7. Actions related to erection of the pipeline to be used for transportation of geothermal fluid and its potential impacts on the surface, precautions to be taken	107
III.1.8. Flood study for the project site, where and how to perform flood prevention and drainage operations; procedures of ground safety (Bearing capacity of the plant in case of unique formations such as earthquake, landslide, avalanche, flood, rock-fall, measures to be taken, allowable stress, settlement calculations)	107
III.1.9. Dust spreading operations such as crushing, grinding, washing-screening, transportation and storage during construction, cumulative values, measures to be taken	107
III.1.10. Size of agricultural fields to be disposed of in order to obtain the necessary land during the preparation and construction phase of the land, their utilization capabilities and agricultural product types, evaluation of agricultural lands within the scope of information on the use of agricultural land for non-agricultural purposes, distance of the project site to agricultural lands if all or part of the project area is outside agricultural lands, evaluation of their impacts, measures to be taken.....	110
III.1.11. Whether trees to be cut down in order to obtain the necessary land during the preparation and construction phase of the land, if to be cut, species and quantities of trees to be cut, stand type, closure, impacts on the forest ecosystem within the region; distance of the project site to forest lands if all or part of the project area is outside forest lands, evaluation of their impacts, measures to be taken	110
III.1.12. Water supply system plan, where from to supply; types and amounts of wastewater, disposal methods, discharge areas.....	110
III.1.13. Types and quantities of solid wastes to be generated, where to dispose of these wastes or for which purposes they are to be used, disposal methods	111

III.1.14.	Vibration, sources and level of noise, cumulative values, measures to be taken	114
III.1.15.	Where and how to meet the housing and other technical/social infrastructure needs of the staff and the population affiliated to this staff.....	117
III.1.16.	Works risky and dangerous for human health and environment, measures to be taken.....	118
III.1.17.	Determination of effects on flora/fauna and measures to be taken....	118
III.1.18.	Determination of potential impacts on underground and aboveground cultural and natural assets (traditional urban texture, archaeological remains, Natural values needed to be protected), and measures to be taken	119
III.1.19.	Amount of area and the methods of site arrangements to create landscape elements or for other purposes within the project site (forestation and/or green field arrangements, etc.)	122
III.1.20.	Impacts of the activity on biodiversity and ecosystem, and measures to be taken	122
III.1.21.	Other provisions.....	122
III.2.	Impacts of the project on the physical and biological environment during the operation phase, and measures to be taken.....	123
III.2.1.	Characteristics of all units within the scope of the project, which activities to perform in which units, capacities, amount of energy to be generated, how to transmit the energy to be generated, operating times of the power plant.	123
III.2.2.	Amount of geothermal sources required for the project amount of auxiliary substances, where and how to provide, transportation, storage, their impacts during transportation and storage, measures to be taken	125
III.2.3.	Hazardous, toxic, flammable and explosive substances to be used during power generation in project units, transportation, storage, their impacts during transportation and storage.....	125
III.2.4.	Measures to be taken for heavy metals and toxic chemicals carried by geothermal fluids (arsenic, lead, zinc, boron as well as a significant amount of Carbonate, Silica, Sulfate, Chloride and so on) and gases such as carbon-dioxide and hydrogen-sulfur	126
III.2.5.	Properties of machinery, tools, instruments and equipment to be used in project units.....	127
III.2.6.	After-use evaluation or disposal systems of geothermal source, number, depths and capacities of reinjection wells to be drilled,	127
III.2.7.	Potential impacts on groundwater during the production and transportation of the geothermal source as a result of its use, and measures to be taken	128
III.2.8.	Impacts on other geothermal sources/the basin depending on the use of the source, and measures to be taken (cumulative evaluation)	129
III.2.9.	Potential impacts on the soil layer as a result of the use of the geothermal source, assessment of risks such as collapse or potholes	129
III.2.10.	Potential impacts during the cleaning of existing wells or reactivation of unused wells, and measures to be taken	

.....	130
III.2.11. How much water to be used in project units for which processes characteristics of wastewater to be generated, how to dispose it	
.....	130
III.2.12. Quantities and characteristics of solid wastes to be generated during the operation of the plant, disposal processes, and measures to be taken	131
III.2.13. Quantities and characteristics of gas wastes to be generated during the operation of the plant, its impacts on the air quality region, disposal processes, and measures to be taken	133
III.2.14. Vibration because of the project, sources and level of noise, and measures to be taken	134
III.2.15. Quantities and characteristics of radioactive waste, measures to be taken	134
III.2.16. Impacts on forest areas and measures to be taken against these impacts	135
III.2.17. Impacts on agricultural areas and measures to be taken against these impacts	135
III.2.18. Measures to be taken for flora/fauna	135
III.2.19. Determination of potential impacts on underground and aboveground cultural and natural assets, and measures to be taken	136
III.2.20. Where and how to meet the housing and other technical/social infrastructure needs of the staff and the population affiliated to this staff during the operation of the project; amounts of waste water generated from drinking and use, how to dispose; quantities and characteristics of solid wastes to be generated, how to dispose these wastes	136
III.2.21. Activities risky and dangerous for human health and environment during the operation of the project	137
III.2.22. Current pollution load of the region, and assessment of potential impacts of the power plant (on living creatures, air, water, soil) along with other existing and/or intended geothermal power plants	138
III.2.23. Impacts of the activity on biodiversity and ecosystem, and measures to be taken	138
III.2.24. Other Characteristics	138
III.3. Impacts of the project on the socio-economic setting, and measures to be taken	138
III.3.1. Revenue increase, employment growth, population movements, and migration expected to be realized with the project, educational, healthcare, cultural and other social and technical infrastructural services (agriculture, livestock, tourism, greenhouse cultivation, etc.) and the availability of these services	138
III.3.2. Environmental Cost-Benefit Analysis	139
III.3.3. Expropriation and/or resettlement	140
CHAPTER IV. PUBLIC PARTICIPATION	

IV.1. Identification of the people likely to be affected by the project (how and by which methods the local people are informed) and recommended methods for reflecting public opinion to the environmental impact assessment study (reflecting the views of the public about the project and the explanations related to the subject to the EIA report).....	141
IV.1. Other parties advised to refer their opinion.....	145
CHAPTER V. IMPACTS AFTER AND SURVIVING THE TERMINATION OF THE OPERATION, AND MEASURES TO BE TAKEN AGAINST THESE IMPACTS	146
V.1. Rehabilitation and reclamation	146
V.2. Impacts on existing water sources and measures to be taken.....	146
V.3. Potential impacts to underground and measures to be taken.....	146
CHAPTER VI. ALTERNATIVES TO THE PROJECT	147
(in this section, site selection, technology, measures to be taken, comparison of alternatives and, preference ranking will be specified)	147
CHAPTER VII. OBLIGATION TO PROVIDE INFORMATION ON DEVELOPMENTS IN THE BEGINNING AND CONSTRUCTION PERIODS	148
(Schedule related to the suggested obligation to notify and provide information regarding construction of the activity, environmental management plan and emergency action plan, in case of EIA Positive Certificate, procedures to be carried out within the scope of the Competence Communiqué)	148
CHAPTER VIII. CONCLUSIONS	158
(summary of all explanations, general assessment of the of the extent to which success can be achieved in preventing the negative environmental impacts if the project is implemented, listing the significant environmental impacts of the project, choices among alternatives within the scope of the project and reasons for these choices).....	158
REMARKS AND SOURCES	162
ANNEXES.....	164

TABLES

Table 1. Timetable of the project	14
Table 2. Project site coordinates.....	18
Table 3. Pressure changes by month	21
Table 4. Temperature changes by month	22
Table 5. Aydın precipitation data	23
Table 6. Humidity values (%)	24
Table 7. Distribution of number of days	25
Table 8. Evaporation values (%)	26
Table 9. Wind data by total number of blows from the Aydın Weather Station (1960-2015)	28
Table 10. Wind data by average speeds from the Aydın Weather Station (1960-2015) 29 Table 11.	
Wind data by average speeds from the Aydın Weather Station (1960-2013) 31 Table 12. Seasonal	
wind data by average speeds from the Aydın Weather Station (1960-2013).....	33
Table 13. Wind regime observation records.....	39
Table 14. Streams in Aydın Province.....	54
Table 15. Existing irrigation ponds in Aydın Province and information about these ponds.....	57
Table 16. Flora species with probability of existing within the project site and its surroundings	72
Table 17. Amphibian species with probability of existing within the project site and its surroundings	
75 Table 18. Reptilian species with probability of existing within the project site and its surroundings	
.....	75
Table 19. Mammalian species with probability of existing within the project site and its surroundings	
.....	76
Table 20. Aves species with probability of existing within the project site and its surroundings.....	76
Table 21. Animal species raised in Germencik District of Aydın Province (TÜİK 2015).....	79
Table 22. Amounts of aquaculture production of Aydın Province (TÜİK 2014)	79
Table 23. Amounts of hunted inland (fresh) water products of Aydın Province (TÜİK 2014)	79
Table 24. EPA air quality index	81
Table 25. Limit values of index-calculated parameters.....	81
Table 26. Locations of air quality measurement stations of Aydın Province and measurement	
parameters (Aydın Provincial Directorate of Environment and Urbanization, 2014).....	82
Table 27. PM10 and SO ₂ values of Aydın Province in March 2016 (Turkish Ministry of Environment	
and Urbanization).....	82
Table 28. Monthly average values of 2014 air quality parameters and number of days exceeding the	
limit in Aydın Province (Aydın Provincial Directorate of Environment and Urbanization 2014).....	84
Table 29. Aydın population by years	89
Table 30. Aydın population by districts	90
Table 31. Distribution of Aydın population to age groups.....	91
Table 32. Migration Data of Aydın province	92
Table 33. Distribution of employees to sectors in Aydın province	93
Table 34. Basic indicators according to TÜİK data	94
Table 35. Distribution of unemployment by age and gender	94
Table 36. Statistics of academic year 2014-2015 in Aydın province.....	94
Table 37. Amount of excavation and vegetable soil during the preparation phase of the project.....	98
Table 38. List of coordinates of the storage area of vegetable soil	99
Table 39. Machinery to be employed and their specifications	99
Table 40. Diesel fuel properties.....	100
Table 41. Emission factors of pollution emitted by diesel vehicles	100
Table 42. Pollutants from engineering vehicles to be employed.....	101
Table 43. Vehicle load from vehicles to be employed within the scope of the project.....	101
Table 44. Information on the wells to be included in the project.....	104
Table 45. List of coordinates the wells to be included in the project	105
Table 46. Distances of the project site and the wells to D550 freeway and E87 highway.....	105
Table 47. Dust emission factors used in dust calculations	108

Table 48. Total dust emission during construction activities	109
Table 49. Daily water needs during the construction phase	111
Table 50. Sound power levels defined according to the equipment type and their net power levels..	115
Table 51. Noise levels of machinery and equipment to be used during the land preparation and construction phases.....	116
Table 52. Sound pressure level in the site (land preparation and construction phases)	116
Table 53. Lday values by distance (land preparation and construction phases).....	117
Table 54. Reinjection wells information	128
Table 55. Notification schedule.....	149

FIGURES

Figure 1. Electricity consumption 1970-2015	4
Figure 2. Electricity consumption per capita 1971-2014	5
Figure 3. Map indicating the distances of the project site to residential areas	7
Figure 4. Schematic illustration of the geothermal system	9
Figure 5. Energy generation in steam-dominant fields.....	10
Figure 6. Atmospheric-exhaust steam cycle.....	11
Figure 7. Schematic illustration of dual cycle	12
Figure 8. Work flow chart	15
Figure 9. Satellite image and topographical map showing the location of the project site	17
Figure 10. Transportation map showing the route of transportation to the project site.....	18
Figure 11. Graphical representation of pressure values	21
Figure 12. Graphical representation of temperature values.....	22
Figure 13. Annual areal precipitation in Aydın province	23
Figure 14. Humidity graphic	24
Figure 15. Graphic of the numbers of snowy and snow covered days	25
Figure 16. Graphic of foggy, hail, frosty, and thunderstorm days	26
Figure 17. Evaporation graphic	27
Figure 18. Graphical representation of annual total number of wind blows from the Aydın Weather Station	
Figure 19. Graphical representation of annual average wind speeds from the Aydın Weather Station	
Figure 20. Graphical representation of seasonal total number of wind blows from the Aydın Weather Station	32
Figure 21. Graphical representation of seasonal average wind speeds from the Aydın Weather Station	34
Figure 22. Graphical representation of total number of monthly blows and average wind speeds from the Aydın Weather Station	38
Figure 23. Graphical representation of average wind speed data from the Aydın Weather Station	39
Figure 24. Graphical representation of maximum wind speed data from the Aydın Weather Station	40
Figure 25. Graphical representation of the average number of strong windy days data from the Aydın Weather Station	40
Figure 26. Graphical representation of the average number of stormy days data from the Aydın Weather Station	41
Figure 27. General geological map of Aydın Province (MTA)	42
Figure 28. Legend of the geological map of Aydın Province	43
Figure 29. Stratigraphic column section of the project site and its vicinity	47
Figure 30. Earthquake zones map and location of the project site	49
Figure 31. Hydrogeological units of the Germencik area	51
Figure 32. Basin location map.....	53
Figure 33. Map showing the flow observation stations.....	56
Figure 34. Data on Hıdırbeyli pond.....	57
Figure 35. Data on İkizdere dam	58
Figure 36. Dams and ponds around the project site	58
Figure 37. Map of geothermal sources and volcanic areas (MTA)	60
Figure 38. Turkish Geothermal Energy Sources (MTA).....	61
Figure 39. Distribution and application maps of Turkish geothermal sources - 1 (MTA).....	61
Figure 40. Distribution and application maps of Turkish geothermal sources - 2 (MTA).....	62
Figure 41. Geothermal sources around the project site (MTA).....	63
Figure 42. Land distribution of Aydın province.....	67
Figure 43. Use statuses of agricultural lands.....	68
Figure 44. Map showing the distance of the project site to the closest forest area (Geodata - Ministry of Forestry and Water Affairs 2013).....	69
Figure 45. Phytogeographic regions of Turkey	70

Figure 46. Location of the project site in the grid system	71
Figure 47. Satellite image of air quality measurement station of Aydın province (Turkish Ministry of Environment and Urbanization)	82
Figure 48. March PM10 and SO2 Graphic of Aydın Province (Turkish Ministry of Environment and Urbanization)	84
Figure 49. Aydın population growth by years	90
Figure 50. Aydın population growth rate	90
Figure 51. 2014 motorways traffic volume map of 2nd Highways region	102
Figure 52. 2014 state roads volume map of 2nd Highways region	102
Figure 53. Lday distribution graphic by distance (land preparation and construction phases)	117
Figure 54. Local newspaper advertisement	142
Figure 55. National newspaper advertisement	143
Figure 56. Public participation meeting images	144

ANNEXES

ANNEX-1 COORDINATES OF THE LOCATION SELECTED FOR THE PROJECT

ANNEX-2 SITE LOCATION MAP

ANNEX-3 TOPOGRAPHIC MAPS

ANNEX-3A 1/25,000-scale topographic map

ANNEX-3B Topographic map showing the sphere of influence

ANNEX-3C Topographic map showing the vegetable soil storage area

ANNEX-3D Topographic map showing the distances of geothermal wells to highways

ANNEX-4 SATELLITE MAP

ANNEX-5 ENVIRONMENTAL PLAN MAP

ANNEX-6 GEOLOGICAL MAP

ANNEX-7 ACTIVE FAULT MAP

ANNEX-8 LANDSLIDE MAP

ANNEX-9 EARTHQUAKE MAP

ANNEX-10 LAND ASSETS

ANNEX-11 STAND MAP

ANNEX-12 PROTECTED AREAS MAP

ANNEX-13 MAP OF AREAS WHERE HUNTING IS AND IS NOT ALLOWED

ANNEX-14 LAYOUT PLAN

ANNEX-15 TITLE DEEDS

ANNEX-15A Title deeds belonging to the plant area

ANNEX-15B Title deeds belonging to well points

ANNEX-16 APPLICATIONS

ANNEX-17 METEOROLOGICAL DATA

ANNEX-18 PHOTOGRAPHS OF THE ACTIVITY FIELD

ANNEX-19 GEOLOGICAL-GEOTECHNICAL SURVEY REPORT

ANNEX-20 CHEMICALS SAFETY DATA SHEETS

ANNEX-21 OPINIONS OF INSTITUTIONS

ANNEX-22 CONSENT

ANNEX-23 Project approval letter for the treatment plant

ANNEX-24 RESULTS OF ANALYSIS RELATED TO PRODUCTION WELLS

ANNEX-25 EMERGENCY ACTION PLANS

ANNEX-26 EMERGENCY POOL

ANNEX-27 OPERATING LICENSE

ANNEX-28 ENERGY LICENSE

NONTECHNICAL SYNOPSIS OF THE PROJECT

The project, which is the subject of the file, is the "Efe 6 Geothermal Power Plant" project intended to be implemented within the boundaries of Alangüllü Quarter of Germencik District of Aydın Province by Gürmat Elektrik Üretim A.Ş. The installed power of the power plant intended to be erected within the scope of the project will be 22.6 MWe. Therefore, it is planned to generate 180,800,000 kW per year.

The project shall be implemented on plot 883 in Değirmencivarı Locality of Alangüllü Quarter and plot 603 of Öziçi Locality of Ömerbeyli Quarter of Germencik District of Aydın Province. The surface area of plot 883 is 25,051 m², whereas a 17,098-m² portion designated within the plot is named as the 1st Polygon.

The surface area of plot 603 is 20,270 m², and its purchase surface area is 20,839 m². A 20,461-m² portion designated within this plot is named as the 2nd Polygon.

Plot no. 603, which is to be used for the plant and all of its units, is registered to the activity owner, Gürmat Elektrik Üretim A.Ş. Plot no. 883 is registered to Miraj Turizm ve Ticaret A.Ş., which is a company of the activity owner as well.

Electrical energy to be generated by means of a binary system within the scope of Efe 6 Geothermal Power Plant shall be transmitted from the switchyard on plot no. 883 to the 154-kV Gürmat I Feeder.

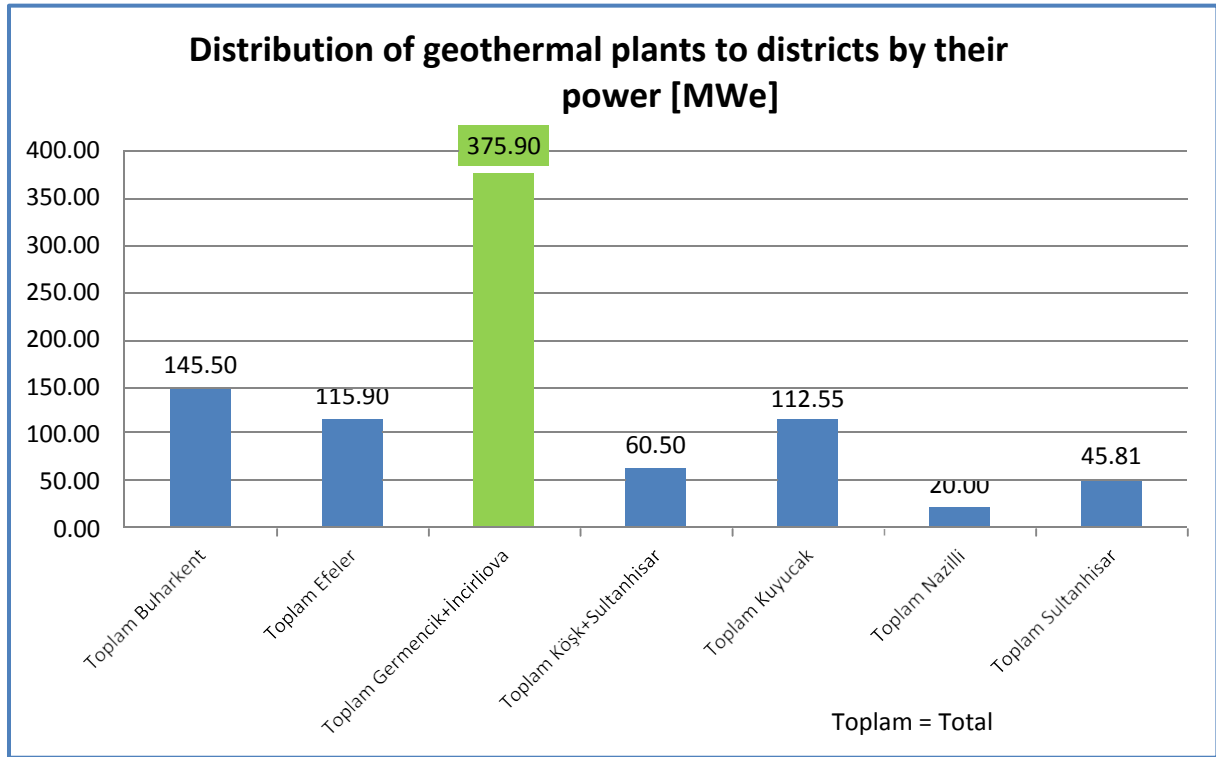
The area on which the project is intended is located on M19- a1, M19-a2, M19-a3, and M19-a4 sheets in 1/25,000-scale topographic maps.

Pursuant to Electricity Market Law no. 4628 and the relevant legislation, license no EÜ/4165-16/2491 dated 13.12.2012 has been obtained from the Energy Market Regulatory Authority to perform energy generation activities for a period of 29 years through Efe 6 Geothermal Power Plant project.

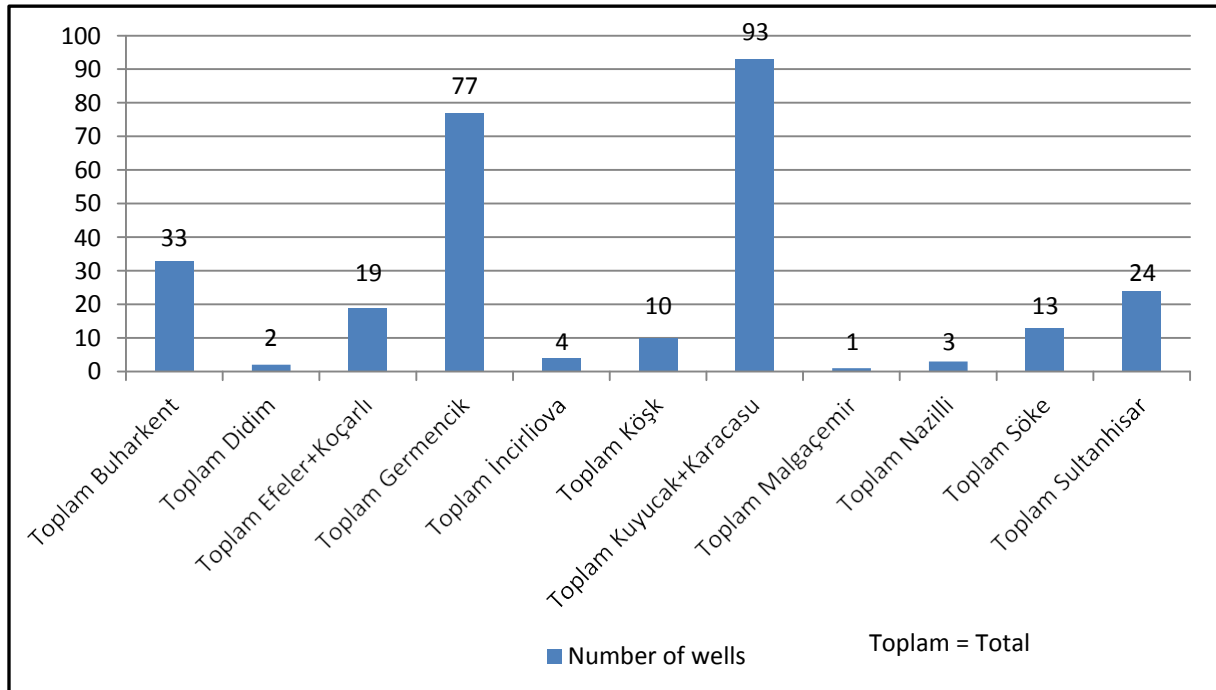
This report has been authored by assessing the project, which is the subject of the file, based on 'Article 44 - Extraction and use of geothermal resources (20 MWe or more thermal capacity)' of the "Regulation on Environmental Impact Assessment" promulgated the Official Gazette issue number 29186 dated 25.11.2014.

50 people in the construction phase of the project and 40 people in the operation phase are planned to be employed.

The geothermal power plants, including the existing and planned ones, Germencik district of Aydın Province, where the project is intended to be implemented, and its immediate vicinity, have a total power of 375.90 MWe. The following figure illustrates the distribution to Districts of the existing and planned Geothermal Plants in Aydın Province by their power.



"EIA Not Required" decisions have been made after 2013 for 77 geothermal wells in Germencik District of Aydın Province in total. The following figure illustrates the distribution of geothermal wells in Aydın Province provided with "EIA Not Required" decisions by districts after 2013.



CHAPTER I: DEFINITION, LOCATION AND CHARACTERISTICS OF THE PROJECT

I.1. Definition, lifetime, service purposes, significance, and

necessity of the project Definition of the project investment

"Efe 6 Geothermal Power Plant" project, the installed power of which is to be 22.6 MWe, is intended to be implemented and operated by Gürmat Elektrik Üretim A.Ş. in order to generate electrical energy from a geothermal source within the boundaries of Alangüllü Quarter of Germencik District of Aydın Province. It is planned to generate 180,800,000 kW per year within the scope of the intended project.

The project shall be implemented on plot 883 in Değirmencivarı Locality of Alangüllü Quarter and plot 603 of Öziçi Locality of Ömerbeyli Quarter of Germencik District of Aydın Province. The surface area of plot 883 is 25,051 m², whereas a 17,098-m² portion designated within the plot is named as the 1st Polygon.

The surface area of plot 603 is 20,270 m², and its purchase surface area is 20,839 m². A 20,461-m² portion designated within this plot is named as the 2nd Polygon.

Plot no. 603, which is to be used for the plant and all of its units, is registered to the activity owner, Gürmat Elektrik Üretim A.Ş. Plot no. 883 is registered to Miraj Turizm ve Ticaret A.Ş., which is a company of the activity owner as well. Copies of title deeds are given in Annex-15, and the deed of consent is given in Annex-22.

Electrical energy to be generated by means of a binary system within the scope of Efe 6 Geothermal Power Plant shall be transmitted from the switchyard on plot no. 883 to the 154-kV Gürmat I Feeder.

The area on which the project is intended is located on M19- a1, M19-a2, M19-a3, and M19-a4 sheets in 1/25,000-scale topographic maps. The topographic map is given in Annex-3.

This report has been authored by assessing the project, which is the subject of the file, based on 'Article 44 - Extraction and use of geothermal resources (20 MWe or more thermal capacity)' of the "Regulation on Environmental Impact Assessment" promulgated the Official Gazette issue number 29186 dated 25.11.2014.

Pursuant to Electricity Market Law no. 4628 and the relevant legislation, license no EÜ/4165-16/2491 dated 13.12.2012 has been obtained from the Energy Market Regulatory Authority to perform energy generation activities for a period of 29 years through Efe 6 Geothermal Power Plant project. The energy generation license is given in Annex-28.

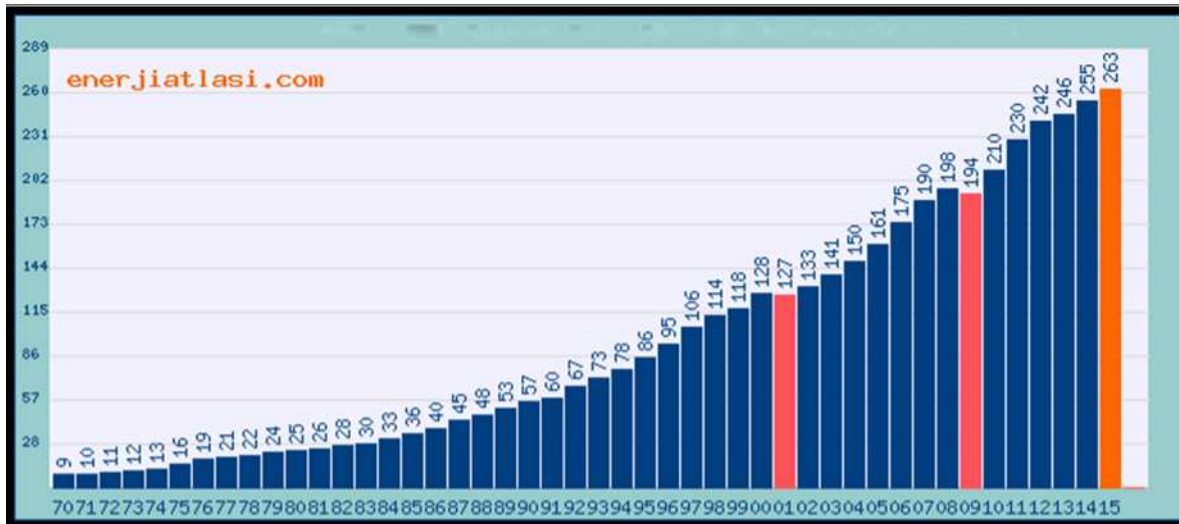
Service purposes, significance, and necessity

The growing need for energy with the rapid increase in the world population and industrialization as well as the air pollution from facilities erected on the purpose of generating energy as a result of this need have created a threat to health of living creatures by disrupting the natural balance of the world, and caused a decrease in the living standards consequently.

Energy requirement plays a significant role in terms of meeting the daily and essential needs of people and sustain a healthy technological development. On the other hand, energy has irreplaceable benefits to our lives, but it also causes substantial environmental pollution during production, cycle, transmission and consumption.

Today, fossil fuels are widely used as energy sources. The use of fossil fuels significantly escalates environmental problems. In order to prevent the pollution caused by fossil fuels, the use of fossil fuels is reduced and it is replaced with alternative energy sources. Renewable energy sources, a type of environmentally sensitive alternative energy, are of great importance. Renewable energy sources provide energy with an efficiency ever-increasing thanks to technological developments.

Energy is an important factor for our national economy. Energy is the foundation of industrialization and an indispensable element of daily life. Our country is growing rapidly in terms of industry, economy and population, so does the energy need. For this reason, it is of great importance to use the generated energy with high efficiency and to make use of the potential of alternative and renewable energy sources in addition to the existing energy resources.

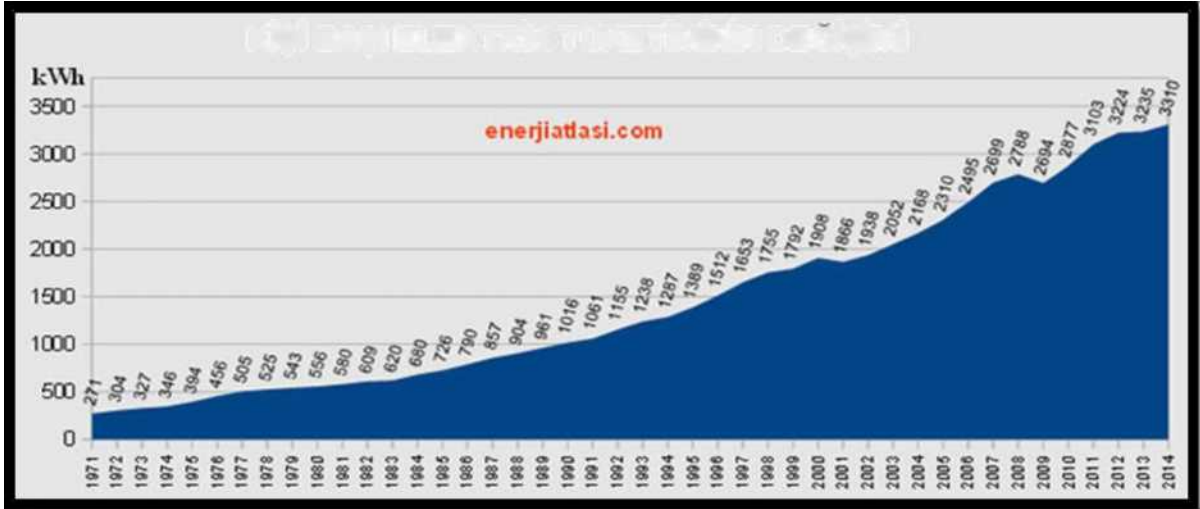


(Source: www.enerjiatlasi.com)

Figure 1. Electricity consumption 1970-2015

Electricity consumption of our country in 2015 is calculated as approximate 263,377,604,265 kWh

As for electricity consumption per capita within the 1971-2014 period, it appears that consumption increases almost every year. Electricity consumption per capita 1971-2014 is given in the following graph.



(Source: www.enerjiatlası.com)

Figure 2. Electricity consumption per capita 1971-2014

According to these two graphs, it appears that energy needs increase in our country every day. A new investment is being made every day in order to meet this growing electrical energy demand from renewable sources.

"Efe 6 Geothermal Power Plant" project, the installed power of which is to be 22.6 MWe, is intended to be implemented and operated under the project, which is the subject of the file, in order to generate electrical energy from a geothermal source within the boundaries of Alangüllü Quarter of Germencik District of Aydın Province. It is planned to generate 180,800,000 kW per year within the scope of the intended project.

There will be no significant damage to the environment within the scope of the project planned by Gürmat Elektrik Üretim A.Ş.; on the contrary, the aforementioned geothermal power plant will generate electrical energy for our country without harming the nature and the environment. All of the energy to be generated on site will be transferred to 154 kV Gürmat I Feeder and transferred from there to the national energy network. The plant, which is going to contribute to meeting the national energy demand which increases in parallel with the population growth and industrial development, will be a first step taken to reduce the external energy dependency of Turkey.

Lifetime of the project

The construction work within the scope of the Efe-6 Geothermal Power Plant project is expected to last 24 months in average. The license period of the project is 29 years. It is estimated that the economic life of the project will be 49 years by means of the license modification procedures to be completed within the scope of the project.

I.2. Location selected for the project (Environmental Plan showing the project location, Plan Notes & Provisions and Legends thereof, Notes and Legends of Master Development Plan and Land Use Plan (approved by the relevant agency), scaled map if these plans are unavailable).

Efe 6 Geothermal Power Plant will be located within the license no. J-553 for operating Geothermal Sources and Natural Mineral Waters covering the 700.66-ha field belonging to Gürmat Elektrik Üretim A.Ş. The said operating license is given in Annex-27.

Plot no. 603, which is to be used for the plant and all of its units, is registered to the activity owner, Gürmat Elektrik Üretim A.Ş. Plot no. 883 is registered to Miraj Turizm ve Ticaret A.Ş., which is a company of the activity owner as well.

The geothermal power plant will be installed in two polygons. The surface area of plot 883 is 25,051 m², whereas a 17,098-m² portion designated within the plot is named as the 1st Polygon.

The surface area of plot 603 is 20,270 m², and its purchase surface area is 20,839 m². A 20,461-m² portion designated within this plot is named as the 2nd Polygon.

The topographic map showing the location of the Efe-6 Geothermal Power Plant (22.6 MWe) Project is given in Annex-3. The site location map showing the transportation network and location the project site is given in Annex-2. The project site is within agricultural lands according to the Environmental Plan. The environmental plan map on which the project site has been recorded, the approved environmental plan, the legend of the approved environmental plan, and the provisions of the approved plan are given in Annex-5.

The development plan process related to the project site is continuing along with the EIA process. In this process, all the aspects specified in letter 78927862- 045.01-869-17820 of Aydın Metropolitan Municipality dated 17.06.2016 shall be complied with.

I.3. Locations of technical infrastructural units, administrative and social units, and other units under the Project (individual distances to residential areas and illustration thereof on map)

The locations of the technical infrastructural units, administrative and social units, and other units planned within the scope of Efe-6 Geothermal Power Plant Project are indicated on the Layout Plan in Annex-14.

The project site is located approximately 19 km west of Aydın city center, its air distance to the center of Germencik district is approximately 2,5 km. The residential area closest to the plant site is Alangüllü Quarter at northwest, whereas the air distance is approximately 1.2 km. Furthermore, Kızılcagedik and Ömerbeyli Quarters is approximately 1.25 km northeast and 2.4 km east of the project site, respectively. Access to the project site can be provided via the İzmir-Aydın highway (D 550). A map showing the distances of the residential areas to the project is given in the following.

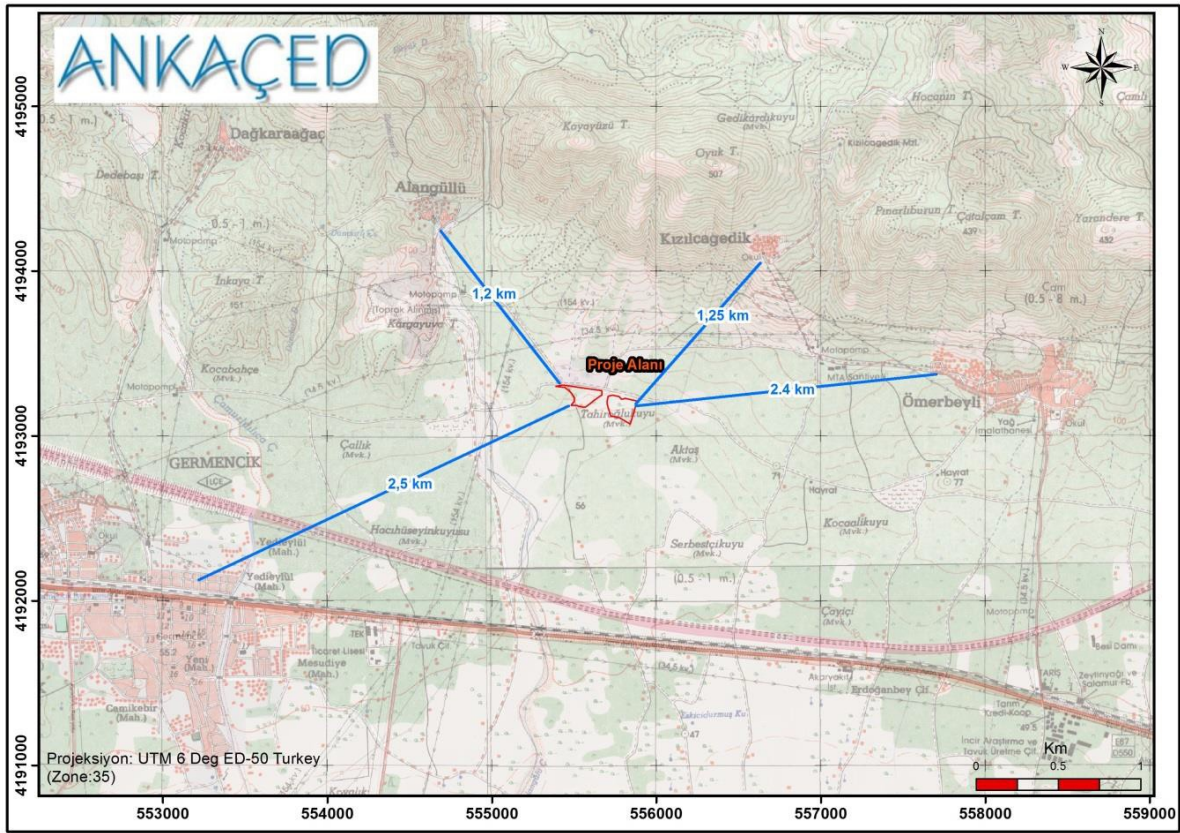


Figure 3. Map indicating the distances of the project site to residential areas

I.4. Technical characteristics of the project (plant's main production, product type, production capacity during the operation phase of the plant, types and quantities of raw and auxiliary materials to be used in the plant, etc.)

The main production is energy and the product is electrical energy during the project phase. The annual generation capacity of the project planned for the electrical energy to be generated is planned to be 180,800,000 kW. The geothermal source will be used as raw material in the plant, and a second fluid (pentane) will be used in the plant, which is planned as a binary system. This fluid turns the turbine by evaporating as a result of being heated by the geothermal source in a closed system, this is how this fluid is used for energy generation.

During the operation phase of the plant, the existing wells which have been drilled for Gürmat GPP, which is another plant of the project owner and at approximately 2 km to the activity field, will be used. 1 more production well will be drilled in addition to these wells. It was decided which wells would be used as production wells and which other would be used as injection wells as a result of tests and measurements applied on the existing wells.

Furthermore, in-well and surface geothermal pipelines, valves, HP and LP separators as well as some CaCO₃ (GS8466) and Silica (GS5195) inhibitors for preventing sedimentation within the reinjection lines will be used within the scope of the project. The safety data sheets for the chemicals to be used are given in Annex-20.

Geothermal energy will be generated using Binary system technology in the project.

This system has been developed in order to generate electricity from medium-low temperature sources in the fields and to recover the waste heat by increasing the use of thermal resources. Binary systems utilize a secondary working fluid with low boiling temperature and low vapor pressure at low temperatures. This secondary fluid works in accordance with a conventional Rankine cycle. Binary systems with a suitable working fluid can operate at inlet temperatures in the range of 80-170 °C.

The fluid coming from the geothermal source (production wells) will firstly be separated into steam and liquid phases in the separator. This geothermal fluid separated into the steam and liquid phases will then be sent to the evaporators (exchangers) and in these evaporators, the liquid, which has already been increased in temperature, will convert the secondary work fluid (pentane) into the steam without physically mixing. The pentane which is converted into steam will be dispatched to the turbine and energy will be generated by the generator connected to the turbine. The pentane in the form of exhaust steam from the turbine will first enter the heat exchanger called a recuperator, which provides heat recovery. This equipment is characterized by the fact that it is located between the turbine and the cooling tower and the liquid and steam phases of pentane pass in separate lines through it. Some part of the heat of the pentane in steam form is transferred to liquid phase in the recuperator, and goes from here to the cooling tower and condense there and dispatched to pre-heater by means of a circulating pump.

Geothermal Energy:

Geothermal energy is the internal heat of the earth. This heat is emitted from the central hot zone to the surface of the earth. Geothermal sources have three important components:¹

- Heat source,
- Fluid carrying heat from underground to surface,
- Adequate rock permeability to circulate water

In geothermal areas, hot rocks and high groundwater temperature are found in shallower places than normal areas. The main reasons for this are as follows:

- The magma rises towards the shell and therefore carries heat,
- Heat flow occurs as a result of high temperature difference where the shell is thinned,
- The groundwater rises to the surface after it gets a few kilometers deep and warms up.

The following figure shows the geothermal system schematically.

¹ Official web site of Izmir High Technology Institute,
<http://web.iyte.edu.tr/~geocen/turkish/whatGeothermalEnergyIsTurkish.htm>

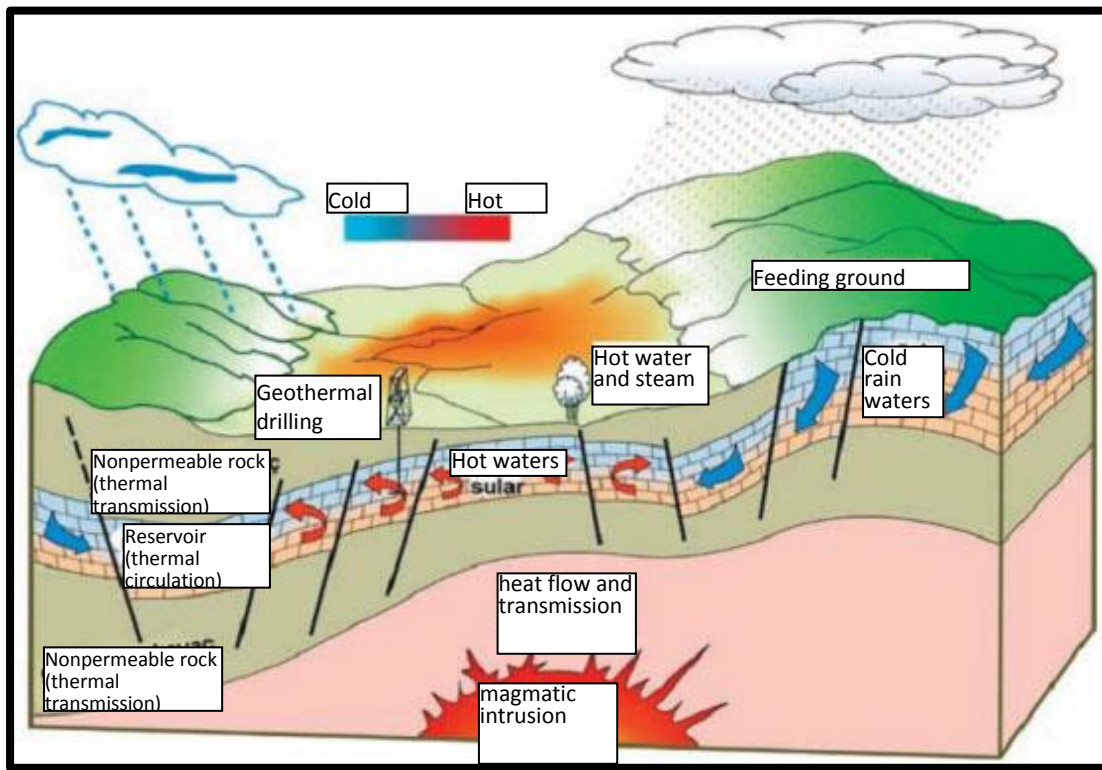


Figure 4. Schematic illustration of the geothermal system

The following definitions can be made to distinguish the geothermal field, system and reservoir.

Geothermal field: It is a geographic definition of a geothermal activity on earth. It is used to describe the area above the underground geothermal reservoir, if there is no natural geothermal outlet on the earth.

Geothermal system: This term is used to define an underground hydraulic system with all its components (such as feeding area, exit points to the earth and underground parts).

Geothermal reservoir: This term describes the hot and permeable part of a geothermal system in operation.

Geothermal systems and reservoirs are classified according to their characteristics such as reservoir temperature, fluid enthalpy, physical condition, nature and geological settlement. For example, it is possible to divide the systems into two groups depending on the temperature at a depth of 1 km in the geothermal reservoir.

- Low temperature systems where the temperature of the reservoir is less than 150 °C: Such systems usually show natural hot water or boiling outlets reaching the earth.
- High temperature systems where the temperature of the reservoir is less than 200 °C: Such systems are characterized by natural steam outlets (fumerols) and boiling mud ponds.

Conventional electricity generation takes place in geothermal fields where the temperature of the reservoir is more than 150 °C.

Thanks to a recently-developed system called as binary cycle, gases with low evaporation points (freon, isobutane etc.) are used, so that electricity can be generated from waters with temperature $80^{\circ}\text{C} < T < 170^{\circ}\text{C}$.

Various systems are available to convert steam- and liquid-dominant systems into electrical energy.

A. Steam-dominant fields

The easiest to use areas are dry steam fields. The steam from the well is passed through a filter and sent to a condensing turbine. A natural or mechanical cooling tower is used in addition to the condenser. The system is schematically shown below.

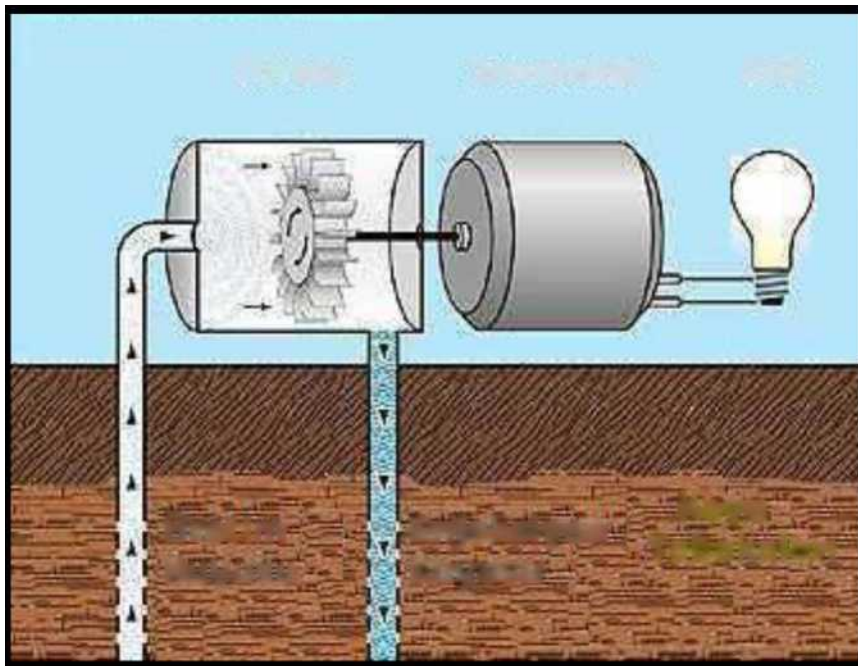


Figure 5. Energy generation in steam-dominant fields

B. Liquid-dominant fields

B.1. Conventional steam turbines with atmospheric exhaust

They are the simplest and cheapest turbines in terms of initial investment costs. In this type of plant, the geothermal fluid first comes into the separator. The liquid and vapor phases are separated here. The steam phase feeds a steam turbine and discharged directly to the atmosphere as dead steam. A simplified schematic representation of atmospheric exhaust plants is given below.

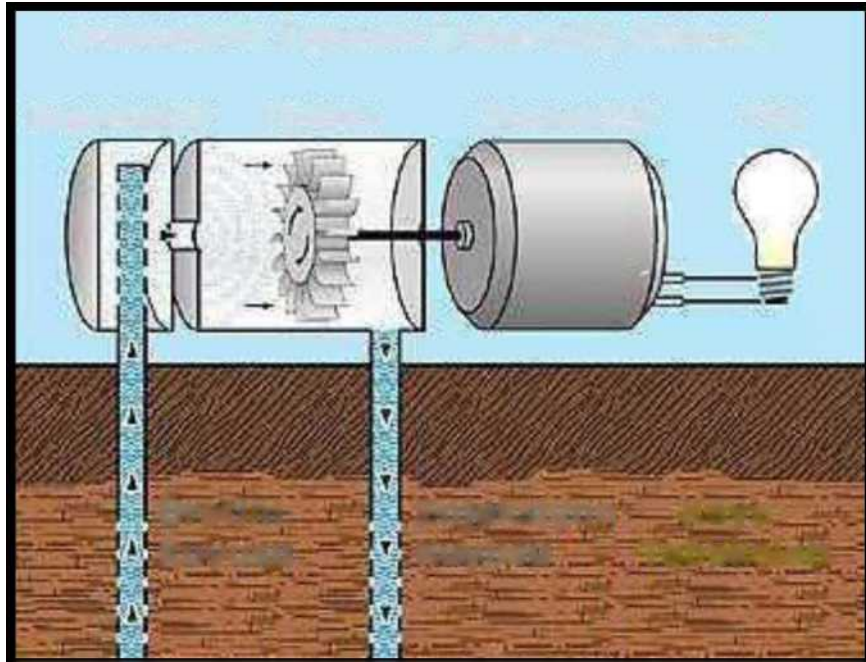


Figure 6. Atmospheric-exhaust steam cycle

Information on these geothermal power plant units is explained below.

B.2. Conventional steam turbines with condensation

It is a version of atmospheric exhaust design, which is advanced in terms of thermodynamics. The two-phase fluid is first separated into the liquid and steam phases in the separator. The steam is discharged from the turbine into a condenser held at a very low pressure (about 0.12 bar) rather than being discharged directly to the atmosphere.

B.3. Double-stage evaporation

The wellhead fluid first goes to the separator and is separated into steam and liquid phases. The steam is sent to a high pressure turbine and water to an evaporator (flash tank). The remainder of the fluid flashed to a low pressure here is sent to the injection, the resulting steam is sent to the low-pressure turbine. Thus, the system efficiency is enhanced.

B.4. Multiple evaporation

The liquid separated from the separator is sent to a second separator, the number of separators can be increased within the economic constraints.

B.5. Binary Cycle Power Plants (Binary System)

The most important waste heat source in geothermal fields is the liquid separated in the separator. Since conventional steam turbines use only steam, large amounts of remaining liquid are usually discharged into surface waters or injected underground. The binary technology has been developed in order to generate electricity from medium-low temperature sources in the fields and to recover the waste heat by increasing the use of thermal resources.

A simplified schematic representation of binary systems is given below. Binary systems utilize a secondary working fluid with low boiling temperature and low vapor pressure at low temperatures. This secondary fluid works in accordance with a conventional Rankine cycle. Binary systems with a suitable working fluid can operate at inlet temperatures in the range of 80-170 °C.

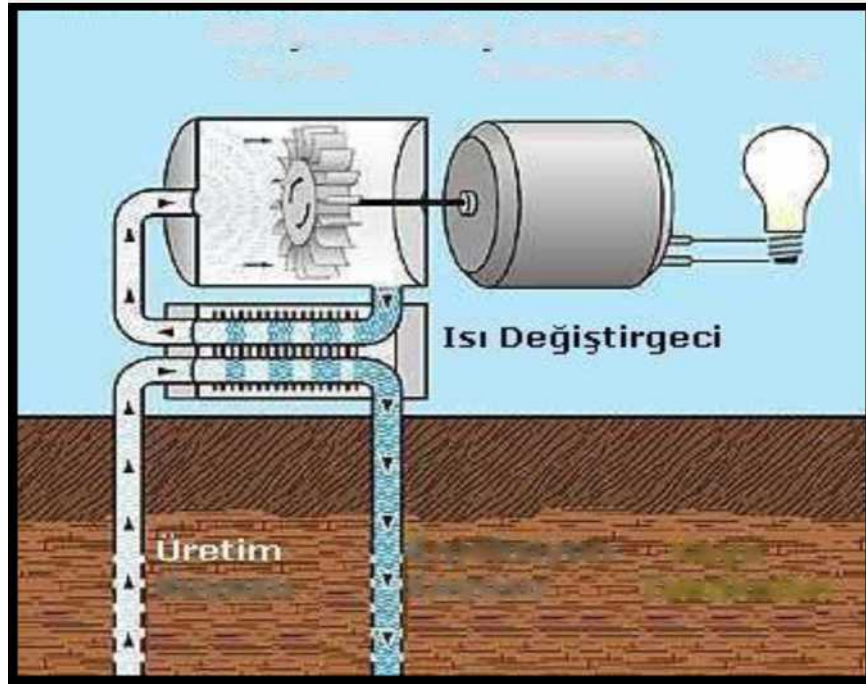


Figure 7. Schematic illustration of dual cycle

Turbines, generator:

High-pressure secondary work fluid (pentane) in the gas phase entering the turbines enters the turbine to turn the turbine blades and the kinetic energy produced in this way is converted into electrical energy in the generator. System control will be ensured by equipping every turbine inlet with control valves. The cooling water system that provides cooling of the bearings and oil in the system will provide cooling of the bearing components and oils of the turbine and generator.

Production and injection system:

In this system, the geothermal fluid is collected from the production wells and transported to the separation station. The gas and liquid geothermal fluid separated here from each other is sent to the evaporator.

The evaporator makes pentane hot. The liquid geothermal fluid from the evaporator is sent to the pre-heaters, so that the pentane is passed to the gas phase. The liquid geothermal fluid from the pre-heater conveyed to injection wells and reinjected to the reservoir by means of reinjection pumps.

Uncondensed gas discharge system:

Uncondensed gases from the evaporator are removed from the system by means of a silencer on the air-cooled condenser.

Air-cooled condenser:

This system is intended to cool the secondary work fluid from the turbine and convert it into a liquid phase.

Circulation pump and recuperator:

The secondary working fluid (pentane) in the liquid phase from the air-cooled condenser is pumped to recuperator by means circulating pumps and it is loaded with the heat energy of the secondary pentane in gas phase directed to the air-cooled condenser in the recuperator and continues its movement towards the pre-heater.

Auxiliary systems:

In addition to the specified main systems, this system has been designed to provide the necessary system for supplying the required running water for the plant site and the fire protection of the plant equipment. It consists of running water supply, fire response systems, and a fire water storage tank.

Instrument control system of the power plant:

The plant control and protection system, which is established for the purpose of protection, automation and control room of the plant, is a system consisting of monitoring instruments and control valves and panels.

Air system:

It is a system consisting of compressors, dryers and tanks, which are installed to supply the compressed air required by the control valves.

Wellhead systems:

These systems consist of tubular materials and brackets used in the construction of geothermal wells, wellhead main valves to be used at wellheads to control and regulate the flow, inhibitor systems preventing in-pipe incrustation, check valves, and silencers and flumes used for test procedures.

I.5. Economic characteristics of the project (relevant investment schedule, sources of finance, where from to obtain these sources, workflow diagram or timing table, cost-benefit analysis.

The project is planned to be implemented with the company's equity and sources of borrowing.

The Efe-6 Geothermal Power Plant Project shall be designed to use the Binary technology. The economic life of the system, which can operate at low temperatures, is estimated to be 49 years. The license period for energy production, which is 29 years, can be extended with future license amendments.

The project plan is as follows: the first 8 months of 2016 for the EIA process, the rest of 2016 for obtaining the permits required by the legislation in force, 12-month construction period in 2017-2018, and commissioning as of 2018. The following table shows the timetable of the project.

Table 1. Timetable of the project

DESCRIPTION	YEAR/MONTH			
	2016	2016	2017	2018
	1st month	9th month	1st month - 12th month	10th month - 11th month
EIA process				
Permits to be obtained under the legislation				
Construction period				
Commissioning				

The investment cost of the project is approximately TRY 315,000,000 and the production cost is approximately TRY 63,000,000. The total cost has been calculated to be TRY 378,000,000. The estimated 1-year total production revenue of the plant has been calculated as approximately TRY 73,500,000. Considering these figures, the plant is intended to move into profit approximately 5.5 years later.

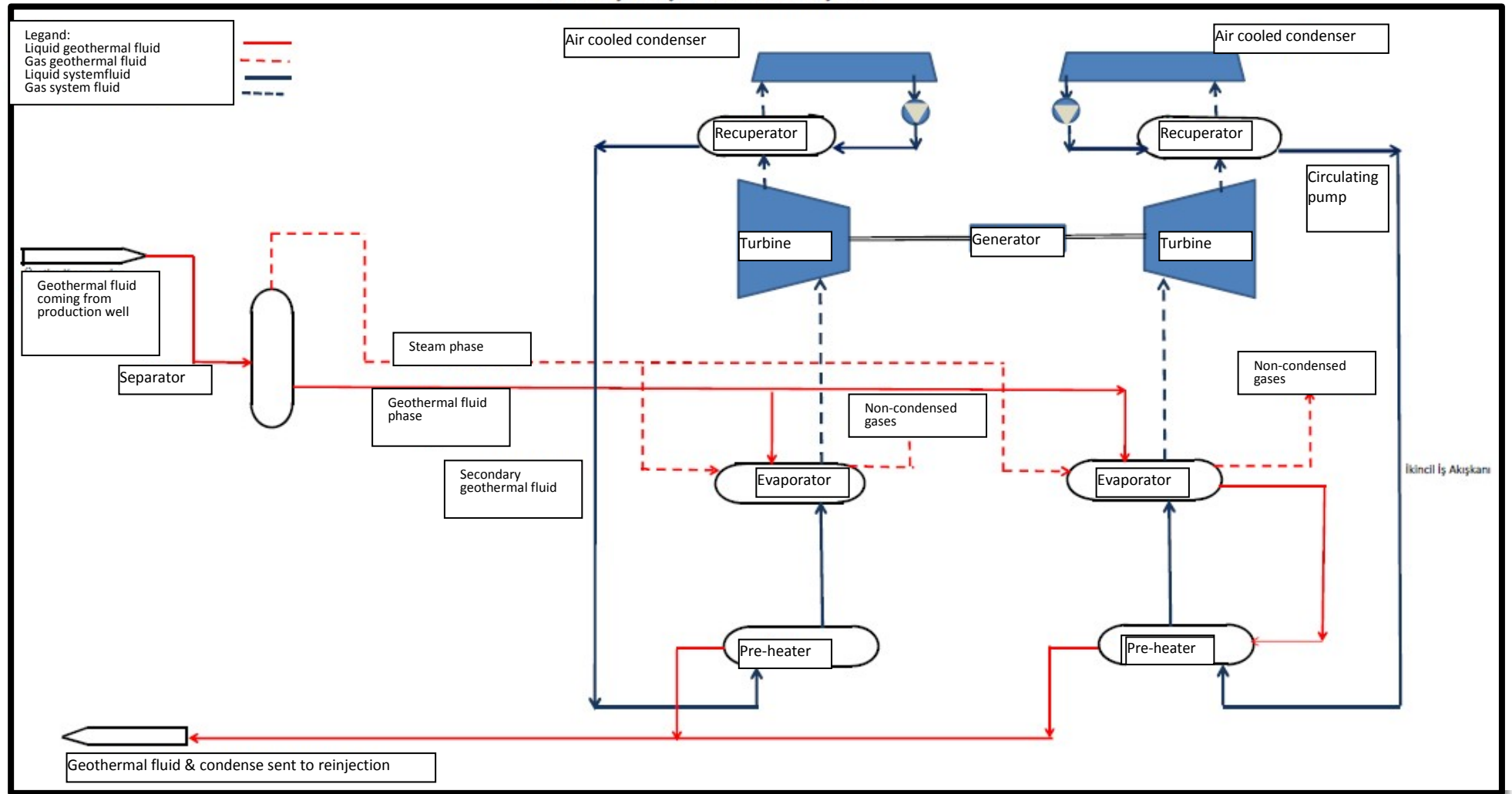


Figure 8. Work flow chart

I.6. Other**provisions****Ownership status**

Plot no. 603, which is to be used for the plant and all of its units, is registered to the activity owner, Gürmat Elektrik Üretim A.Ş. Plot no. 883 is registered to Miraj Turizm ve Ticaret A.Ş., which is a company of the activity owner as well. Copies of title deeds are given in Annex-15, and the deed of consent is given in Annex-22.

CHAPTER II: ENVIRONMENTAL CHARACTERISTICS OF THE PROJECT LOCATION AND SPHERE OF INFLUENCE (*)

(*) In this section, the environmental aspects of the site selected for the project should be considered while the sphere of influence is considered. While the issues listed in this section are explained, the sources and entities, such as public organizations and institutions, research agencies, universities, or other similar entities, from which information is obtained are indicated in the notes section of the report or imprinted on the relevant maps, documents, etc. If the project owner wants to provide information based on his/her own investigations, a document shall be obtained for any information under the jurisdiction of a public organization or institution from the relevant public organization or institution verifying the accuracy of the information and it shall be added to this report.

Location of the project

The project shall be implemented on plot 883 in Değirmencivarı Locality of Alangüllü Quarter and plot 603 of Öziçi Locality of Ömerbeyli Quarter of Germencik District of Aydın Province. The surface area of plot 883 is 25,051 m², whereas a 17,098-m² portion designated within the plot is named as the 1st Polygon.

The surface area of plot 603 is 20,270 m², and its purchase surface area is 20,839 m². A 20,461-m² portion designated within this plot is named as the 2nd Polygon.

The following figure shows the location of the project site. Furthermore, a 1/25,000-scale topographic map showing the project site is given in Annex-3A and a site location map is given in Annex-2.

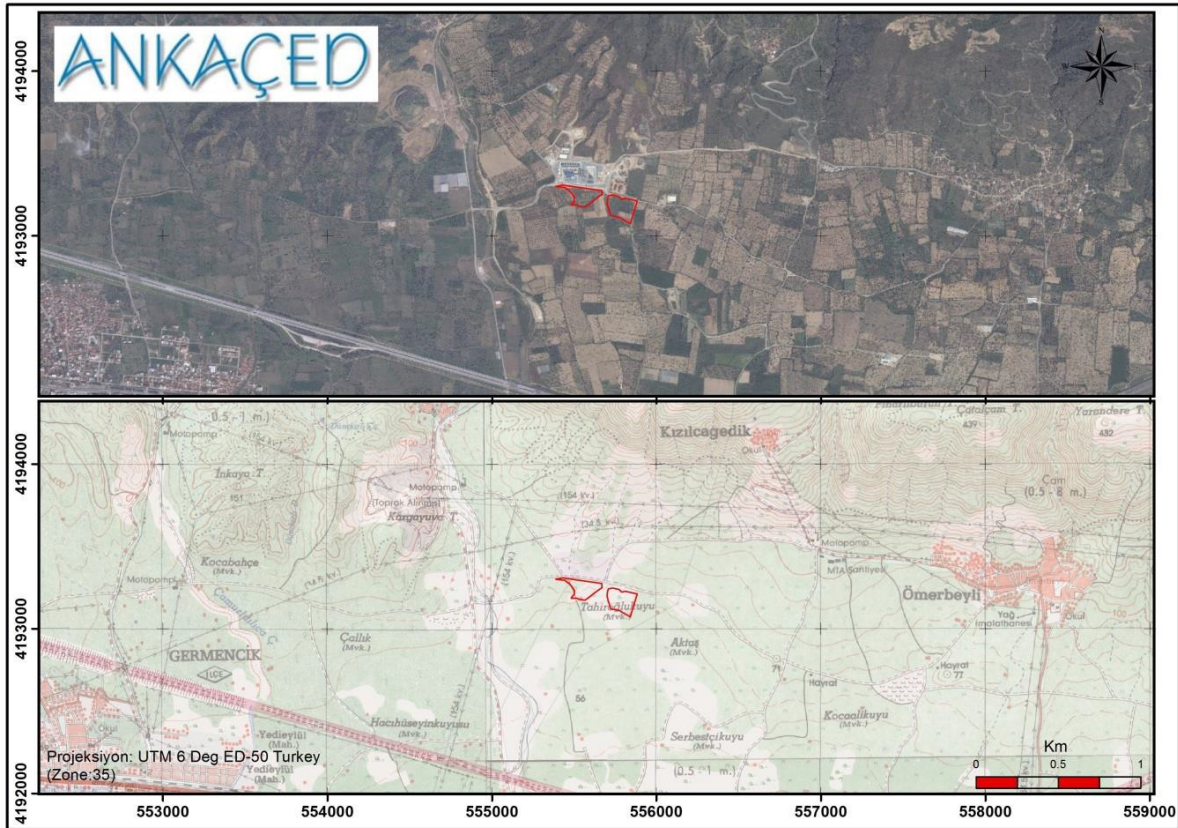


Figure 9. Satellite image and topographical map showing the location of the project site

The project site is accessed through the Alangüllü Junction on D550 İzmir-Aydın Highway.

A map showing the route of transportation to the project site is given in the following figure.

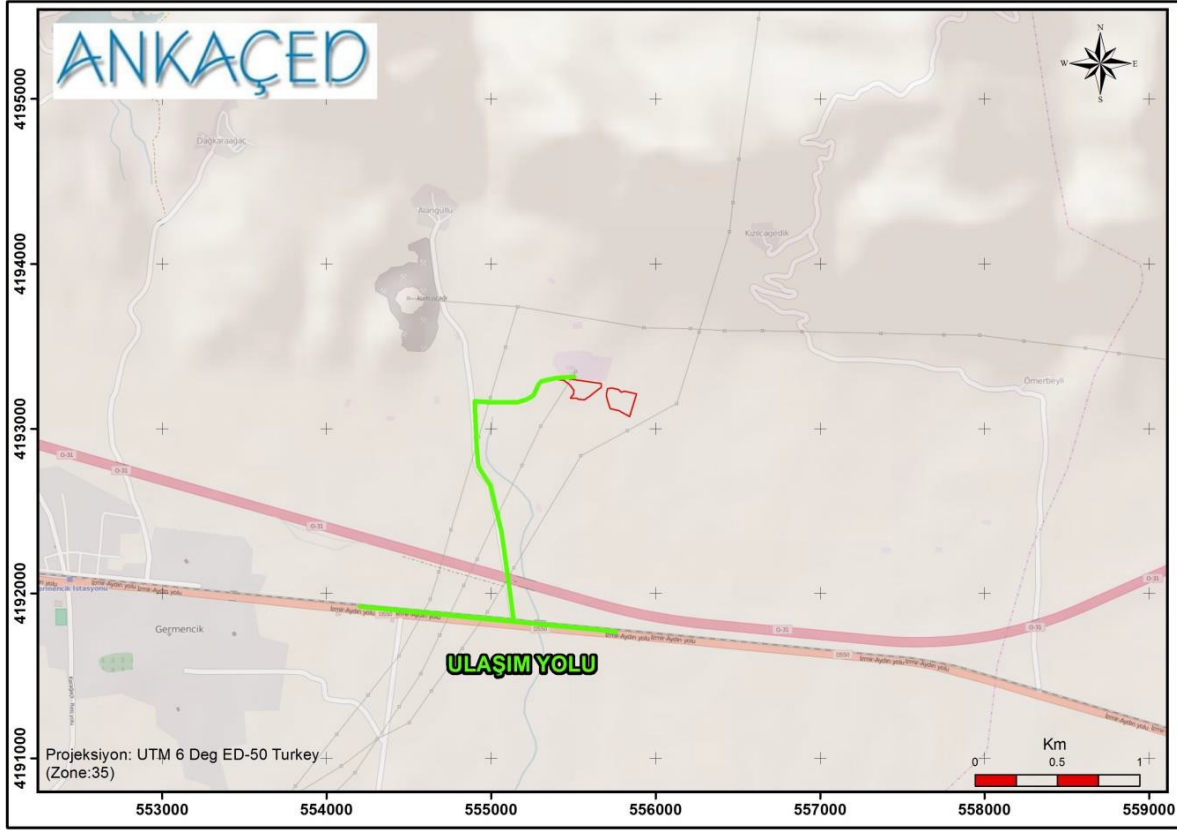


Figure 10. Transportation map showing the route of transportation to the project site

Coordinates of the project site are given in the following table.

Table 2. Project site coordinates

COORDINATES OF POLYGON FIELD NO 1				
Datum	ED50		Datum	WGS84
Type	UTM		Type	Geographica
Element order	Easting value, northing value		Element order	Latitude,
Scale factor	6 degree		Scale factor	****
Dom	27		Dom	****
Zon	35		Zon	****
Point No.	Y	X	Latitud	Longitude
P1.1	555388.3181	4193300.51	37.883853	27.629395
P1.2	555429.7290	4193308.048	37.883918	27.629866
P1.3	555667.8173	4193274.292	37.883600	27.632571
P1.4	555668.5948	4193248.383	37.883366	27.632578
P1.5	555657.6512	4193242.041	37.883310	27.632453
P1.6	555621.0926	4193215.323	37.883071	27.632035
P1.7	555595.6576	4193195.151	37.882891	27.631744

COORDINATES OF POLYGON FIELD NO 1				
Datum	ED50		Datum	WGS84
Type	UTM		Type	Geographica
Element order	Easting value, northing value		Element order	Latitude,
Scale factor	6 degree		Scale factor	****
Dom	27		Dom	****
Zon	35		Zon	****
Point No.	Y	X	Latitud	Longitude
P1.8	555587.2150	4193189.167	37.882837	27.631648
P1.9	555578.5873	4193183.175	37.882784	27.631549
P1.10	555566.0493	4193174.180	37.882704	27.631406
P1.11	555526.3779	4193180.022	37.882759	27.630955
P1.12	555521.9946	4193185.018	37.882804	27.630906
P1.13	555481.1368	4193185.998	37.882815	27.630441
P1.14	555501.1621	4193210.443	37.883034	27.630671
P1.15	555502.8354	4193231.424	37.883223	27.630692
P1.16	555485.5765	4193256.609	37.883452	27.630497
P1.17	555474.5117	4193269.265	37.883566	27.630373
P1.18	555442.5389	4193293.717	37.883789	27.630011
AREA	17098 m2			
COORDINATES OF POLYGON FIELD NO 2				
Datum	ED50		Datum	WGS84
Type	UTM		Type	Geographica
Element order	Easting value, northing value		Element order	Latitude,
Scale factor	6 degree		Scale factor	****
Dom	27		Dom	****
Zon	35		Zon	****
Point No.	Y	X	Latitud	Longitude
P2.1	555708.8211	4193241.8474	37.883305	27.633035
P2.2	555731.4852	4193248.0810	37.883360	27.633293
P2.3	555770.8547	4193238.4577	37.883270	27.633740
P2.4	555790.3780	4193221.8483	37.883120	27.633961
P2.5	555805.4511	4193226.4674	37.883160	27.634132
P2.6	555807.7341	4193228.9662	37.883183	27.634159
P2.7	555883.7242	4193210.8675	37.883015	27.635021
P2.8	555840.861	4193073.1788	37.881777	27.634523
P2.9	555775.8367	4193110.2672	37.882115	27.633787
P2.10	555723.7402	4193121.5448	37.882220	27.633195
P2.11	555707.1677	4193168.1394	37.882641	27.633010
P2.12	555699.0139	4193199.9829	37.882928	27.632920
P2.13	555701.2371	4193219.0514	37.883100	27.632947
P2.14	555705.7673	4193234.1994	37.883236	27.632999
AREA	20461 m2			

II.1. Determination of the area to be influenced by the project (how and based on what the sphere of influence determined to be explained and the sphere of influence to be shown on map)

The closest residential area to the intended project site is Alangüllü Quarter, which is at a 1200-m distance. Dust and noise calculations have been made using this distance to determine the sphere of environmental influence of the project. A 1/25,000-scale topographic map showing the sphere of environmental influence is given in Annex-3B.

The sphere of influence of the project contains houses of Alangüllü and Kızılcagedik quarters, energy transmission lines, E87 İzmir-Aydın Motorway, access roads to Alangüllü and Ömerbeyli quarters, Agricultural Islands, another Geothermal Power Plant (Galip Hoca Power Plant) belonging to the activity owner, and the existing production and reinjection wells and their piping.

Galip Hoca Geothermal Power Plant, which is within the sphere of influence of the project, generates energy by means of double flash method. The technology of Efe-6 Geothermal power plant, which is the subject of the project, is binary system. This system does not have an intense gas discharge, and uses the geothermal fluid as heater and evaporator in a sealed system and pumps the fluid back to underground through reinjection wells. In this way, it will not contribute to the formation of gas waste and odor on the existing air quality in the project site and its immediate vicinity.

II.2. Characteristics of physical and biological environment and use of natural resources within the sphere of influence

II.2.1. Meteorological and climatic characteristics (activity site's general climatic characteristics, temperature distribution, precipitation distribution, humidity distribution, evaporation, distribution of number of days (foggy, snowing, snow-covered, highest snow cover thickness, etc.), wind distribution, wind speed distribution, stormy days, strong windy days - information under this heading to include monthly-seasonal-annual distributions, meteorological data to belong set for many years to cover the last years),

General climatic conditions of the region

The Mediterranean climate prevails in Aydın Province. Summers are hot and dry, winters are rainy and warm. It is cooler than the Mediterranean region due to the north winds.

Nearly 40% of the province of Aydın is covered with forests and maquis. The forests contain various trees such as oak, sycamore, red pine, larch, pistachio, linden, nuts, wild olive, ash, bay, and chestnut. On the plains, all kinds of fruits, vegetables and agricultural products are grown.

While evaluating meteorological conditions, the observation records of Aydın Weather Station for the period 1960-2015 obtained from the General Directorate of State Meteorological Affairs, have been used, whereas the Meteorological Bulletins and given in Annex-17.

Pressure:

According to the observation data of the Weather Station of Aydın Province, the annual average pressure is 1006.9 hPa. The highest pressure was 1028.7 hPa in January and the lowest pressure in January was 975.4 hPa.

Table 3. Pressure changes by month

MONTHS	Average pressure	Maximum pressure (hPa)	Minimum pressure (hPa)
January	1010.6	1028.7	975.4
February	1009.2	1026.1	984.1
March	1008.0	1024.4	985.9
April	1006.1	1023.0	989.1
May	1005.6	1015.1	993.9
June	1003.8	1012.7	992.5
July	1001.3	1010.4	994.1
August	1001.9	1009.0	995.0
September	1005.8	1016.1	997.4
October	1009.2	1019.9	995.4
November	1011.0	1023.8	994.7
December	1010.7	1026.9	985.2
ANNUAL	1006,9	1028,7	975,4

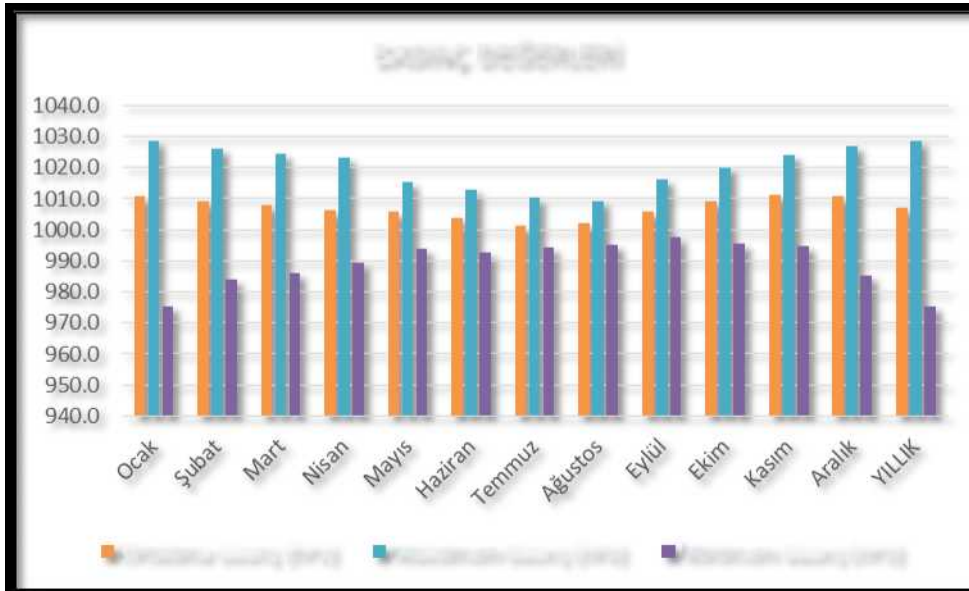


Figure 11. Graphical representation of pressure values

Temperature

In the province of Aydın, the average annual temperature is 17.7 °C according to 56 years of observational data. The hottest months are June and July. The months with the lowest temperature in the region are December, January and February.

Table 4. Temperature changes by month

MONTHS	Average temperature	Maximum temperature (°C)	Minimum temperature (°C)
January	8.2	23.2	-7.6
February	9.2	25.2	-5.2
March	11.9	32.4	-5.0
April	15.8	35.4	-0.8
May	20.9	40.2	4.6
June	25.9	44.4	8.4
July	28.4	44.6	13.4
August	27.5	43.8	11.8
September	23.4	43.3	7.6
October	18.5	37.8	2.0
November	13.3	30.7	-2.0
December	9.6	25.4	-5.2
ANNUAL	17.7	44.6	-7.6

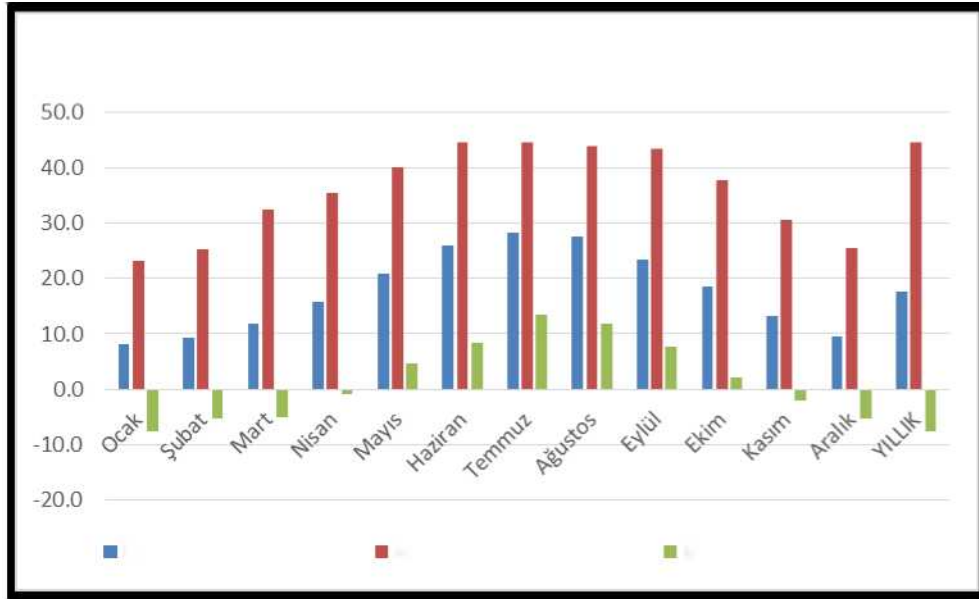


Figure 12. Graphical representation of temperature values

Precipitation:

The average annual precipitation in Aydın province is 634.5 mm.
The maximum precipitation is 93.8 mm in January.

Table 5. Aydın precipitation data

MONTHS	Maximum precipitation	Total precipitation average (mm)
January	93.8	104.6
February	54.8	94.1
March	68.2	69.1
April	48.2	55.1
May	92.0	35.1
June	46.0	13.9
July	29.3	3.2
August	20.3	1.9
September	31.8	12.3
October	86.9	42.9
November	65.9	79.8
December	80.2	122.5
ANNUAL	717.4	634.5

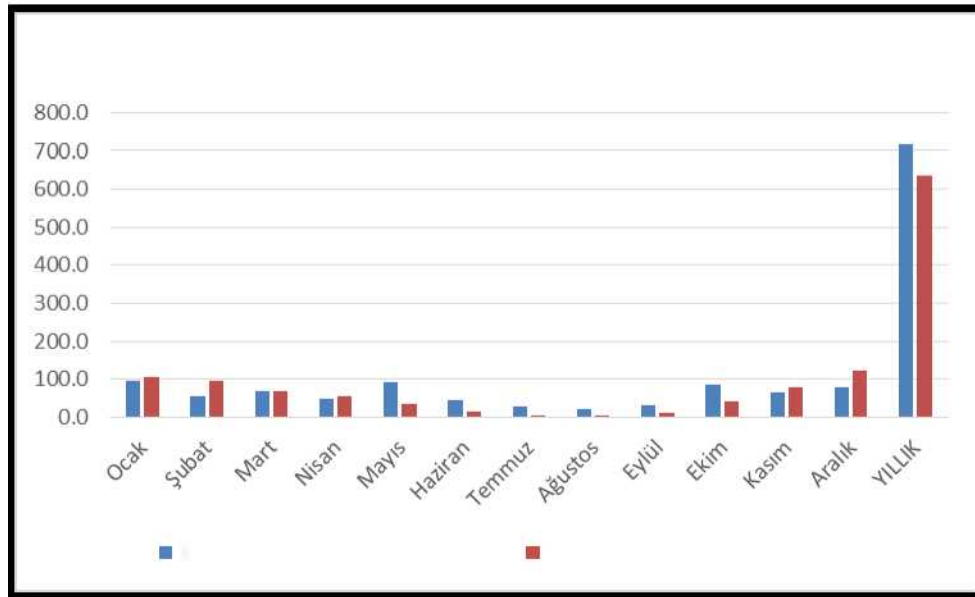


Figure 13. Annual areal precipitation in Aydın province

The highest amounts of precipitation measured at the standard times of Aydın Weather Station is given in Annex-17. These values will be taken into consideration in underground and aboveground construction during construction and operation phases of the activity.

Extraordinary meteorological event observations:

Extraordinary meteorological event observation data obtained from the General Directorate of Meteorology of Turkish Ministry of Forestry and Water Affairs with respect to the project site is given in Annex-17. The most-widely seen (38.2%) extraordinary meteorological events within the region during the

period 1977-2012 are precipitation and flood. in general. It has been noted that damage to agricultural crops, settlements, and transportation routes has been observed in general during precipitation and flood events.

Humidity distribution:

According to the observation data of the Weather Station of Aydın Province, the annual average humidity is 62.0%. The lowest humidity has been measured 4% in July. The average relative humidity values of Aydın Weather Station are given in the table below.

Table 6. Humidity values (%)

MONTH	Average humidity (%)	Minimum humidity (%)
January	72.4	15
Februar	69.7	15
March	66.5	11
April	63.4	6
May	57.5	7
June	49.8	9
July	48.5	4
August	52.5	9
Septemb	56.3	10
October	63.2	10
Novemb	69.7	12
Decemb	74.0	13
ANNUA	62.0	4

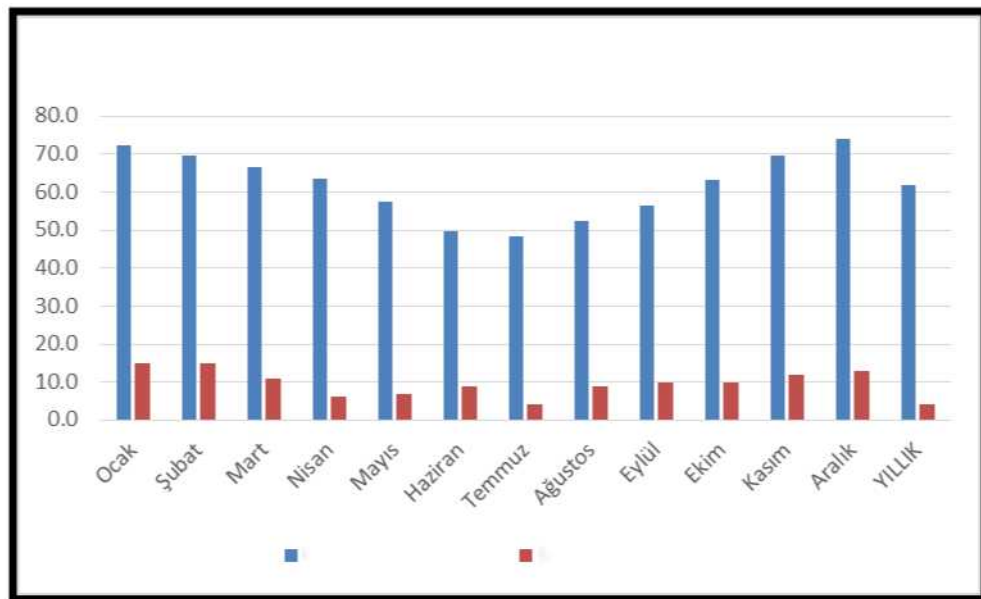


Figure 14. Humidity graphic

Number of days

According to the observation records of Aydın Weather Station, annual average number of foggy days is 1.2, annual average number of snowy days is 0.6, annual average number of snow-covered days is 0.1, annual average number of hail days is 1.5, annual average number of frosty days is 21.4, and annual average number of thunderstorm days is 22.4.

Table 7. Distribution of number of days

Mont hs	Average number of foggy days	Average number of snowy days	Average number of snow- covered days	Average number of frosty days	Average number of hail days	Total number of thunderstorm days
January	0.2	0.3	0.1	6.8	0.3	1.9
February	0.2	0.1	0.0	4.8	0.3	2
March	0.2	0.1	0.0	3.0	0.2	1.8
April	0.1			0.2	0.2	2.5
May	0.0				0.2	3.2
June					0.1	2
July						0.8
August					0.0	0.6
September	0.0				0.0	1.3
October	0.1			0.1	0.1	1.7
November	0.1			1.9	0.0	2.2
December	0.3	0.1	0.0	4.6	0.1	2.4
Annual	1.2	0.6	0.1	21.4	1.5	22.4

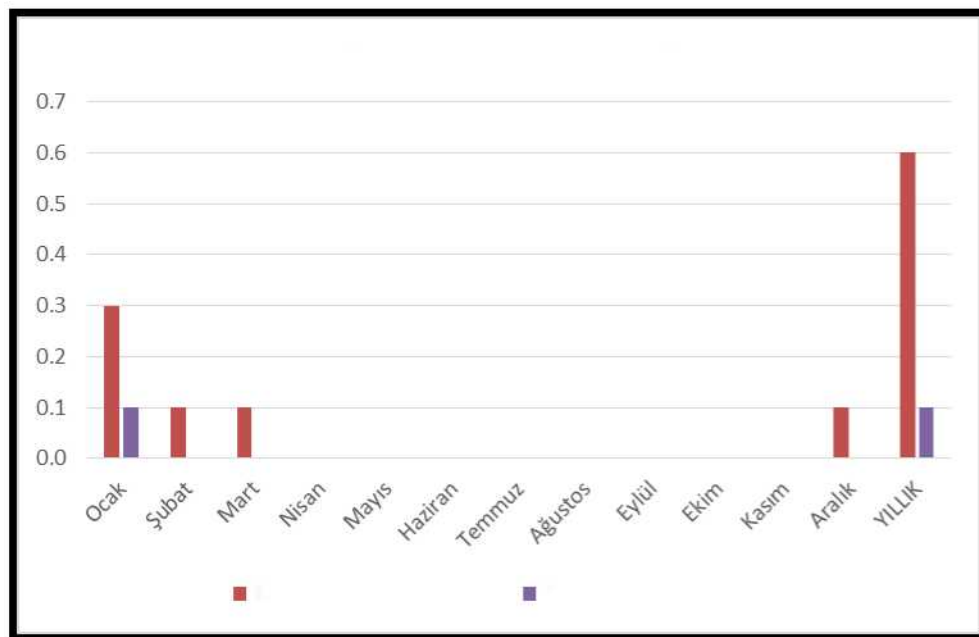


Figure 15. Graphic of the numbers of snowy and snow covered days

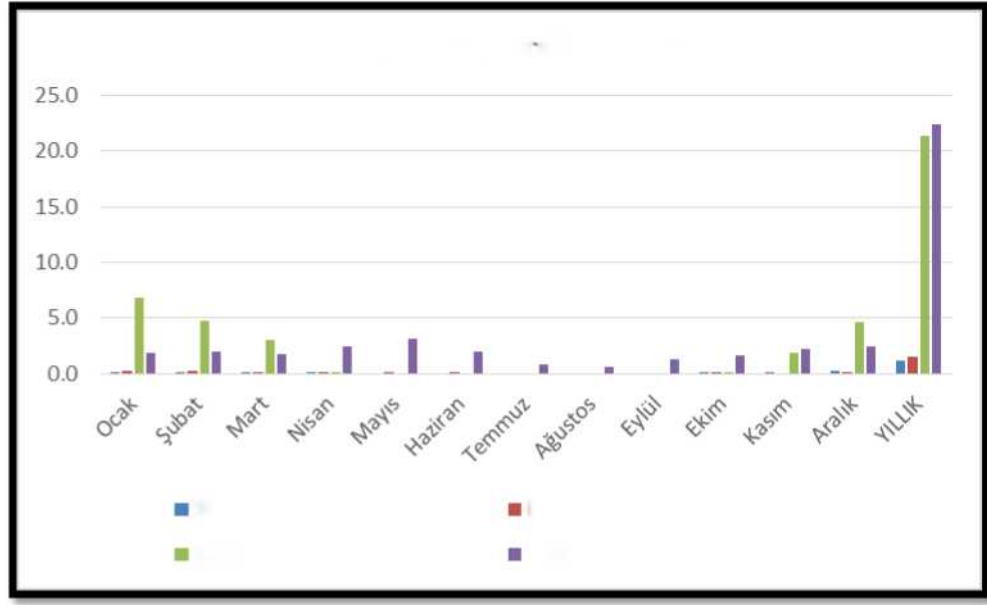


Figure 16. Graphic of foggy, hail, frosty, and thunderstorm days

Evaporation

According to the observation records of Aydın Weather Station for many years (1960-2015), average open surface evaporation is 1,428.3 mm, and maximum open surface evaporation 16.8 mm which is measured in July.

Table 8. Evaporation

MONTH	Average open surface evaporation (mm)	Maximum daily open surface evaporation (mm)
January	15.1	9.4
Februar	18	11.3
March	43.2	8.0
April	104.4	11.0
May	169.0	11.5
June	230.4	13.7
July	268.9	16.8
August	242.7	13.5
Septemb	169.9	10.4
October	103.3	9.6
Novemb	42.8	9.0
Decemb	20.6	5.8
ANNUA	1428.3	16.8

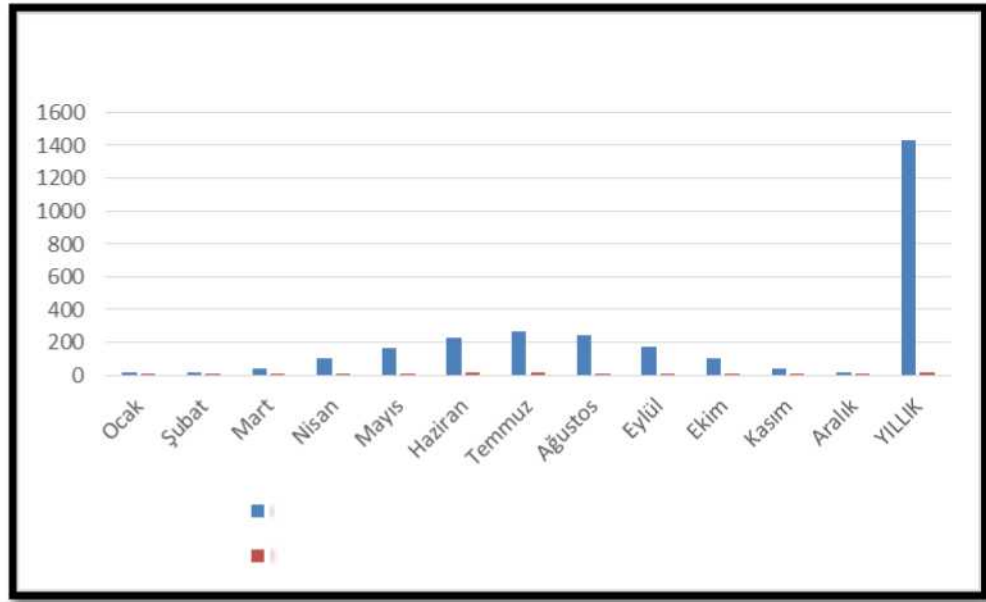


Figure 17. Evaporation graphic

Wind:

Annual and monthly wind directions by number of blows

Annual wind direction

According to the observation data of Aydın Weather Station, the dominant wind direction is NNW (north northwest) and average wind speed is 2.4 m/sec.

Table 9. Wind data by total number of blows from the Aydın Weather Station (1960-2015)

Directions	Januar	Februa	March	April	May	June	July	August	Septem	October	Novemb	December	Annual
N	1154	1340	1200	1044	1132	1275	1130	908	699	783	1133	1265	13063
NNE	1078	1145	1006	849	836	861	1135	984	1036	1097	1300	1153	12480
NE	1849	1636	1519	1172	1107	1015	889	833	802	1320	1722	1711	15575
ENE	5223	4074	3169	2692	2264	2089	1732	1725	2247	3744	4723	5731	39413
E	13111	10241	9227	7557	7042	6014	5194	6304	7208	9293	11736	14095	107022
ESE	6317	5189	5041	4064	3598	2976	3554	3741	3944	4958	5205	5987	54574
SE	1734	1502	1482	1392	1335	1392	1598	1401	1270	1091	1308	1661	17166
SSE	599	564	658	677	590	616	888	820	589	572	463	507	7543
S	623	606	792	824	772	881	1017	786	745	586	527	572	8731
SSW	494	587	836	920	851	916	1325	1311	927	602	431	422	9622
SW	866	1018	1492	1961	2162	2351	3060	3002	2374	1651	855	738	21530
WSW	1409	1699	2503	2713	2734	3189	4398	4391	3919	2847	1577	1065	32444
W	1929	2409	4121	4729	4318	4323	6581	6774	5792	4473	2416	1425	49290
WNW	1457	2114	3789	4500	5405	5021	4917	4424	4347	3807	2051	1373	43205
NW	763	1019	1601	1966	2289	2212	1426	1298	1313	1347	1067	787	17088
NNW	824	1007	1178	1293	1290	1405	1122	750	735	871	976	791	12242

Table 10. Wind data by average speeds from the Aydın Weather Station (1960-2015)

Directions	January	Februa	March	April	May	June	July	August	Septem	October	Novemb	December	Annual
N	1.1	1.2	1.2	1.3	1.4	1.7	2	1.9	1.4	1.1	1	1	1.4
NNE	0.9	1.1	1	1.1	1.1	1.4	1.8	1.5	1.4	0.9	0.9	0.8	1.2
NE	1.1	1.2	1.2	1.2	1.2	1.3	1.5	1.3	1.1	1	0.9	1	1.2
ENE	1.4	1.4	1.3	1.2	1.1	1.1	1.1	1	1	1.1	1.3	1.4	1.2
E	1.9	1.9	1.7	1.6	1.4	1.4	1.2	1.3	1.3	1.5	1.7	1.9	1.6
ESE	1.7	1.7	1.6	1.5	1.3	1.2	1.1	1.1	1.3	1.4	1.6	1.7	1.4
SE	1.4	1.5	1.3	1.3	1.2	1.1	1.1	1	1	1.1	1.2	1.4	1.2
SSE	1	1.2	1.2	1.2	1.2	0.9	1	1	0.9	0.9	0.9	1.1	1.0
S	1.1	1.3	1.4	1.3	1.4	1.3	1.3	1	1.1	1	1	1.1	1.2
SSW	0.9	1.2	1.2	1.5	1.4	1.3	1.3	1.4	1.1	1	0.9	1	1.2
SW	1.2	1.2	1.4	1.5	1.6	1.6	1.7	1.8	1.5	1.1	1	1	1.4
WSW	1.2	1.3	1.6	1.7	1.7	1.7	1.9	2	1.9	1.4	1.1	1.1	1.6
W	1.3	1.5	1.8	2.1	2.3	2.3	2.4	2.4	2.2	1.6	1.3	1.3	1.9
WNW	1.1	1.3	1.6	1.9	1.9	2	2	2	1.9	1.5	1.2	1.2	1.6
NW	1.1	1.2	1.5	1.6	1.7	2	1.9	1.7	1.6	1.2	1.1	1.1	1.5
NNW	0.9	1.1	1.2	1.3	1.5	1.7	1.8	1.6	1.3	1	0.9	0.8	1.3

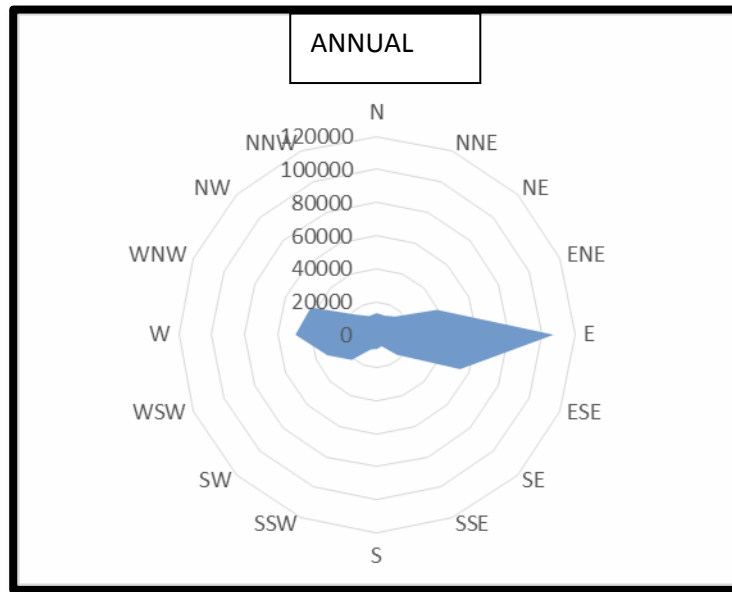


Figure 18. Graphical representation of annual total number of wind blows from the Aydın Weather Station

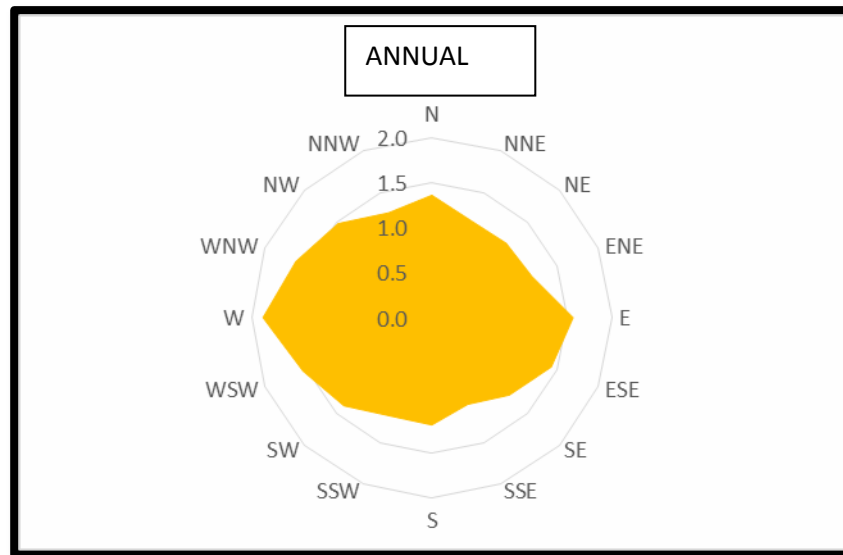


Figure 19. Graphical representation of annual average wind speeds from the Aydın Weather Station

Seasonal wind direction

Table 11. Wind data by average speeds from the Aydın Weather Station (1960-2013)

	SEASONS / MONTHS															
	WINTER				SPRING				SUMMER				AUTUMN			
Directio	Decem	Janua	Febru	TOTAL	Marc	April	May	TOTAL	June	July	August	TOTAL	Septe	Octob	Novem	TOTAL
N	1265	1154	1340	3759	1200	1044	1132	3376	1275	1130	908	3313	699	783	1133	2615
NNE	1153	1078	1145	3376	1006	849	836	2691	861	1135	984	2980	1036	1097	1300	3433
NE	1711	1849	1636	5196	1519	1172	1107	3798	1015	889	833	2737	802	1320	1722	3844
ENE	5731	5223	4074	15028	3169	2692	2264	8125	2089	1732	1725	5546	2247	3744	4723	10714
E	14095	13111	10241	37447	9227	7557	7042	23826	6014	5194	6304	17512	7208	9293	11736	28237
ESE	5987	6317	5189	17493	5041	4064	3598	12703	2976	3554	3741	10271	3944	4958	5205	14107
SE	1661	1734	1502	4897	1482	1392	1335	4209	1392	1598	1401	4391	1270	1091	1308	3669
SSE	507	599	564	1670	658	677	590	1925	616	888	820	2324	589	572	463	1624
S	572	623	606	1801	792	824	772	2388	881	1017	786	2684	745	586	527	1858
SSW	422	494	587	1503	836	920	851	2607	916	1325	1311	3552	927	602	431	1960
SW	738	866	1018	2622	1492	1961	2162	5615	2351	3060	3002	8413	2374	1651	855	4880
WSW	1065	1409	1699	4173	2503	2713	2734	7950	3189	4398	4391	11978	3919	2847	1577	8343
W	1425	1929	2409	5763	4121	4729	4318	13168	4323	6581	6774	17678	5792	4473	2416	12681
WNW	1373	1457	2114	4944	3789	4500	5405	13694	5021	4917	4424	14362	4347	3807	2051	10205
NW	787	763	1019	2569	1601	1966	2289	5856	2212	1426	1298	4936	1313	1347	1067	3727
NNW	791	824	1007	2622	1178	1293	1290	3761	1405	1122	750	3277	735	871	976	2582

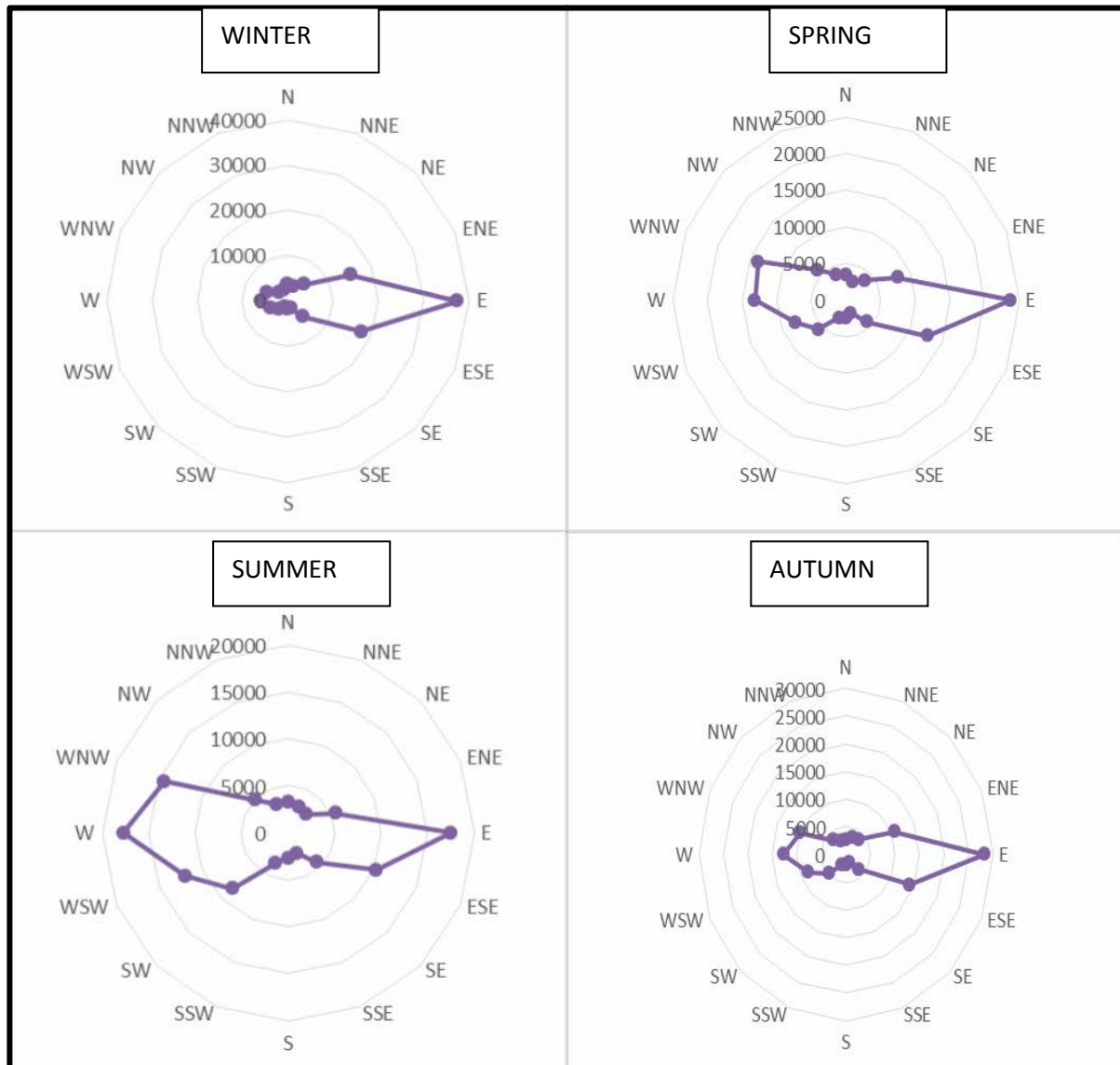


Figure 20. Graphical representation of seasonal total number of wind blows from the Aydın Weather Station

Table 12. Seasonal wind data by average speeds from the Aydın Weather Station (1960-2013)

	SEASONS / MONTHS															
	WINTER				SPRING				SUMMER				AUTUMN			
Direction	Decem	Janua	Febru	TOTAL	Marc	April	May	TOTAL	June	July	August	TOTAL	Septe	Octob	Novem	TOTAL
N	1	1.1	1.2	1.1	1.2	1.3	1.4	1.3	1.7	2	1.9	1.9	1.4	1.1	1	1.2
NNE	0.8	0.9	1.1	0.9	1	1.1	1.1	1.1	1.4	1.8	1.5	1.6	1.4	0.9	0.9	1.1
NE	1	1.1	1.2	1.1	1.2	1.2	1.2	1.2	1.3	1.5	1.3	1.4	1.1	1	0.9	1.0
ENE	1.4	1.4	1.4	1.4	1.3	1.2	1.1	1.2	1.1	1.1	1	1.1	1	1.1	1.3	1.1
E	1.9	1.9	1.9	1.9	1.7	1.6	1.4	1.6	1.4	1.2	1.3	1.3	1.3	1.5	1.7	1.5
ESE	1.7	1.7	1.7	1.7	1.6	1.5	1.3	1.5	1.2	1.1	1.1	1.1	1.3	1.4	1.6	1.4
SE	1.4	1.4	1.5	1.4	1.3	1.3	1.2	1.3	1.1	1.1	1	1.1	1	1.1	1.2	1.1
SSE	1.1	1	1.2	1.1	1.2	1.2	1.2	1.2	0.9	1	1	1.0	0.9	0.9	0.9	0.9
S	1.1	1.1	1.3	1.2	1.4	1.3	1.4	1.4	1.3	1.3	1	1.2	1.1	1	1	1.0
SSW	1	0.9	1.2	1.0	1.2	1.5	1.4	1.4	1.3	1.3	1.4	1.3	1.1	1	0.9	1.0
SW	1	1.2	1.2	1.1	1.4	1.5	1.6	1.5	1.6	1.7	1.8	1.7	1.5	1.1	1	1.2
WSW	1.1	1.2	1.3	1.2	1.6	1.7	1.7	1.7	1.7	1.9	2	1.9	1.9	1.4	1.1	1.5
W	1.3	1.3	1.5	1.4	1.8	2.1	2.3	2.1	2.3	2.4	2.4	2.4	2.2	1.6	1.3	1.7
WNW	1.2	1.1	1.3	1.2	1.6	1.9	1.9	1.8	2	2	2	2.0	1.9	1.5	1.2	1.5
NW	1.1	1.1	1.2	1.1	1.5	1.6	1.7	1.6	2	1.9	1.7	1.9	1.6	1.2	1.1	1.3
NNW	0.8	0.9	1.1	0.9	1.2	1.3	1.5	1.3	1.7	1.8	1.6	1.7	1.3	1	0.9	1.1

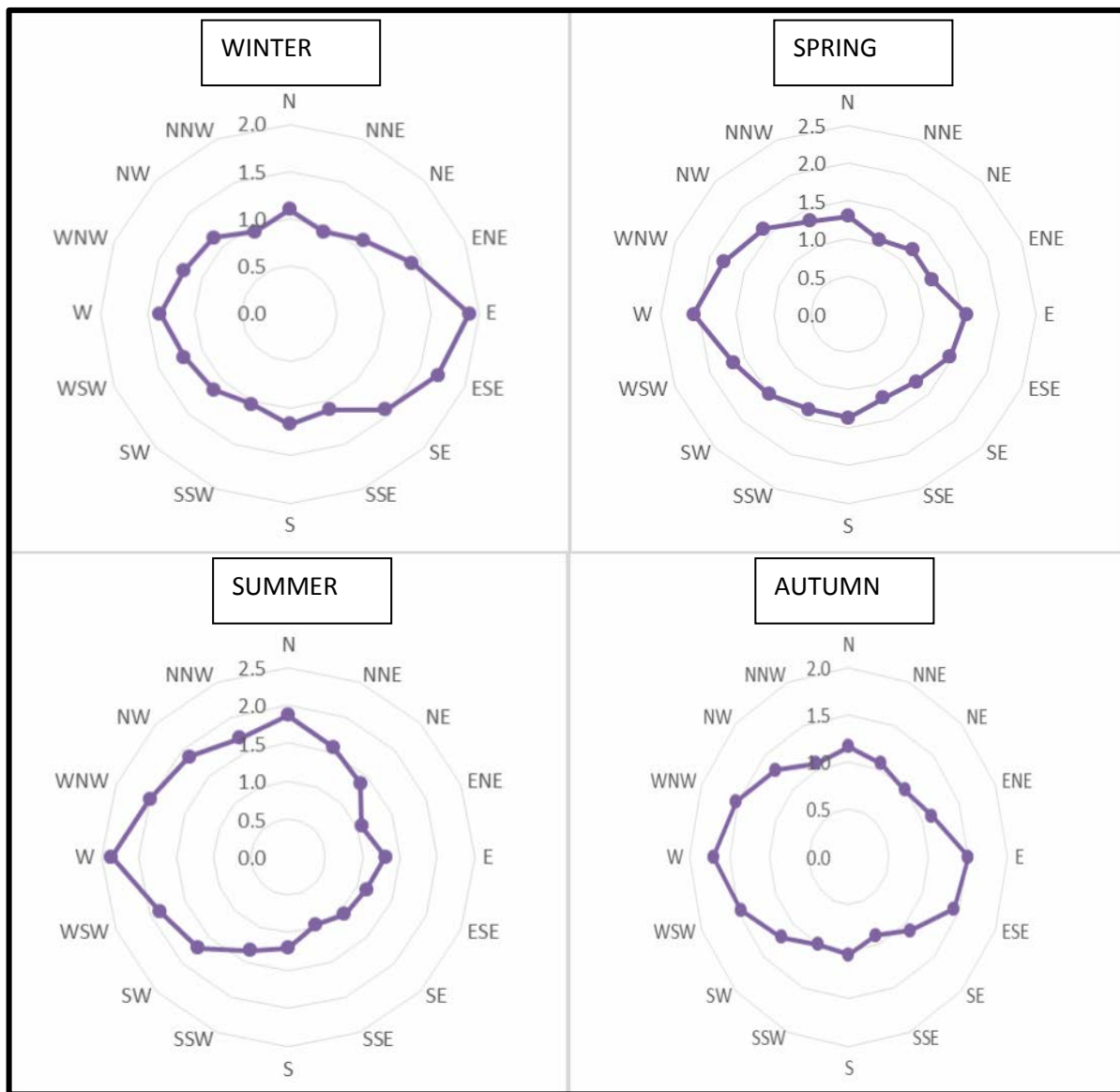
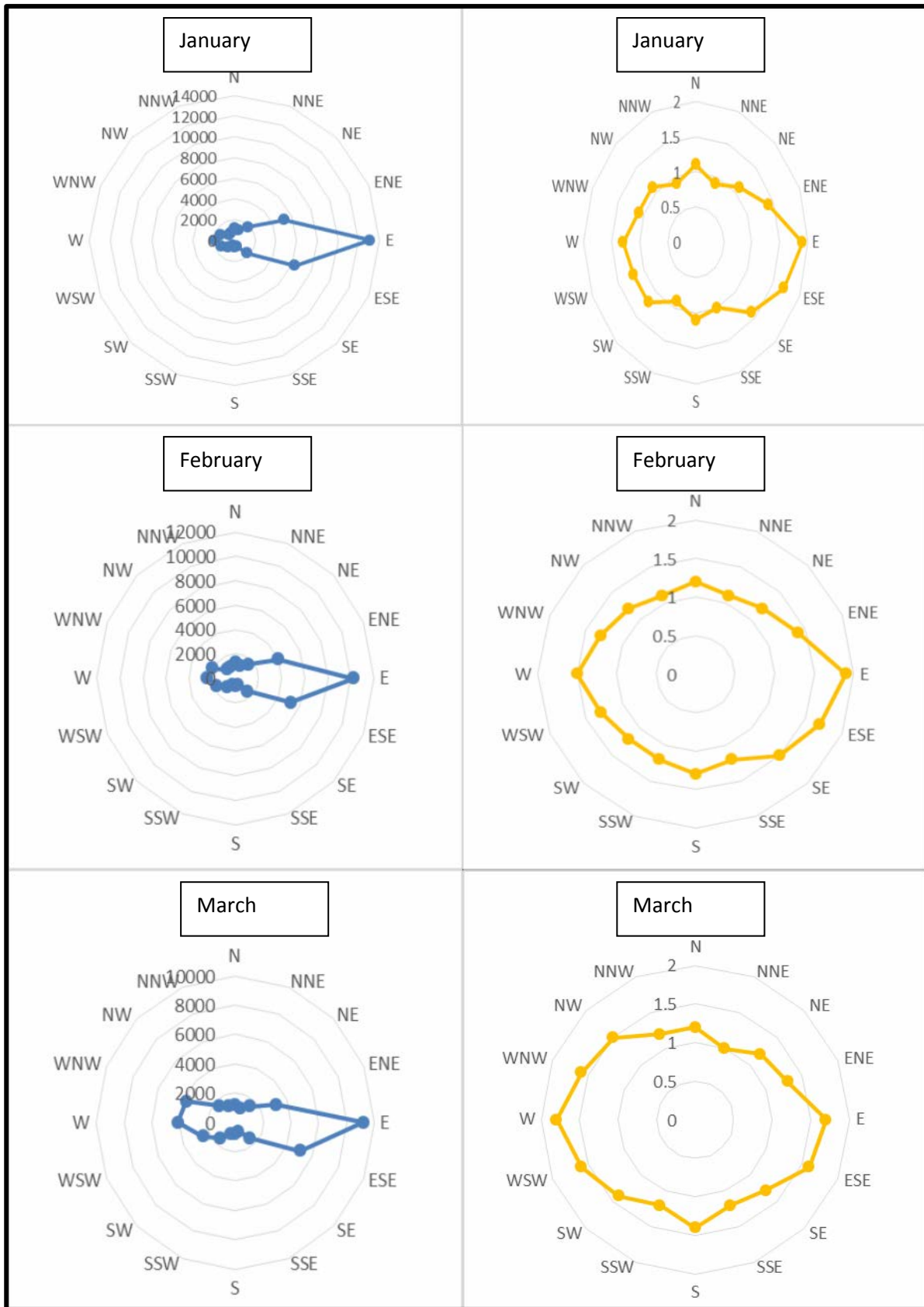
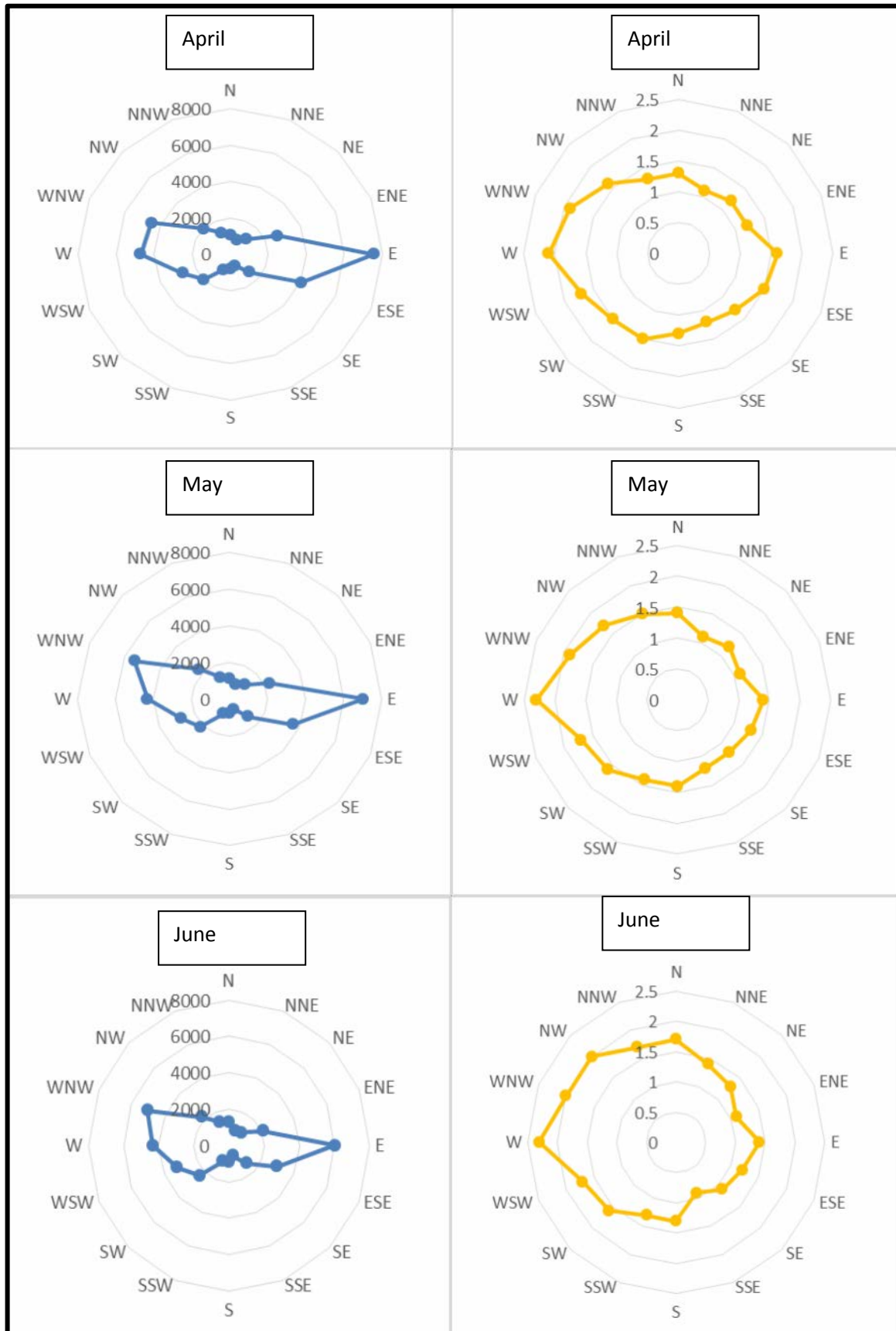
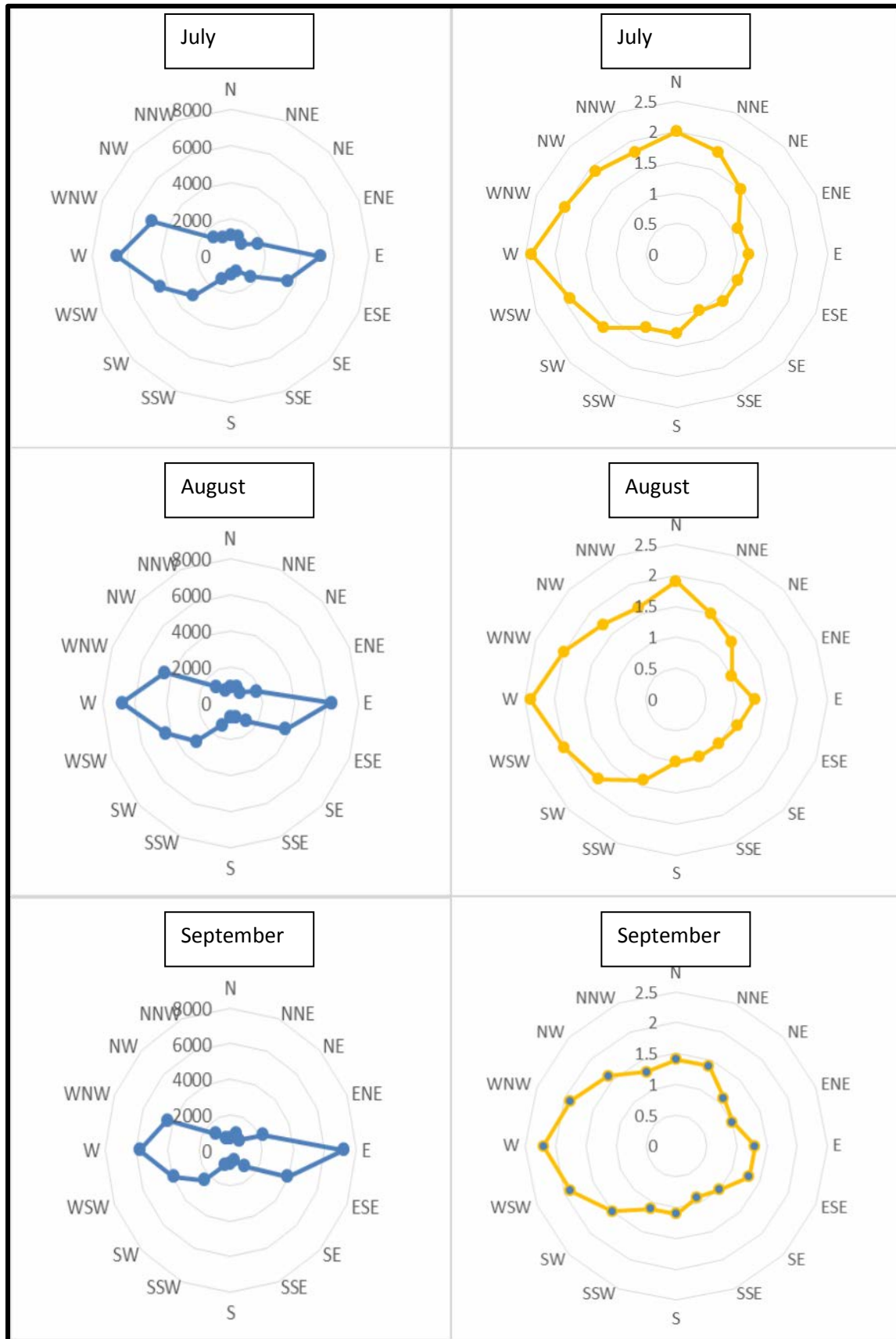


Figure 21. Graphical representation of seasonal average wind speeds from the Aydın Weather Station

Monthly wind direction







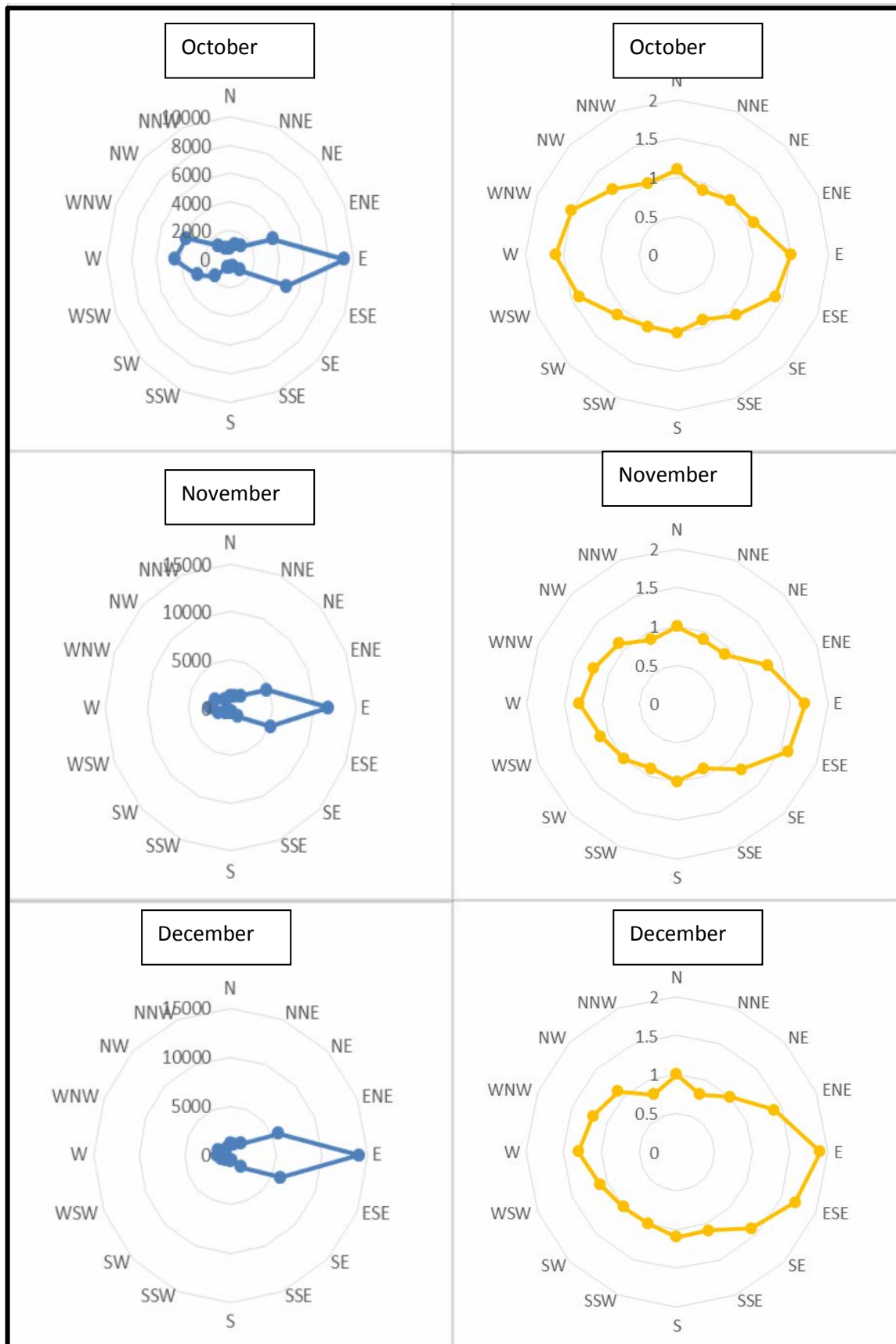


Figure 22. Graphical representation of total number of monthly blows and average wind speeds from the Aydın Weather Station

Wind regime observation records

Table 13. Wind regime observation records

Months	Average wind speed (m/sec)	Fastest blowing wind		Average Number of stormy days	Average number of strong windy days
		Direction	Speed (m/sec)		
January	1.7	E	23.4	0.7	4.4
February	1.7	WSW	28.0	0.5	4.3
March	1.7	SW	27.5	0.6	4.4
April	1.8	SSE	29.5	0.3	4.6
May	1.9	SSW	21.5	0.1	4.6
June	2.0	NNE	22.3	0.2	5.7
July	2.0	NE	21.7	0.3	6.7
August	1.9	SE	25.6	0.3	6.6
September	1.7	S	26.4	0.2	5.2
October	1.4	WNW	27.5	0.1	2.7
November	1.4	SW	25.5	0.1	3
December	1.7	W	25.9	0.4	4.5
ANNUAL AVERAGE	1.7			3.8	56.7

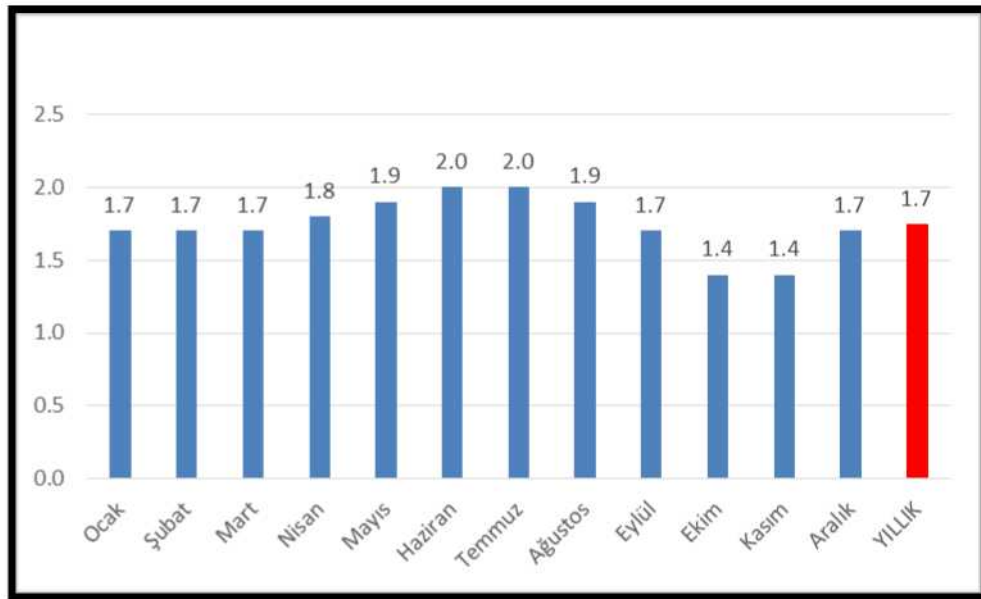


Figure 23. Graphical representation of average wind speed data from the Aydın Weather Station

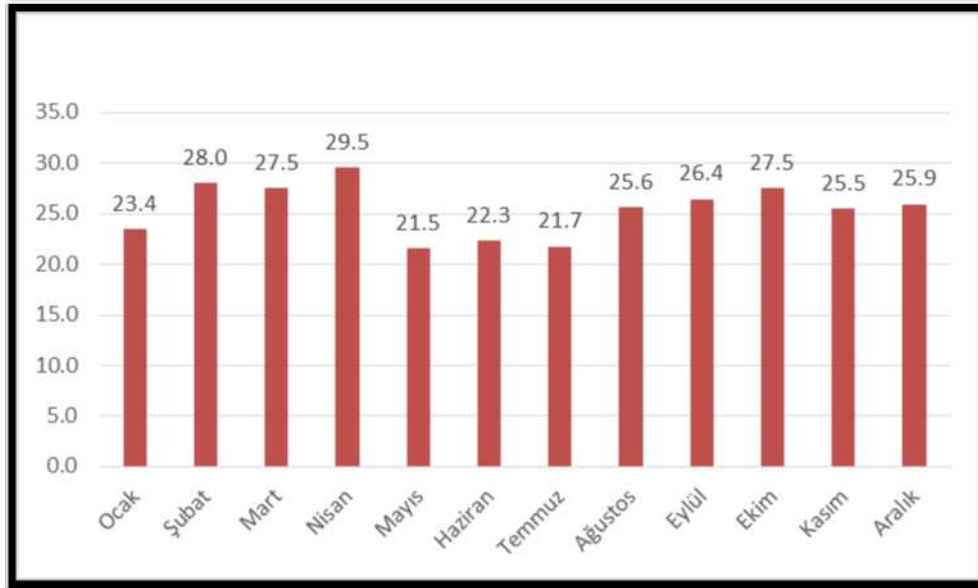


Figure 24. Graphical representation of maximum wind speed data from the Aydın Weather Station

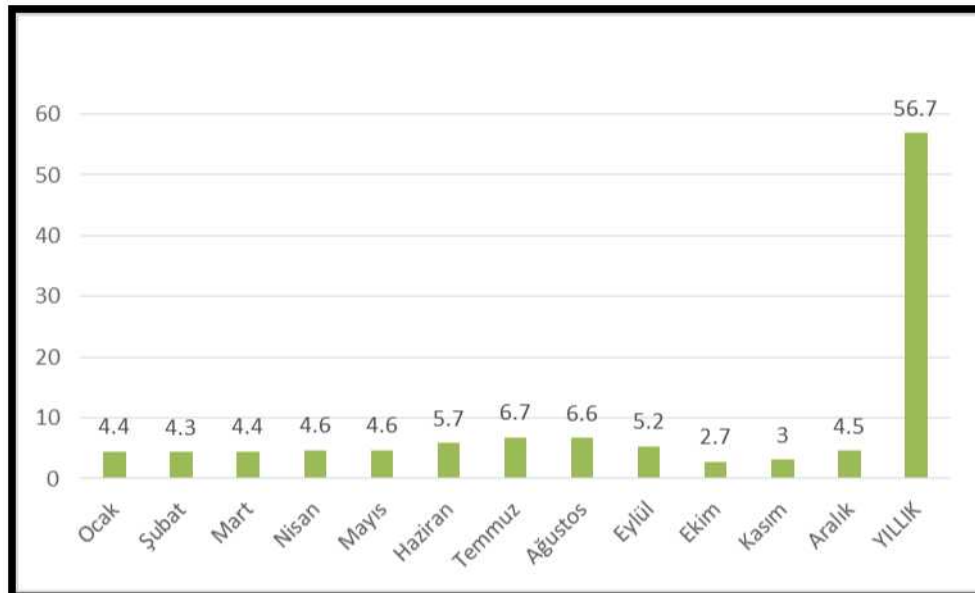


Figure 25. Graphical representation of the average number of strong windy days data from the Aydın Weather Station

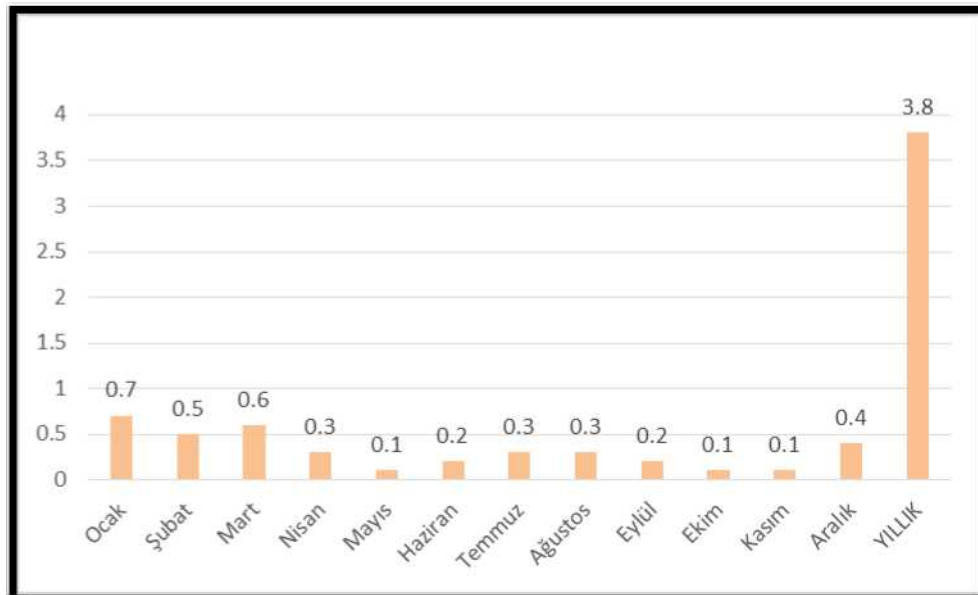


Figure 26. Graphical representation of the average number of stormy days data from the Aydın Weather Station

II.2.2. Geological characteristics (regional geology, 1/25,000-scale general geological map, stratigraphic column sections, geology of the Project site, large-scale (1/25,000 or 1/100,000, if any) geological map of the examined area and sections of the units under the Project, mass movements (landslide/debris-slide), sensitivity analysis, landslide risk map, landslide-precipitation relationship, slope stability, slide analysis; seismicity and natural disaster potential, geotechnical study report of the project, if any),

Geological Features

The oldest rocks in the study area in the middle section of the Menderes Grabens are schist, gneisses, marble and calcschists under the name of Menderes Massive. Above these palaeozoic aged rocks comes neogene aged conglomerate, sandstone, claystone, siltstone, clay, silt units. Above the Neogene units are Quaternary aged terrace, travertine, alluvial fan and alluviums. The tectonic movements in east-west direction have been dominated by the Hercynian and Alpine orogenesis in the region.

At the very bottom of the study area and around, the Paleozoic Menderes Massif metamorphites are located. Neogene aged deposits above these are formed by Miocene and Pliocene aged units. On the top, there are Quaternary aged units with wide spreading along the Menderes Graben.

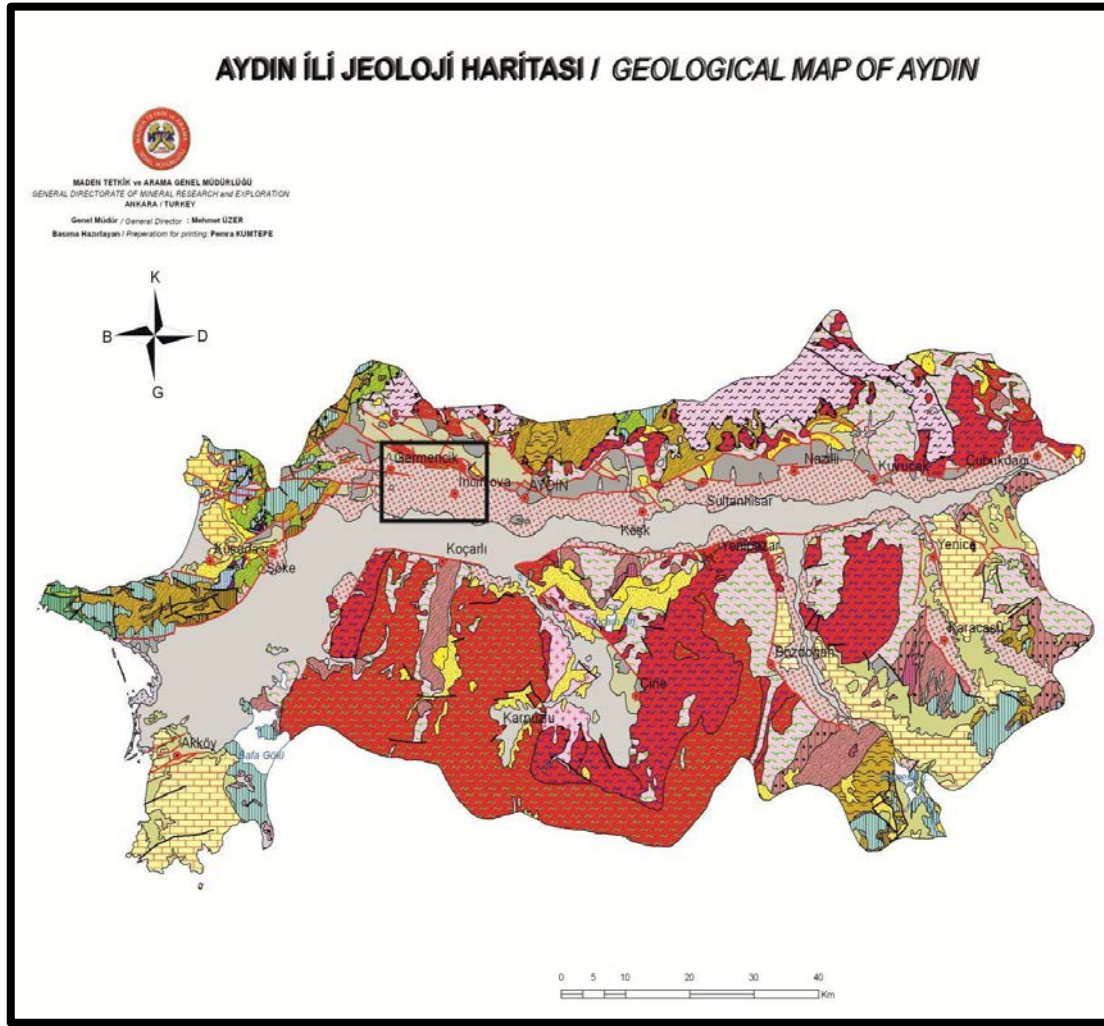


Figure 27. General Geology Map of Aydın Province (MTA)

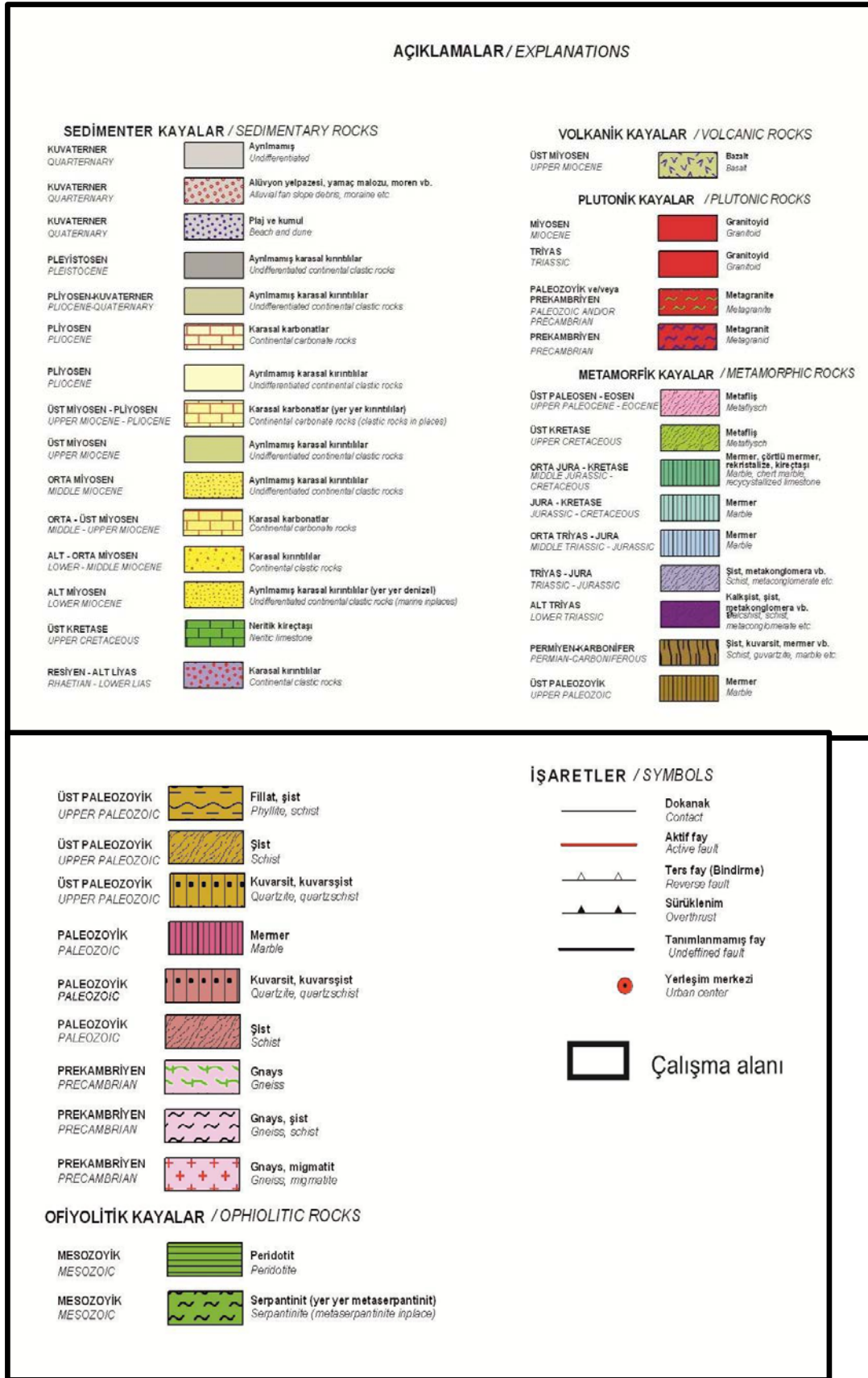


Figure 28. General Geology Map Legend of Aydın Province (MTA)

Stratigraphy

In the zone, metamorphic rocks, Miocene, Pliocene and Quaternary sedimentary rocks and Pliocene volcanic rocks are present belonging to Palaeozoic aged Menderes Massif.

The metamorphites of the Menderes Massif are composed of Gneisses, Schists, Marble, Quartzite and various schists in various sections from base to the ceiling.

The Viumlei Formation, formed by Miocene aged units, consists of red conglomerate, sandstone, claystone alternation and contains coal at lower levels.

As Pliocene units; Conglomerate, sandstone alternation of the Lower Pliocene Arzular Formation and pebbly blocky conglomerate and sandstones belonging to the Plio-Quaternary aged Hiyo-quaternary Formation were mapped.

Dacites were formed as a result of the volcanic activity developed in the Pliocene. Alluvium, slope debris, alluvial fans and travertine have been developed in Quaternary.

Paleozoic

Menderes Massive Metamorphites

The oldest units in the Germencik region are the metamorphites of the Paleozoic Menderes Massif. These metamorphic rocks of various gneiss, quartzite, calcschist, chlorite, biotite, muscovite schist and marbles have been metamorphosed by almandine-amphibolite and green schist facies.

Metamorphics in the study area are composed of different rocks depending on the chemistry of the primary rock, the type and the environment and facies of the rock, and the nature of the metamorphism. They are both lateral and vertical transitive to each other. The general sequence seen in the field is various gneisses, schists, quartzites, marble and schist alternations.

Gneiss (Pgny): Stratigraphically, they are located in the core series at the bottom of the stack. However, they are found as allochthonous over shale and marbles by thrusting in the sequence cut at the north of the drilling area and at the drilling. They have undergone a lot of tectonics and are altered because they are dragged along the thrust zone. In the field, they are found as gneisses, migmatite gneisses and granitic gneisses. It is yellowish pink colored and cataclastic texture is common. Although their thickness is not known precisely, they had been cut in thicknesses ranging from 50 m - 860 m in the vicinity drillings.

Schist (Pms): Over the gneisses forming the base, various schists are located after gneiss, quartzite, micaschist crossings. Lateral and vertical transitions are seen on this unit which is composed of various schists. They give common crops in Koçarlı Horst and Bozköy Horst. According to the petrographic analysis, the levels defined as mica schists are mainly composed of garnet, albite, biotite, chlorite, chalk schist and phyllites. Phyllite and calc schist are common in the upper levels. It includes marble zones at various levels and thicknesses.

The thickness of the schists is more than 2000 m. The unit, which is formed as a result

of alternation of dark brown - black quartzite, graphitechist, calcschist and marble intercalation, is typical. The upper zones of the second reservoir in the area developed within this unit. As a result of the tests carried out in the opened wells, it was found that these zones did not receive enough yield.

Marble (Pmr): The marbles on the cover schists of the Menderes Massif have been spread widely at the north of the drilling area. The marbles are observed alternately with phyllite, quartz schist and calcschist units in the work area and drills. Total thicknesses are accepted as 1000-1500 m. Their general appearance is massive, thick bedded, gray whitish colored and they are dolomitized, coarse crystalline and sugar textured in places. They are found as fine crystals in places intercalated with phyllites and are observed in dark gray, black colors. Due to the fact that they get a fractured, cracked structure with tectonic effects, they show geothermal reservoir rock characteristics. The marls are found transitionally with calcschists formed by the metamorphism of clayey limestones.

CenozoicMiocene

Vişneli Formation (Tmv): Miocene units which do not outcrop within the planned area of the project but outcrops west of Söke are mainly composed of red and brown conglomerate, sandstone, red milestone and claystone alternation. There are coal levels around Söke and Aydın. There is a large stratigraphic gap between the Menderes metamorphics (Paleozoic) and the terrestrial-lacustrine sediments (Miocene), which is the first unit to be uncomfortably overlying these units. Secondary reservoirs may be formed in the fault zones where the conglomerates are thick. In the basin; Since the deposition of Miocene deposits is local, the thickness varies between 0-750 m. This unit, which is thick towards the middle of the graben, becomes slimmer towards the northern edge of the graben (Kızılcagedik Horstuna) and disappears further north.

Pliocene

Arzular Formation (Tpa): This unit, which is common in Graben section, is composed of light brown colored conglomerate, sandstone and claystone alternation. In particular, it is overlying the Menderes metamorphics with directly angular unconformity in the northern part of the site. Common outcrops are observed in Arzular Graben and Bozköy Horst. The thickness of this unit, which was cut in all the wells opened in previous years, varies between 27-236 m.

Plio-Quaternary

This is a yellowish, poorly sorted, coarse, coarse blocky and gravelly, loose pinned conglomerate, sandstone intercalation unit, clay and milestone levels and lenses are seen in places. Lithologies are typical gully products and are transitional in the lateral and vertical directions. It is common in grabens. Thickness is variable and in the middle of graben thickness is more than 500 m. It was cut between 38-322 m in the wells. Dağkaraağaç and Alangüllü Villages are located on this formation.

Volcanites: Pliocene and Plio-Quaternary aged young volcanics which cut Pliocene sediments were determined in the East of Germencik, Söke and its West. The volcanics are composed of basalt and andesite in the west of Söke, and dacites and andesites in the west of Germencik near Ortaklar.

Volcanic outcrops in the west of Söke are seen as NE-SW trending lava chain.

The Dacite outcrops at Çataltepe and Kaynaktaş locality in the north of Ortaklar cover an area of 3 km². Fresh rock yellowish, hard, sharp-edged fractures and joints are evident. The extension is in the direction of Ömerbeyli fault and it is WNW-ESE. These volcanic outcrops, which are considered as acid volcanics and marked on the geological map, were considered as the first evidence of geothermal energy. It also helped explain the high temperature gradient in the region.

Quaternary

Quaternary alluvium, slope debris, alluvial fan and travertine are observed in the area of investigation. It is very common and mainly composed of non-engaged or slightly engaged gravel, sand, mil and clay and thickens from the edge of the Büyük Menderes valley to the middle up to 150-200 meters. Width is about 13 km in Germencik and 20 km in Söke. It is seen at active edge faults and at the sections where rivers that penetrate southern horsts of Kızılcagedik and Bozköy Horsts. The main ones are Ömerbeyli, Akçeşme and Balateç alluvial fans.

It is very common in low block slopes of the main faults of the Horst. It covers large areas around Ömerbeyli and Alangüllü.

The waters originating from the Bozköy and Gümüş hot spring springs, mainly composed of CaCO₃ and yellowish travertine deposits. These are not seen outside the hot springs. In Bozköy, sulfur sediment in the travertine is also present in places.

The stratigraphic section of the project area and its vicinity is given in the following figure. The 1/25000 scale geological map within which the project area is also located is given in Annex 6.

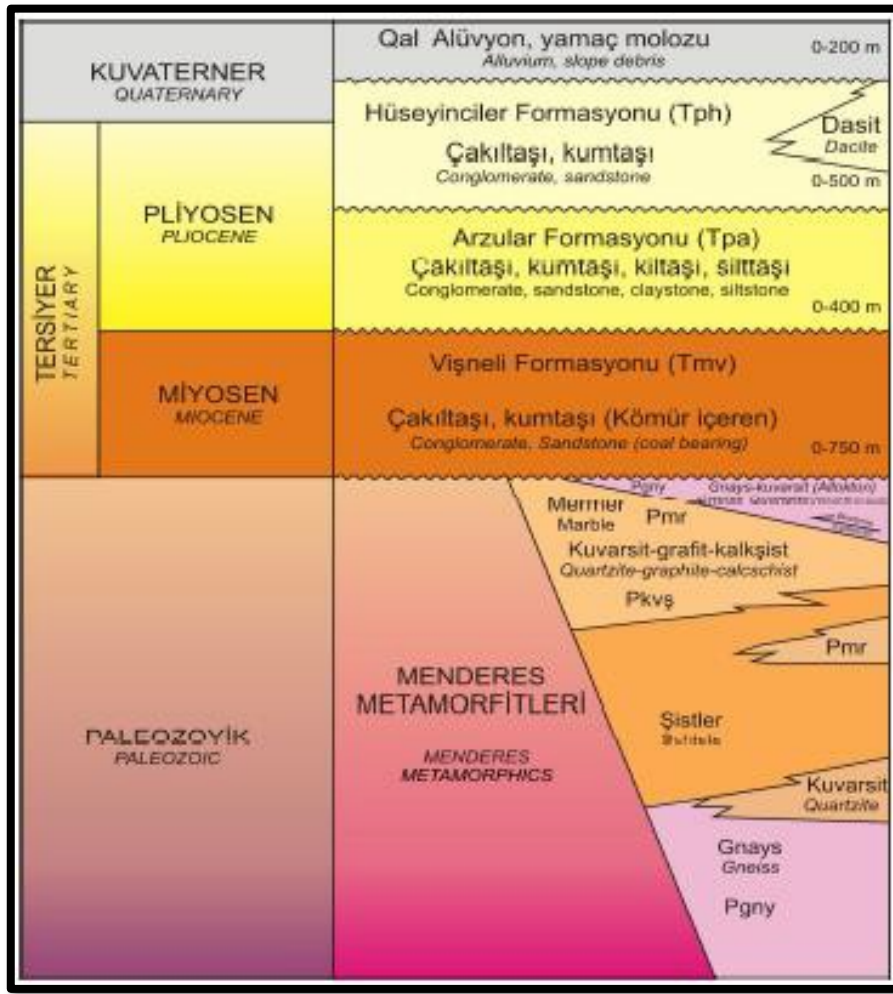


Figure 29. Stratigraphic Section of the Project Area and Its Vicinity

Geology of the Project Area

During the preparation of geotechnical and geological survey reports, the geology of the project area was studied. As a result of the site and drilling operations, the entire area consists of a quaternary-aged alluvial fan. The alluvial fan in the region has a wide distribution in front of the topographic escarpment as topographical structure and tectonic activities in the region together with north-south directional drainage and fault control. After drilling operations which are carried out in the area of investigation, metaphoric blocky, coarse-silty sands and low plasticity, clayey-sandy silt were observed.

Natural Disaster Status

According to the "Seismic Zones Map of Turkey" prepared by abolished Ministry of Public Works and Settlement, the area of investigation is included into the first-degree seismic zone. In the area where many active faults along the Büyük Menderes Graben are easily observed and where there are many sources of hot water and natural steam outlet and where young alterations are observed, it is understood that the Alpine movements continue and they form earthquakes. The earthquake zones are entirely in the east-west direction in compliance with the young tectonic structure. It is known that there are many earthquakes in the

Germencik region since the historical ages. The map shows the seismic zone of the project area and the map showing earthquakes of $M>4$ over the period between 1960 and 03.2016 is given in Annex 9.

Since the northern part of the Büyük Menderes Graben is a zone in which vertical tectonic movements continue, it still remains a candidate for high seismic activity in the future. These data indicate that geothermal potential will be important in the region.

All kinds of structuring on the project site shall conform to "Regulation on Buildings to be Constructed on the Seismic Zones" which entered into force after published in Official Gazette no.26454 dated 06.03.2007 and "Regulations for the Structures to be Built in Disaster Areas" which entered into force after published in Official Gazette no.26582 dated 14.07.2007.

The landslide map including Efe-6 Geothermal Power Plant Project Areas is given in Annex 8. The project area is located in an area where there is no risk of landslides.

Seismicity

According to the "Seismic Zones Map" prepared by General Directorate of Natural Disasters Earthquake Research Department, project site is included into the First-Degree Seismic Zone. In the figure below, project site is shown in the Seismic Zones Map. Besides, the locations of magnitude 4 and above earthquakes which occurred between 1960 and 03.2016 are shown in the Annex 9 - Earthquake Status Map.

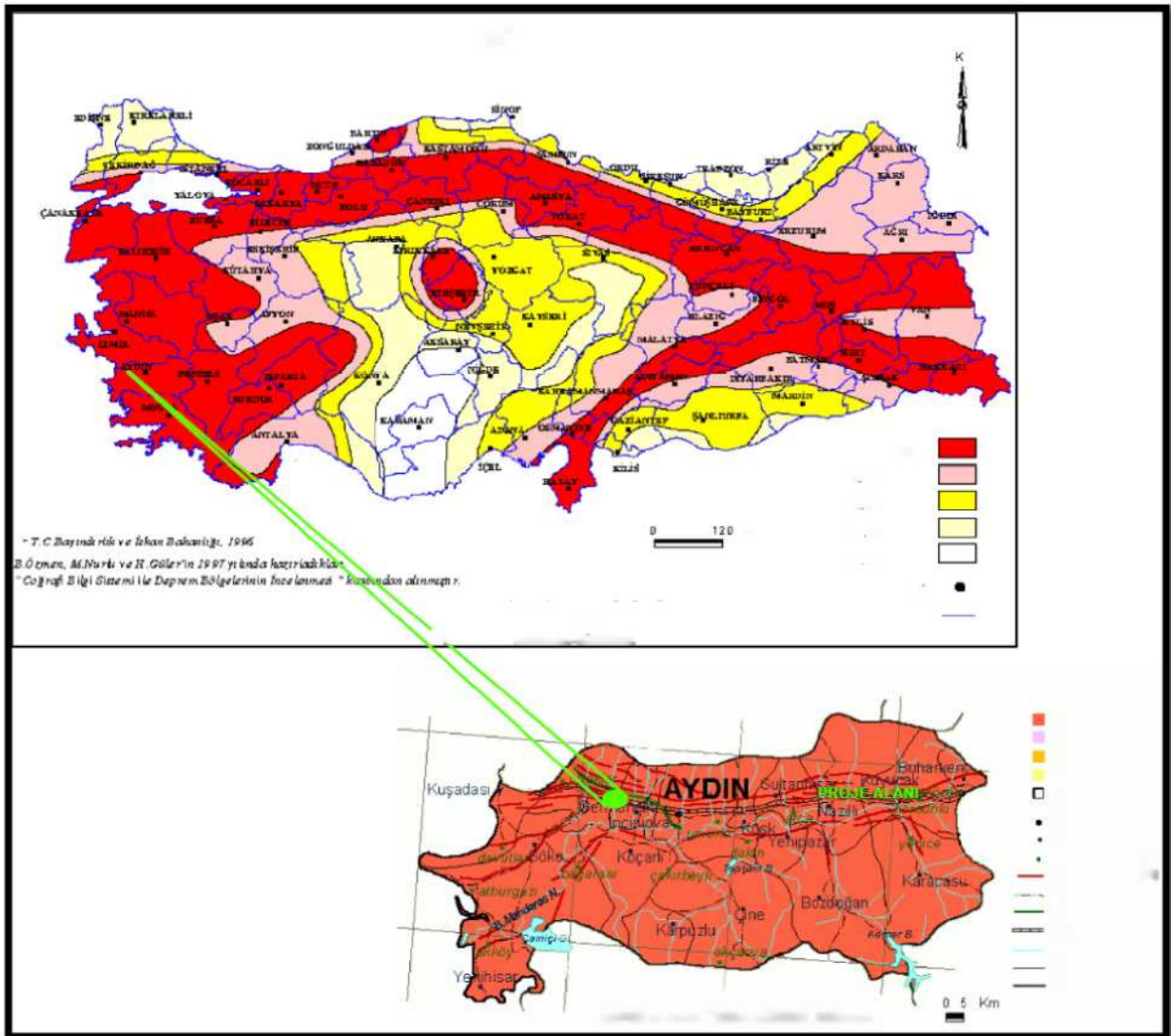


Figure 30. Seismic Zones Map and Location of Project Area

The map showing the faults and active faults in the project area and its surroundings is given in Annex 7.

There is not a landslide area or active landslide area in the vicinity of the project area. For this reason, landslide risk is not expected within the scope of the project. The landslide map of the project area is given in Appendix 8.

Besides, the Geological-Geotechnical Survey Report of the project is given in Annex 19. In line with this report;

- SPT experiments generally vary 15-50. According to this experiment, relative tightness of the ground can be said to be medium tight - tight.

- According to the "Regulation on Buildings to be constructed on the seismic zones" by General Directorate of Natural Disasters, Ministry of Public Works and Settlement, quaternary-aged alluvial grounds are included into the C-2 ground group and Z-3 ground

class.

- As the groundwater level is not found in the wells drilled within the scope of the Survey Report, liquefaction is not expected on the ground. Drainage measures will be taken in order to remove the possible seasonal precipitation water from the environment.

- As a result of the geological and field observations in the study area, due to the low topographic slope (0-10%), it was determined that there was no slope insensitivity, rock drop, rupture and flow structure which would cause mass movements. No mass movement is expected.

- The probability of occurrence of an earthquake with a magnitude of $M = 7.5$ in 50 years has been calculated as 32.9% in the region which is drawn to surround the 100 km surrounding of Germencik county center. The largest earthquake in the region on 16.07.1955 was in Söke-Yuvaca.

II.2.3. Hydrogeological characteristics (underground water levels; any existing caisson, deep, artesian etc. well safe drawing value; physical, chemical, bacteriological properties of water, current and planned use, flow rates of groundwater and its distances to the project area),

Regional Hydrogeology

The metamorphic rocks of the Menderes Massif are located in the Germencik District of Aydın. The marbles inside the massif form the main chamber rock. The marbles have a melting cavity in place and have a fractured structure as a result of the tectonic effects. Due to these properties, they exhibit high porosity and permeability. Micaschists beneath and above the marble have low porosity and permeability. The schists act as cover with these features. Gneisses may show high porosity and permeability due to both faulting and their close relationship with marbles in the study area (Karamanderesi, 1989). The loose, sandy, gravelly parts of the Neogene sediments on the basement units have high porosity and permeability and have a reservoir characteristic. The hardened parts of these units and the clayey levels act as the cover rock.

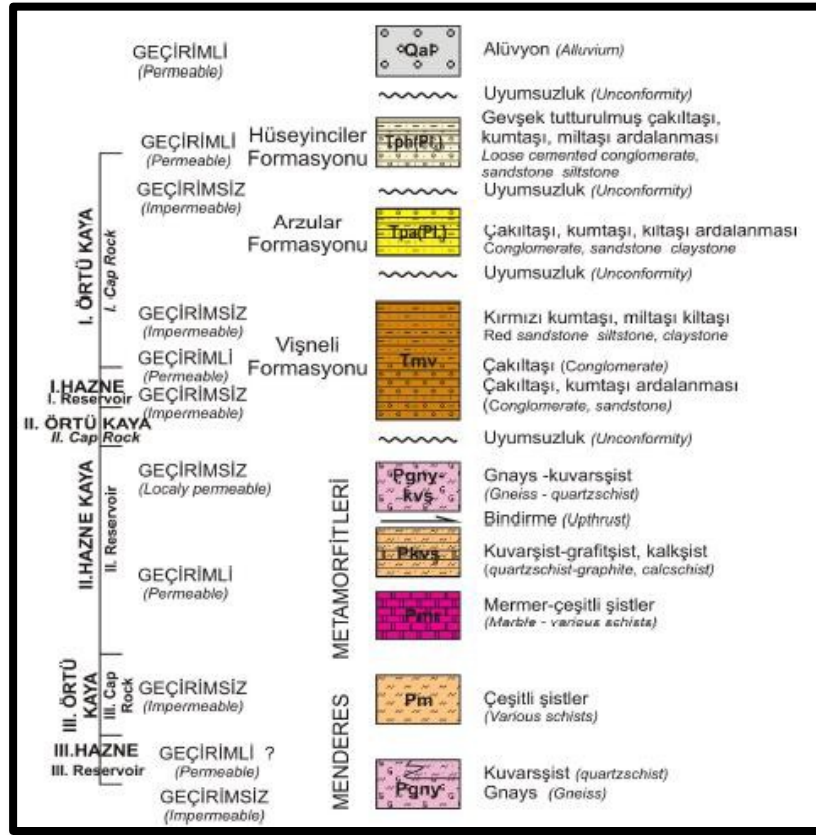


Figure 31. Germencik Region Hydrogeology Units

Hydrogeology of the Project Area and its Surroundings

Considering the geology of the project area and its surroundings, it is observed that sedimentary units are widespread. The permeability of these units varies according to the level of consolidation and grain size. The degree of permeability in the hardened regions where clay-silt sized grains are present is lower than 10^{-5} cm/s. These units, of which the value of porosity varies in accordance with the level of hardening are generally classified as low permeable or impermeable.

Although the porosity value of the sedimentary units decreases with the growth of grain size, their permeability value increases. The permeability value is generally greater than 10^{-5} cm / s in alluvial fan, conglomerate, sandstone-mudstone-limestone intercalation units which exist in the area and they are included into the semi-permeable, permeable and very permeable class. Besides, metamorphic rocks are also observed in the region. These units consist of deformed units depending on tectonism. The hydrogeological characteristics of these units are generally non-porous, although they have the ability to retain water in fractures that develop as a result of tectonism. As an example of these units classified as impermeable, the Eyed Gneiss-Metagranitoid geological unit in the region can be shown. The area on which the project area is located is entirely composed of alluvium and alluvial fan and its porosity and permeability value is high.

In the light of this information, it can be said that the project area is on a permeable - very permeable hydrogeological classification.

Underground Waters

There is abundant groundwater in the wide alluvial plain where the Büyük Menderes River is located. There is also free underground water in alluvium fans opening to stream beds and plains. Büyük Menderes has a large alluvial area and cold water is operated on several levels in the alluvial plain. The quality of the groundwater is deteriorated due to the geothermal fluid which is mixed with the groundwater along the Ömerbeyli fault and thus, the groundwater is not used as drinking water in a section from the south of Ömerbeyli and Hıdırbeyli to the main road.

According to the survey well data in the region; there is an underground water wealth of about 290-300 million m³. Approximately 80-90 million cubic meters of these reservoirs are being used. There are 13319 artesian wells in 17 counties and 262 villages. With these waters; 279.235 decares of land is irrigated. In addition, 637 of these wells are used for drinking water supply. The number of wells to benefit from groundwater resources together with caisson wells is more than 15.000.

Within the boundaries of Aydın, there is underground water well with 2.656 usage certificates and there are 351 wells opened by DSİ 21st Regional Directorate. There are also 8 spring water facilities in the province.

Sources

Cold Water Resources

Usually there are cold water sources at low flow near horsts in the forested area and near the main faults of the horst. Cold spring waters from quartzite, marble and gneisses are transported to settlements in the plains for drinking water use.

Hot Water Resources

There are many hot springs in the Germencik region, ranging in temperature from 36-92 to °C. These sources are in the north of Kizilcagedik horst and are mainly sources of mud and hot springs.

Mineral Water Resources

Thermal and hydrothermal mineral water sources with abundant CO₂ output were observed in fault zones where allochthon gneisses outcrop and iron hydrothermal alterations developed. However, their flow rates are low.

II.2.4. Hydrological characteristics (physical, chemical, bacteriological and ecological properties of surface water such as lake, river and other wetlands, flow rate and seasonal changes of streams, floods, oligotrophic, mesotrophic, eutrophic, dystrophic classification of water catchment basin, sedimentation, drainage, coastal ecosystems of all water resources),

The region where the project area is located is divided into 26 large-scale hydrological basins as a result of the studies performed by General Directorate of Renewable Energy (ex. Ministry of Energy and Natural Resources General Directorate of Electrical Power Resources

Survey and Development Administration).

The average annual total flows of the basins are 186 billion m³. The project area is located on the Büyük Menderes Basin. Büyük Menderes Basin has a rainfall area of 24.976 km². As catchment area, it has a slice of 0.9% of the Turkey. Its annual average effectiveness is 3.9 l/s/km^{2.2}

Basin Index Map showing the location of the project area on the Büyük Menderes Basin is given as follows.

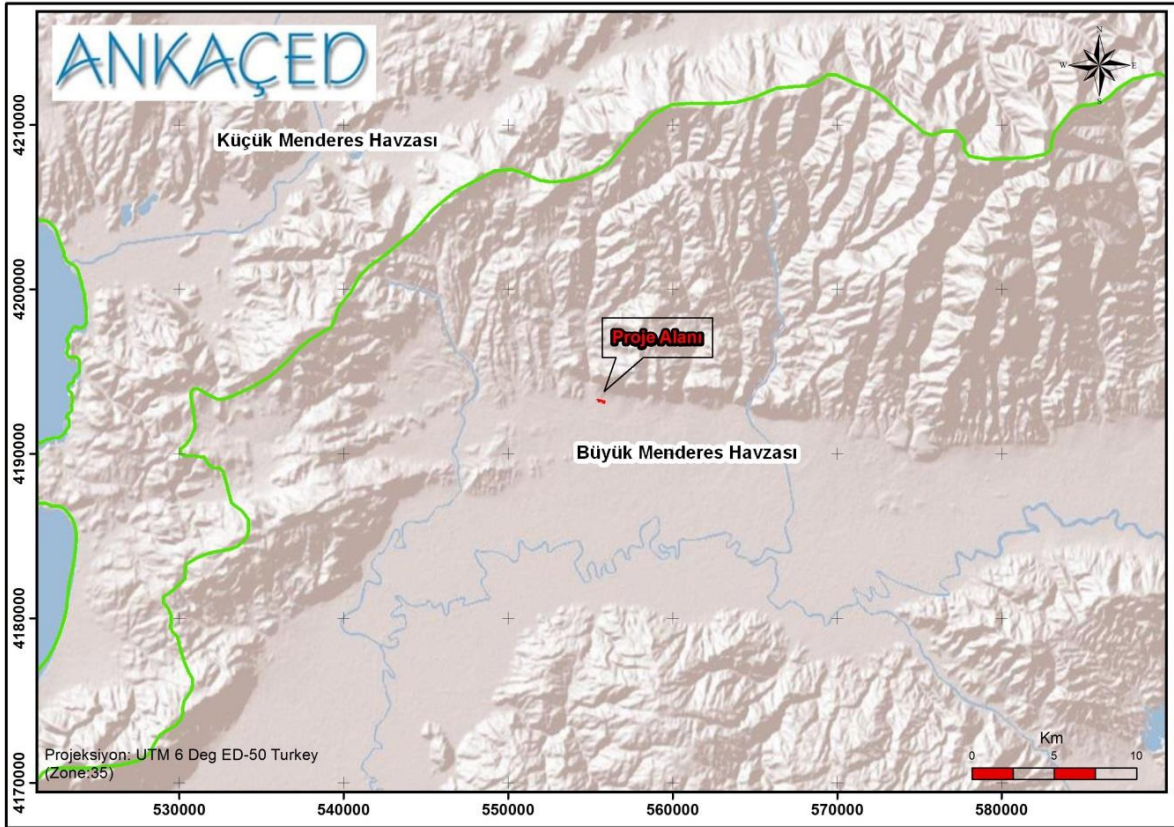


Figure 32. Basin Index Map

Surface Water Resources

The total potential of surface and groundwater in Aydın is 4.092 hm³/year. Menderes basin, the boat-shaped valley formed in thousands of years with rich water flows from the right and left slopes to the Aegean Sea starting from 900 altitude and has rich underground water resources.

Streams

The largest stream within the boundaries of Aydın is the Büyük Menderes River, which flows from East to West and flows into the Aegean Sea from West of Söke. Alangüllü Creek, Kavaklı Creek, Oyuk Creek, Yalkı Dere and Cılımbız Creek are some of the streams connecting to this river.

² (Source: Ministry of Forestry and Water Affairs, Department of Information Technology (2012))

Büyük Menderes

Büyük Menderes River, which is the longest stream in the Aegean Region, springs from the plateaus between Sandıklı and Dinar in the Inner Western Anatolia and from the sources near Çivril and Honaz and feeds on waters filled with Lake Işıklı. Its total length is 584 km and its length within Aydın is approximately 293 km. The Banaz Creek from Uşak, through involving the Çine Creek from Muğla, flows into the Aegean Sea. Büyük Menderes carries approximately 13 million m³ of alluvial annually. In this way, it formed an alluvial plain about 320 km².

Dandalaz Creek

This is a river which is formed by the collection of waters in the southeast of Karacasu. In the first part, it has the name of Geyre Creek. It joins Büyük Menderese near Kuyucak with the participation of Işıklar Creek and Akyar Creek.

Akçay

It springs from the mountains in the northeast of Muğla and combines with Yenidere from the slopes facing the Tavas plain. Kemer Dam was constructed on. It enters into the Büyük Menderes near Yenipazar.

Çine Creek

It is formed by the water coming from a large source called Pınarbaşı near Bozüyük Village and joining the Bencik and Kamış creeks which are gathered together in Yatagan Plain. It waters the Çine Plain with the participation of Sağnani Gökçay and Madran Creeks. After Çine Plain, it reaches to Büyük Menderes with the participation of Karpuzlu Creek.

Streams in Aydın and information regarding these streams are provided in the table below.

Table 14. Streams of Province of Aydın

Name of the Stream	Total length (km)	Its length within the province (km)	Min. Flow (m ³ /sn)	Max. Flow (m ³ /sn)	Avg. Flow (m ³ /sn)	Tributary	Intended Use
Büyük Menderes	584	293	1.000	700.0	80.59		Data Supply
Çine Creek	359	143.9	0.000	625.0	10.70	Büyük Menderes	Watering, Energy and Flood Prevention
Akçay	158	69.8	0.004	975.0	20.10	Büyük Menderes	Watering, Energy and Flood Prevention

Name of the Stream	Total length (km)	Its length within the province (km)	Min. Flow (m ³ /sn)	Max. Flow (m ³ /sn)	Avg. Flow (m ³ /sn)	Tributary	Intended Use
Köşk Creek		23.1	0.000	170.0	1.070	Büyük Menderes	Watering
İkizdere		21.5	0.000	450.0	2.130	Büyük Menderes	Drinking Water Supply
Dandalaz Creek		44.5	0.001	250.0	2.270	Büyük Menderes	Watering and Drinking Water
Kapızdere	17.9	17.9	0.000	150.0	0.661	Büyük Menderes	Watering
Sarıçay		47.7	0.000	419.0	1.590	Büyük Menderes	Drinking Water Supply
Kargın Creek			0.000	105.0	0.329	Büyük Menderes	Drinking Water Supply
Cımbız Creek	11.2	11.2	0.000	38.7	0.264	Büyük Menderes	İkizdere Dam Drinking Water Supply
Yalkı Creek	21.1	21.1	0.000	43.0	0.225	Büyük Menderes	İkizdere Dam Drinking Water Supply
Tabakhane Creek	20.2	20.2	0.000	15.6	0.373	Büyük Menderes	Aydın Drinking Water
Madran Creek	41.2	41.2	0.000	86.0	0.950	Büyük Menderes	Watering and Flood Prevention

(Source DSI, 2014)

Current Observation Stations in the vicinity of the project area have been examined and there is no stream gauge station to represent the micro-basin on which the project area is located. However, there are stream gauge stations on the Büyük Menderes Basin. The closest stream gauge station is the Alangüllü Stream Gauge Station and is located 1.1 km northwest of the project area. The map showing the project area and surrounding stream gauge stations is as follows.

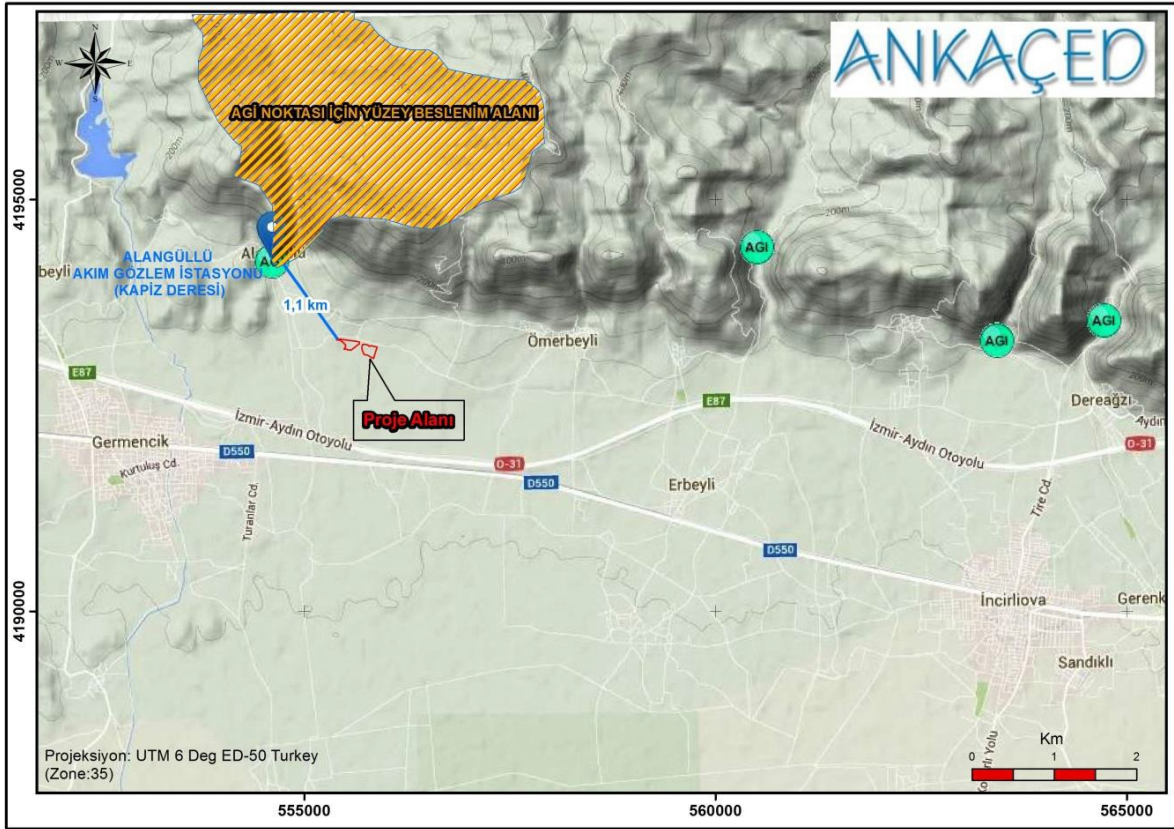


Figure 33. The Map Showing the Stream Gauge Stations

Natural Lakes, Ponds and Reservoirs

The only natural lake in the province Aydın is Bafa Lake, some of which is located within the borders of Province of Muğla. The surface area of the lake is approximately 65 km² and 37 km² is located within the borders of Aydın.

The lake, which was a part of the Aegean Sea in ancient times, was completely disconnected from the sea as a result of the alluvials carried by the Büyük Menderes and the lake became freshwater lake in time.

Lake Bafa is Class A Wetland Area. It was declared as Nature Park in 1994 and taken under preservation. The lake is fed by rainfall that falls on the lake area, streams that show seasonal flow, springs from the coasts, bed/bottom sources and the connection with the Menderes river. There are 4 islands on the lake where there are ancient ruins.

On the lake there are carp, spring, yellow fish, rudd and mullet. It is rich in terms of bird presence. Lake Bafa is located about 39 km south of the Project area.

In addition to Lake Bafa, there are many irrigation ponds in Aydın Province. The current irrigation ponds in the province of Aydın and information about these ponds are provided in the table below.

Table 15. The current irrigation ponds in the province of Aydın and information about these ponds

Name of the Pond:	Pond Volume (hm ³)	Irrigation Area (ha)	Amount of Drawn Water (m ³)	Intended Use
Kavakderesi Irrigation Pond	0.290	27	0.290	Watering
Hıdırbeyli Irrigation Pond	3.520	230	3.21	Watering
Akçaova Irrigation Pond	2.44	294	2.33	Watering
Çatak Irrigation Pond	1.64	147	1.530	Watering
Karacaören Irrigation Pond	0.55	-	0.50	Hayvan İçin İçme Suyu

(Source DSI, 2014)

The nearest pond and around the project area is Hıdırbeyli Pond which is located 3.3 km northwest. This pond used for irrigation purposes and its construction was completed between 1992-1998 with zoned earth body type. The pond with a storage volume of 3.52 hm³ has an irrigation area of 230 ha. There is also İkizdere Dam which is 8.6 km away from the project area. This dam has been designed as the use and drinking water dam and its construction was completed between 1999-2000 as Clay Core Earth and Rock Fill. At normal water level, the lake volume is 196 hm³. The data with regards to these dams and their distance from the project area are shown in the following figures.³

	Location of the Pond	Aydın-Germencik
	Its stream	Çamurlu Ilica
	Purpose	Irrigation
	Construction Years	1992 - 1998
	Body filling type	Zoned Filled Earth
	Storage volume	3.52 hm ³
	Active Volume	3.21 hm ³
	Dead Volume	0.31 hm ³
	Height (from thalweg)	26.5 m
	Height (from foundation)	29.5 m
	Irrigation Area	230 ha
	Project profitability	7/12

Figure 34. Data on Hıdırbeyli Pond

³ DSI-AYDIN, 2015, <http://www2.dsi.gov.tr/bolge/dsi21/aydin.htm>

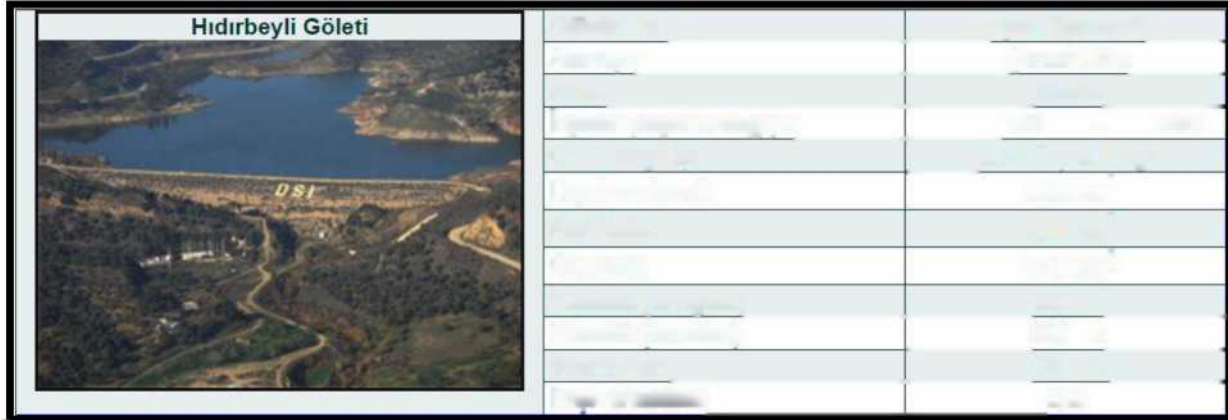


Figure 35. Data on İkizdere Dam

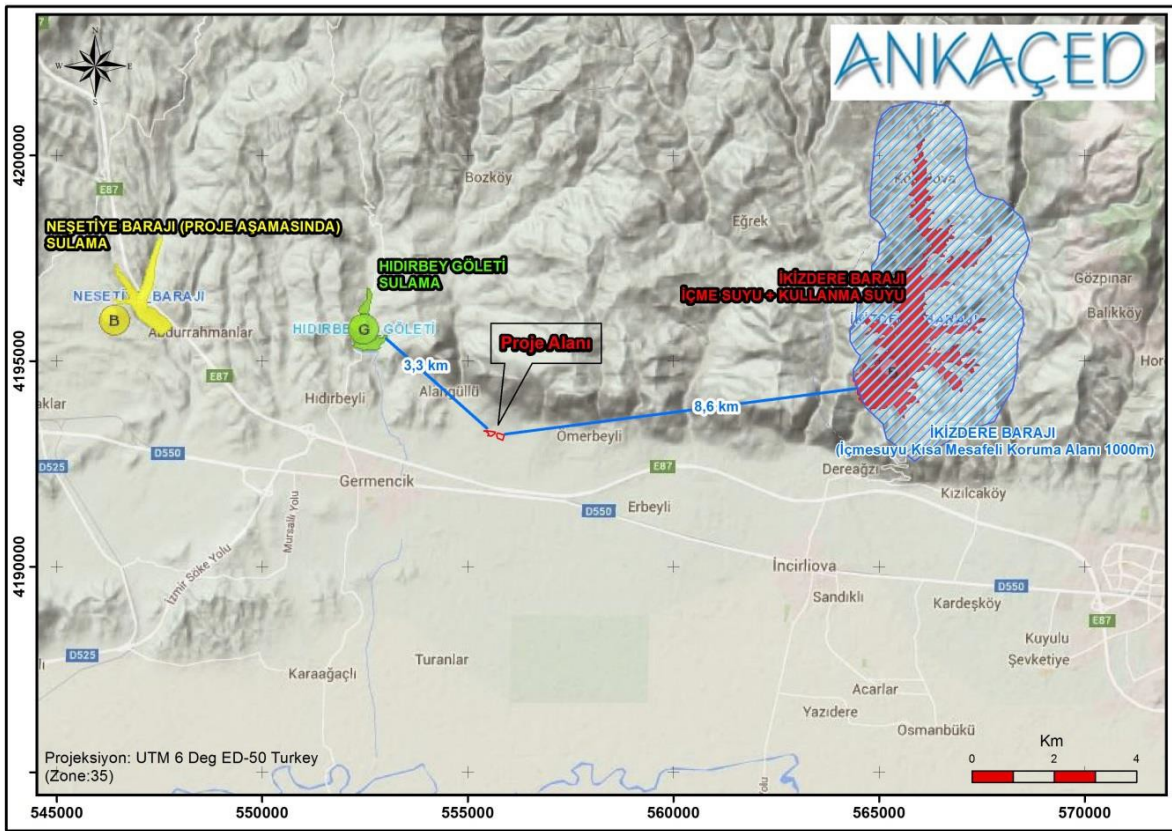


Figure 36. Dam and Ponds around the Project Area

II.2.5. Properties of geothermal source (potential and levels of the geothermal source, other geothermal resources in the region and its relation to the basin)

Although the feed of Aydın-Germencik geothermal area is very wide, the hydrogeology, hydroimide and environmental isotope studies, which are carried out to identify the origin of the hot water source and the geothermal system to which it is connected, are evaluated along with the regional geological structure to reveal the conceptual model of the geothermal system in the field. Geothermometer calculations have shown that the system has a high temperature potential.

In the system located within the fault zones, it has been identified that the heat source has a geothermal gradient origin due to deep circulation controlled by faults.

The geothermal resource area no. Gürmat J-553, on which Efe-6 Geothermal Power Plant is planned to be established, is located within the boundaries of Aydın Germencik-İncirlioğlu District and its size is approximately 35.3 km². The site is a high temperature water-dominant geothermal source.

The geothermal field was determined to be a high temperature geothermal as a result of the underground geological, depth-temperature values and geochemical analysis obtained from the total of 10 exploration wells opened by MTA in the field and evaluation of production tests and reservoir parameter identification tests which are carried out on the wells.

1.400 tons/hour (cyclic) geothermal fluid which is to be produced from the 6 (5 already built and 1 will be built) production wells of Gürmat Elektrik Üretim A.Ş. in the license area, will be used in Efe-6 Geothermal Power Plant.

After the power production, approximately 1200 tons/hour of fluid will be re-injected to the 4 wells of Gürmat Elektrik Üretim A.Ş. After the 200 ton/hour difference between the production wells and the reinjection wells is condensed, it will be re-applied to the reinjection wells. The non-condensed part will also be removed from the non-condensed gas outlet chimneys. The quantities specified for the production and reinjection wells were not considered as the capacity of the wells but were determined as the quantities taken from the wells and given to the reinjection wells.

In the wells drilled in the license area, geothermal fluids will be produced from the second production zones cut within the Paleozoic units called 2nd reservoirs, and the waste fluid will be transferred to the production wells at the re-injection wells in remote areas.

The reservoir temperature of 170-200 °C is expected in the wells which have already been and will be opened within approximately 5 km² area in the western part of the license area. The wells in this section will be used as reinjection wells. The reservoir temperatures measured in the wells drilled in the other parts of the area vary between 215-276 °C.

You may find the Geothermal Resources and Volcanic Areas Map of Turkey below. When the project area is examined on this map, it is seen that the region is not included in the Upper Tertiary-Quaternary Volcanite series but it is a geothermal source formed around the main fault lines on an important geothermal site.



Figure 37. Geothermal Resources and Volcanic Areas Map of Turkey (MTA)

Other geothermal resources in the region are shown under the heading II.2.6. As a result of the studies performed by General Directorate of Renewable Energy (ex. Ministry of Energy and Natural Resources General Directorate of Electrical Power Resources Survey and Development Administration); geothermal resources in the region, with regards to their surface locations, are located at Büyük Menderes Basin among the 26 large-scale hydrological basins. Sources are considered to be fed by different systems.

II.2.6. Other geothermal resources in the region and their utilization (energy, tourism, heating-heating, greenhouses etc.)

In the region and in Turkey; many maps showing the geothermal resources and their utilization are prepared by the General Directorate of Mineral Research and Exploration have been prepared. The distribution and application of geothermal resources maps which are prepared by MTA are given in the figures below. When these maps are taken into consideration, it can be said that geothermal sources are observed intensively in Aydın and project region.

It can be said that these sources have a wide distribution in which the surface temperature measurements vary between 100°C and 25°C. In addition, Turkey Geothermal Power Plants are shown in the following figures.



Figure 38. Turkey Geothermal Energy Resources (MTA)



Figure 39. Turkey Geothermal Resources Distribution and Application Maps-1 (MTA)

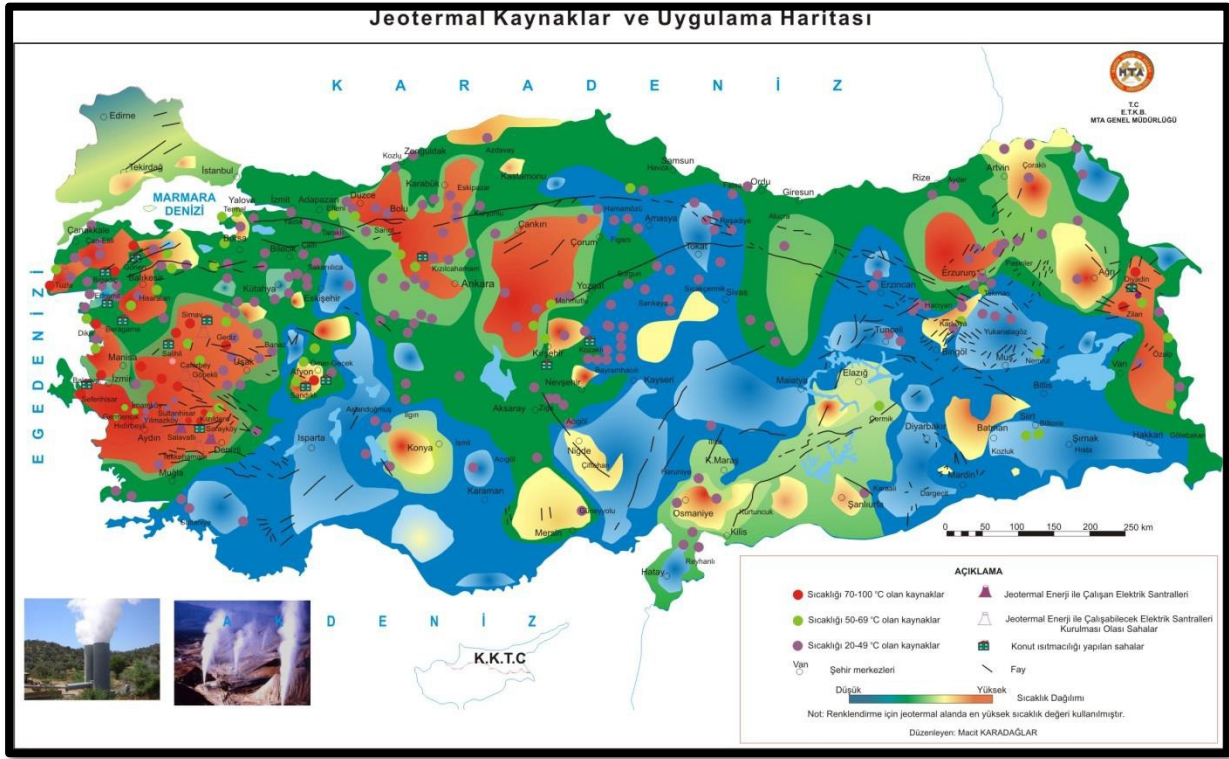


Figure 40. Turkey Geothermal Resources and Application Maps-2 (MTA)

The province of Aydın has significant geothermal energy potential. Search and operation activities are still carried out by people and companies in a total of 193 sites (93 search and 50 operation) within the provincial boundaries. There are 19 projects in Investment and Planning phase.⁴

The collapse area of the Büyük Menderes Graben, which is located between Aydın-Ortaklar and Denizli-Sarayköy district, has approximately 70% of the Geothermal potential with high temperature values in our country. The most important underground wealth of Aydın is geothermal energy sources. Although in many regions, Germencik-Ömerbeyli geothermal field is the highest temperature geothermal fields in Turkey with its 230°C. Project area is in this site.

47 Megawatt geothermal power plant of Gürmat A.Ş. located in Germencik- Ömerbeyli geothermal site has been in production. Waste water left behind from geothermal energy can be used to reduce heating costs, which constitute an important cost item in greenhouse cultivation (*Aydın-2015, Provincial Environmental Status Report*)

Geothermal resources in the region which are specified by MTA sources are as follows. The nearest geothermal source is the source in Ömerbeyli. It is approximately 1 km away from the project area. Its depth is in between 285-2398 m and its temperature is in between 196-233 °C. It has flow potential of 150 lt/sec. It is used for electricity production.

⁴ Governorship of Aydın, 2016, <http://www.aydin.gov.tr/genel-bilgiler>

Below is the satellite image showing the geothermal resources in the vicinity of the project area.

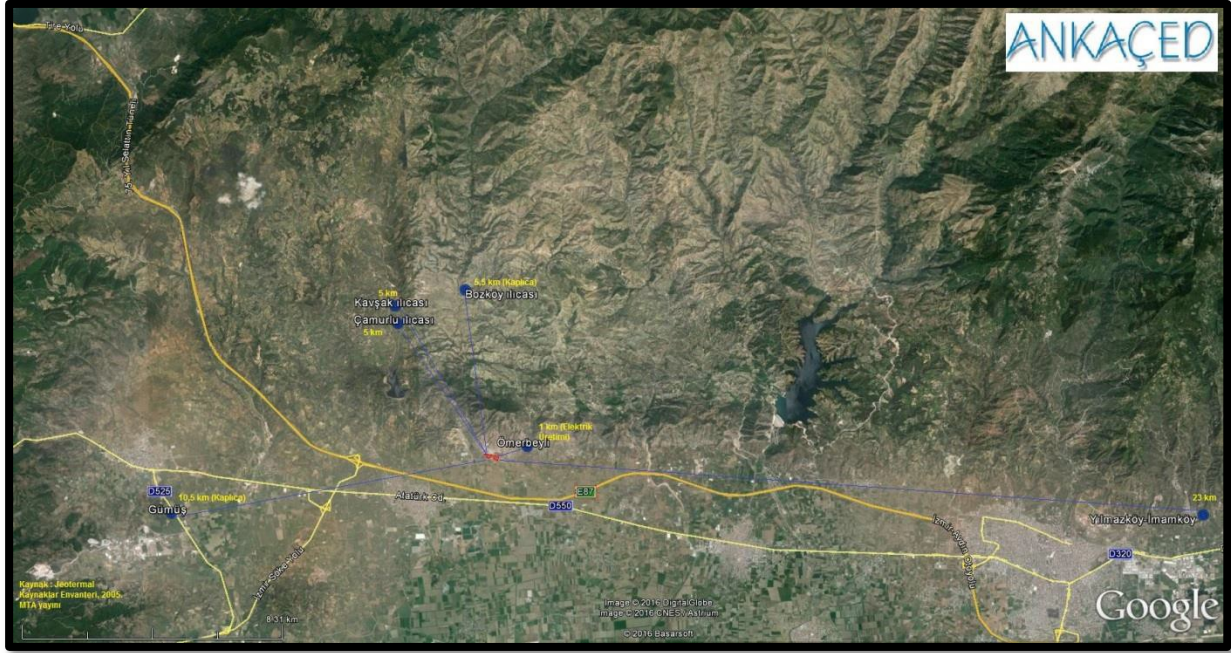


Figure 41. Geothermal Resources Around the Project Area (MTA)

II.2.7. The existing and planned use of surface water resources, if any water basin feature (drinking, domestic, irrigation water, electricity production, dam, lake, pond, aquaculture product types and production quantities, water transportation facilities, tourism, sports and similar purpose water and/or coastal uses, other uses)

The project area is located on the Büyük Menderes Basin. Büyük Menderes Basin has a rainfall area of 24.976 km². As catchment area, it has a slice of 0.9% of the Turkey. Its annual average effectiveness is 3.9 lt/s/km².

The main streams within the border of province of Aydın are Büyük Menderes, Çine Creek, Akçay, Köşk Creek, İkizdere, Dandalaz Creek, Kapızdere and Sarıçay. Among these streams; İkizdere, Sarıçay and Dandalaz Creek are used for drinking water purposes, Kapızdere, Köşk Creek and Akçay are used for irrigation purposes and Çine Creek is used for energy purposes.

The only natural lake in the province Aydın is Bafa Lake, some of which is located within the borders of Province of Muğla. The surface area of the lake is approximately 65 km² and 37 km² is located within the borders of Aydın.

Lake Bafa is Class A Wetland Area. It was declared as Nature Park in 1994 and taken under preservation. The lake is fed by rainfall that falls on the lake area, streams that show seasonal flow, springs from the coasts, bed/bottom sources and the connection with the Menderes river.

In addition to Lake Bafa, there are many irrigation ponds in Aydın Province. Among them; Kavakderesi Pond, Hıdırbeyli Pond, Akçaova Pond and Çatak Pond are used for irrigation purposes.

The present and planned use of surface water resources of the Project area and its vicinity and the basin feature is given in Section II.2.4 in detail.

II.2.8. Soil properties and usage status (soil structure, land use capability, classification, carrying capacity, slope stability, lubricity, erosion, use for soil works, natural vegetation used as pasture, meadow etc.),

Soil and Land Usage Status

The province of Aydın has extensive agricultural lands irrigated by the Büyük Menderes River. The lands close to the Büyük Menderes River are generally composed of first class and alluvial soils. These fertile lands extend to west through beginning from the borders of Kuyucak District in the east and spreads to a 10 km area in north-south direction. The most fertile lands within the provincial boundaries are located in Nazilli, Sultanhisar, Köşk, İncirliova, Koçarlı, Germencik and Söke Districts. There are also alluvial and colluvial first class agricultural lands around the Çine Stream which is passing near Akçay and Çine Districts located in the boundaries of Bozdoğan District. Soils; in the upper category based on the pedogenetic and physical properties of the profile; were classified in the Large Soil Groups level.

1/100.000 Scale Aydın Province Agricultural Property and Land Conformity for Agricultural Purposes prepared by the Abolished General Directorate of Rural Services is given in Annex 10 and the project site is shown on the map.

Large Soil Group

The large soil group of the whole project site is seen as the Colluvial Soil (K). When the vicinity of the site is examined, it is seen that a very large part is the large soil group is Colluvial Soil (K). The large soil groups observed in the project site and its vicinity are explained below.

Alluvial Soils (A)

These are (A) C profile azonal young soils with flat or near-flat slope present of the ground of surface waters or over the young sediments carried by streams at their area of influence. According to the severity of sedimentation at various times, the soil profile generally has various layers. The upper soil passes into the lower soil in an unclear manner. Mild lime washing may be present on those that have passed over many years. In the very large alluvial flood plains formed by the rivers, the soils show some differences in terms of structure, drainage and even topography as they move away from the river bed. According to this, soils are also named as "river edge" or "edge beyond" soils.

In areas where the soil drainage is inadequate, the substrates are generally wet and the reduction horizon (gley) is often encountered at certain depths. New sediments can be taken on the basins of every year on some alluvial plains.

Organic matter amounts vary widely according to climate, drainage and usage. On these soils, even new layers with different thicknesses can still come through sediment.

There is no special climate type and vegetation due to being Azonal soils. Each climate can have vegetation.

Colluvial Soils (K)

These are young (A) C profile soils generated by the materials stored by the surface flow or short distance carriage of the side streams. Soil characters are more like the character of the high land soils in the vicinity. Depending on the severity of the precipitation and the degree of inclination, they add layers with various parts sizes. These layers are not parallel to each other like alluvial soils and are non-homogenous. Those found on the "foot of steep slopes" and "in the valley defiles" contain less soiled rough stone and debris. As the speed of the surface flow decreases, the diameters of the particles decrease and even they become equal to alluvial soil particle size. Thus, in places where the inclination decreases too much, colluvial and alluvial soils are intermixed.

The colluvial soils have an absolute inclination which has to be more than 2%. However, it is possible to see a flat or near-flat slope, especially since long time leveling oriented careful plows reduced slope below 2% at the sites where irrigated agriculture has been carried out.

In colluvial soils, the primary color depends entirely on the parent material. It never changes due to the reasons such as drainage etc. except top soil present at the watery agricultural sites. The reaction is also the same or similar to the parent material from which it breaks. The nature of the rubbles in the profile is the same as the nature of the main material and the rubbles are not rounded completely due to the shortness of the distance, they have corners. These soils are generally well drained (internal) due to inclination and structure, so they do not exhibit salinity and salt accumulation. Their current problems are their roughness, bearing stones, inclination and flood exposure.

They do not have a special climate and vegetation, they can be found in any climate. Wide variety of vegetation can be found.

Land Use Capability Class

In the map provided in Annex 10, the land use capability of the project site is seen as Class 4. The characteristics of Class 4 lands are specified below.

IV. Class: In this class, the restrictions on the use of soils are more limited than in the 3rd class and plant selection is more limited. When they are processed they require careful management. Taking and maintaining protection measures are more difficult. They can be used for meadows, pastures and forests as well as for some of the crops or garden plants adapted to the climate when necessary precautions are taken. The use of this class of soil for cultivated plants is limited due to the continuous influence of one or few of the following features;

- Steep inclination,
- Exposure to severe water or wind erosion,
- Severe adverse effects of previous erosion
- Shallow soil,
- Low moisture retention capacity,
- Frequent floods that damage the product,
- Long-term ponding or old age,
- Severe salinity and sodicity

In Aydın, 4th class lands have an area of 57.570 hectares. Most of them are used as agricultural land (dry, watery, vineyards and orchards) and the rest is used as forest-shrub and meadow-pasture land.

Class IV. soils are most commonly seen at alluvial soils. The sub-distribution of this class is as follows;

IV e	1.140 ha
IV es	17.926 ha
IV se	16.794 ha
IV sw	13.040 ha
IV ws	8.670 ha.

In the map provided in Annex 10, the land use capability of the project site is seen as s (soil limitations within the root zone) and e (erosion) Class 4. These sub-categories of land capacity are described below.

Sub-category s (Soil limitations within the root zone): As the name implies, this subcategory is used for soils with shallow root zone, stony, low water-holding capacity, hardy corrected poor fertility, salinity and sodicity.

Sub-category e (Erosion) This sub-category is used for soils where the main problem and damage is erosion. Exposure to erosion and past erosion damages are the main soil factors that play a role in introducing the soil into this subclass.

Current Use of Land

In the map provided in Annex 10, the current land use of the project site is seen as an olive garden (Zz). There are areas for agricultural use in and around the project site. There is no olive garden in the project site. Olive gardens are located around the project site.

The surface area of province of Aydın is 800,700 hectares. According to the results of the statistics studies made in 2014, 368,336 hectares of this area are agricultural land, 313,362 hectares of forest land and 25,242 hectares are meadow-pasture land. Approximately 14,950 hectares are lakes and marsh. Non-agricultural area is 78.540 hectares.

Agricultural areas being used throughout the province are 368.336 hectares and this figure corresponds to 46% of surface area of the province.

Approximately 239,064 ha portion of 368,336 ha agricultural land is used for irrigated farming in the province of Aydın.

The land use status of the province of Aydın is classified as farmland, forests, meadow/pasture, water bodies, settlements and artificial areas and these are shown in the following figure.

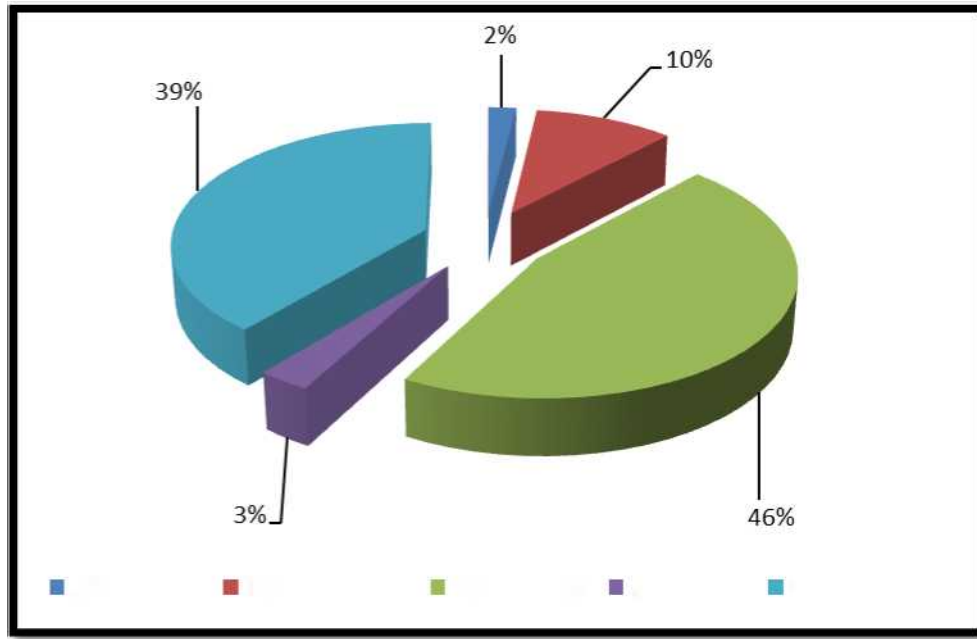


Figure 42. Land Distribution in Aydın

II.2.9. Agricultural areas (if there is an agricultural area or not, if yes, agricultural development project areas, size of irrigated and dry agricultural land, product patterns and their annual production amounts, the position of the products in the country agriculture and their economic value),

The project is located on agricultural land. Under the section II.2.8., the soil properties and usage of the project and its surroundings are specified.

Considering total agricultural area of 368.336 ha in the province of Aydın, approximately 216.657 ha of these is being used for fruit, beverage and spice plant cultivation, about 136.145 ha of these is being used for cereals and other crop products cultivation, approximately 11.595 ha of these is being used for Vegetable production and about 10 ha of these is being used for in the Ornamental Plant cultivation.

The use of agricultural land in Aydın province according to the agricultural products being produced is shown in the graph below.

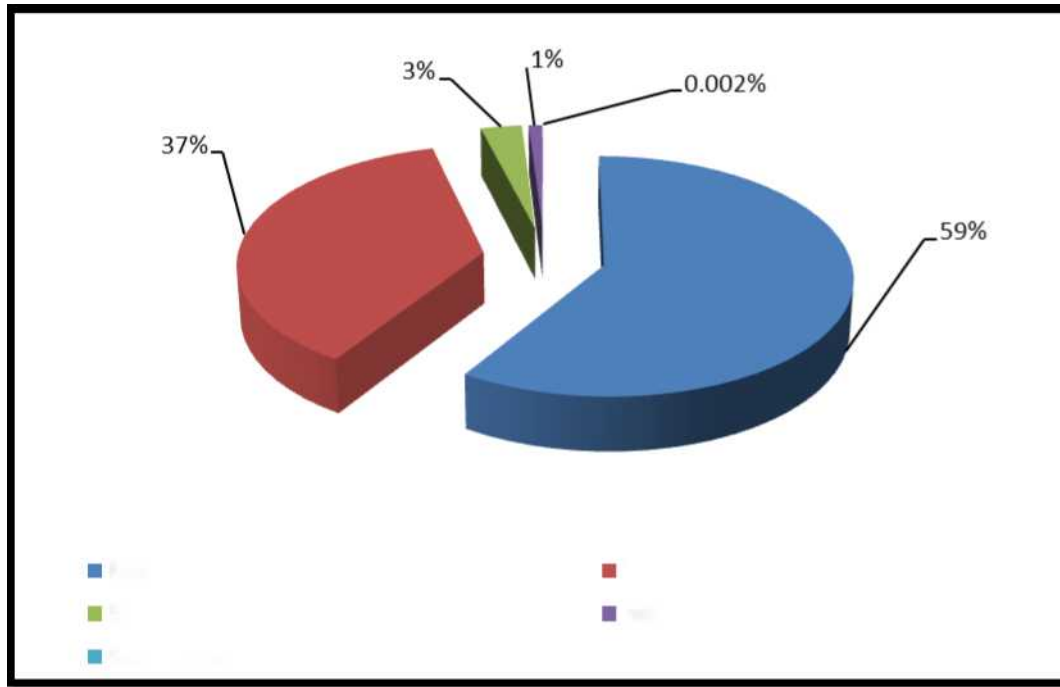


Figure 43. Use of Agricultural Land

When the graph is examined, agricultural lands in Aydın Province are substantially divided into fruit, drink and spice plants. This is followed by grains and other vegetable products. It can be said that about 3% of the land is used for the production of vegetables.

II.2.10. Forest Areas (amount of forest area, tree species and quantities in these areas, the size of the area covered, their closeness and characteristics, the current and planned preservation and/or utilization purposes, if the project area is not a forest area, the distance of the projects and units to the nearest forest area, 1/25.000 scale stand map),

The project area is located on agricultural land. The closest forest area to the project is shown in the figure below. The nearest forest area is the forest located at 600 m north and which is classified as degraded forest lands. The nearest scrub area is located 3 km to the south, and there is a forest area which is classified as a bosket, 6.5 km to the north. In addition, the project areas are shown in Annex 11 on the 1/25000 scaled Stand Map and are classified as agricultural land (Z-1).



Figure 44. Map Showing The Distance to the Closest Forest Area to the Project Area (Geodata-Ministry of Forestry And Water Affairs 2013)

II.2.11. Protected areas (national parks, nature parks, wetlands, natural monuments, nature conservation areas, wildlife conservation areas, biogenetic reserve areas, biosphere reserves, natural sites and monuments, historical, cultural sites, special environmental protection zones, special environmental protection areas , tourism areas and centers, areas covered by the pasture law, the distance of the project to protected areas in a clear and colored 1/100.000 scale map),

1/100.000 scale map which shows distance of Efe-6 Geothermal Power Plant Project and around EIA Regulation to the protection areas specified in Annex-5 is given in Annex 12. The closest protection area is the drinking water protection area of İkizdere Dam given in Figure 36. This dam is used as drinking water and domestic water. This protection area is located approximately 8.6 km northeast of the project area. The project does not remain within the drinking water protection area.

Other protection areas are; C Type Protection Forests which is located approximately 13.5 km south of the project area, Meryemana Nature Park which is located 26 km to the west, Gebekirse Lake Wildlife Development Area which is 30 km to the northwest, Lake Bafa Nature Park and Wetland which is 39 km to the southwest and Dilek Peninsula National Park which is located approximately 40 km southwest.

II.2.12. Flora and Fauna (species, endemic - especially local endemic - plant species, animal species which are living in the area naturally, species protected by national and international legislation, rare and endangered species and their location in the area, their distribution in the region, endemism conditions, abundance amounts, name of the game animals, populations and Central Hunting Commission Decisions taken for them, by whom and when each species, which method (use of literature-to-date source, observation, etc.) is detected, Collins Bird Guide, Turkey's Important Bird Areas Book, Turkey's Key Biodiversity areas Book, IUCN, Bern Convention, MAK Decisions, the situation according to international agreements such as CITES, in what way the species will be affected by the project, vegetation types in the project area to be shown on a map, protective measures to be taken in order to prevent the creatures which will be affected by the project (the construction and operation phases), the flora study to be carried out on the land during vegetation and specification of this period, to check these using Turkey's Plants Data Service for flora (TUBİVES),

In the project area and its immediate vicinity, there are no species that are important for scientific research and/or endangered species or species that may be included in the endangered species and habitats of endemic species for our country, biosphere reserve, biotopes, biogenetic reserve areas, areas that are geological and geomorphologic formations with unique properties.

Our country has the richest flora among the countries in the region due to its high plant diversity. It is under the influence of 3 floristic regions due to differences in topographic structure and climatic characteristics within the holarctic flora. These are; Mediterranean, Iran-Turan and Euro-Siberian regions.

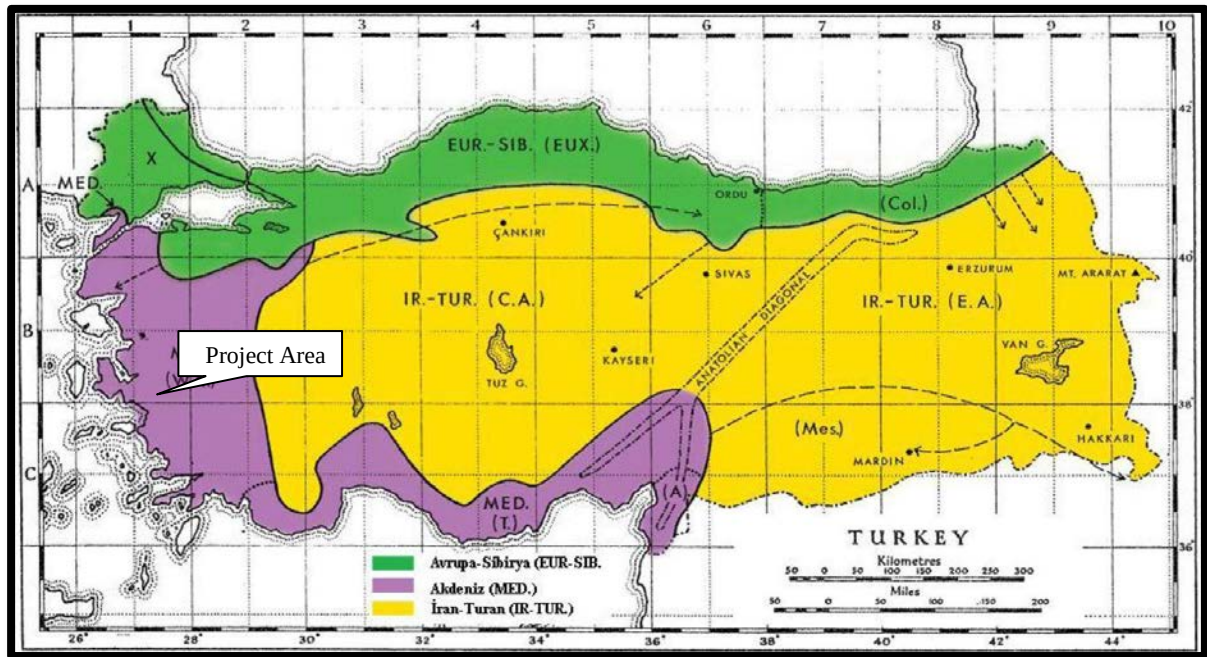


Figure 45. Turkey's Phytogeographic Regions

The planned area of the project is located in the Mediterranean Region (Eastern Mediterranean sub-region). The Grid system proposed by Davis (1965) was taken

as an example for easy monitoring of the distribution of species in the project area in our country. The project site is located in the C1 square according to Davis's Grid system.

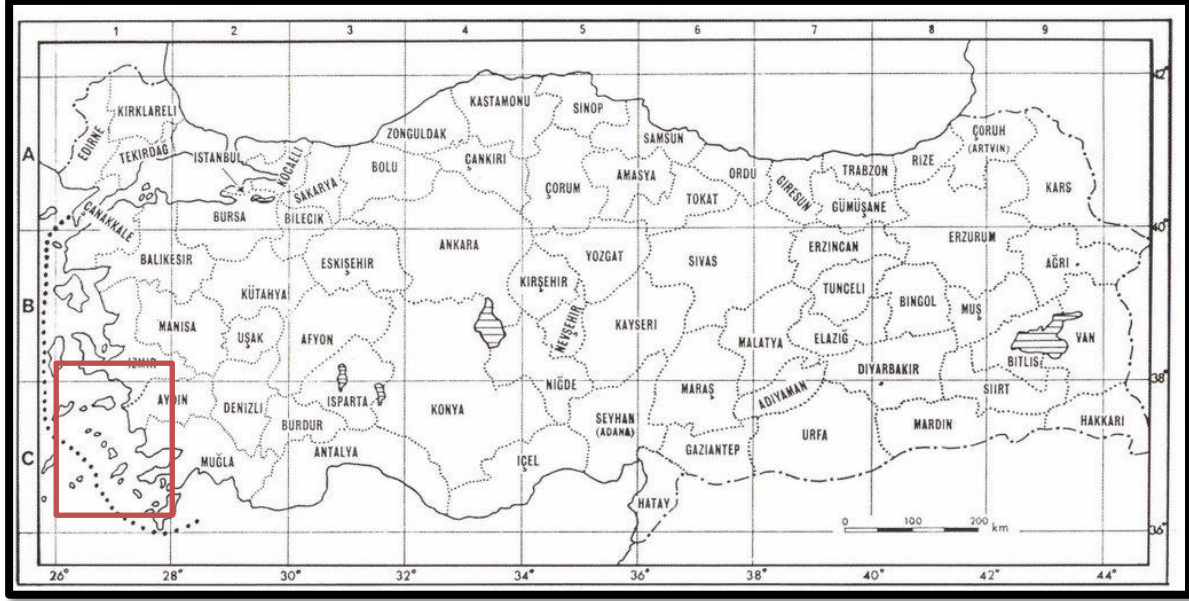


Figure 46. Location of Project Area in Grid System

Vegetation

Plant Geography is a branch of science that investigates the relationships between worldwide distribution of plant species and geographical features. According to this discipline, the world is divided into 37 different flora regions. Turkey, when examined from this angle, is one of the rare geographies where 3 different floristic regions intersect. These floristic regions are Mediterranean, Iran-Turan and Europe-Siberia.

The project site is located in the Mediterranean Region, Western Anatolia Sub-region. The most dominant vegetation type in the region is scrub. In the vicinity of the project area, there are olive fields and agricultural lands along with the scrub formation.

Flora

Following studies are utilized for regional literature study with regards to the flora detection: P. DAVIS "Flora of Turkey and East Aegean Island (1965-1988)", "Red Data Book of Turkish Plants" (Turkey Nature Protection Association and Van Yüzüncü Yıl University) and "Turkish Plant Names Dictionary" (Prof. Dr. Turhan Baytop/TDK). Aydın Provincial Environmental Status Report 2014 which is prepared by Governorship of Aydın Provincial Directorate of Environment and Urban was taken as reference. There are no endangered plant species related to the flora of the area.

In the determination of the flora of the project site, land and literature studies have been made and the list has been tried to be expanded by considering the general floristic character of the province.

Province of Aydın and its surroundings, where the area of activity is located bear the characteristics of "Mediterranean Phytogeographical Region".

The project site is located in the "C1" square according to Davis's Grid system. *Pinus brutia* (Turkish Pine) and *Pinus nigra* (Black pine) are common as the common tree species under the influence of Mediterranean plant geography. Turkish pines have spread on the southern slopes of the Aydın and Menteşe Mountains up to 800 meters high. On the northern slopes of the mountains are the *Pinus nigra* (Black pine) and *Castanea sativa* (Chestnut) communities. In the forests, following types of scrubs are also present: *Cornus mas* (Yellow flowering dogwood), *Cornus sanguinea* (Red berry dogwood), *Salix caprea* (*Salix alba*), *Quercus frainetto* (Hungarian oak), *Quercus cerris* (Haired oak), *Quercus pubescens* (Hairy oak), *Quercus infectoria* (Cyprus oak), *Rubus caesius* (Blackberry), *Phillyrea latifolia* (Phillyrea), *Arbutus andrachne* (Sandalwood).

The project site consists of two polygons and covers a total area of 37,358 m². The whole area is used for agricultural purposes. Natural vegetation has been destroyed in these areas and there are only natural plant species at the boundaries between the fields.

Table 16. Possible Types of Flora in the Project Area and Its Vicinity

PLANT TYPES (FAMILY/SPECIE	TURKISH NAME	ENDEMISM	PHYTOGOGRAP HICAL REGION	IUNC RED LIST	BERN CONVENTION
ASPLENIACEAE					
<i>Asplenium trichomanes</i>	Baldırıkara	-	-	-	-
HYPOLEPIDACEAE					
<i>Pteridium aquilinum</i>	Eğrelti	-	-	-	-
PAPAVERACEAE					
<i>Papaver minus</i>	Gelincik	-	East Mediterranean	-	-
POLYGONACEAE					
<i>Rumex tuberosus</i> L.	-	-	-	-	-
<i>Polygonum bellardii</i> ALL.	Potuk	-	-	-	-
CUPRESSACEAE					
<i>Juniperus oxycedrus</i>	Ardıç	-	-	-	-
<i>Juniperus foetidissima</i>	Kokar Ardıç	-	-	-	-
<i>Juniperus excelsa</i> M. BIEB. subsp. <i>excelsa</i>	Boz ardıç	-	-	-	-
APIACEAE					
<i>Eryngium creticum</i> LAM.	Göz Dikeni	-	East Mediterranean	-	-
MALVACEAE					
<i>Althaea hirsuta</i> L.	-	-	-	-	-
<i>Malva sylvestris</i>	Ebe gümeçi	-	-	-	-
CISTACEAE					
<i>Fumana procumbens</i>	-	-	-	-	-
<i>Cistus laurifolius</i> L.	Davşan otu	-	Mediterranean	-	-
CARYOPHYLLACEAE					
<i>Silene macrodanta</i> BOISS	-	-	-	-	-
<i>Silene compacta</i>	Yapışkan otu	-	-	-	-

PLANT TYPES (FAMILY/SPECIE	TURKISH NAME	ENDEMIS M	PHYTOGOGRAH ICAL REGION	IUNC RED LIST	BERN CONVENTION
LAMIACEAE					
<i>Lamium moschatum</i> MILLER var. <i>rhodium</i>	Ballıbaba	-	East Mediterranean	-	-
<i>Phlomis pungens</i> WILLD. var. <i>hirta</i> VELEN.	Çalba	-	-	-	-
LILIACEAE					
<i>Allium hirtovaginum</i> CAND.	-	-	East Mediterranean	-	-
<i>Ornithogalum armeniacum</i>	Ak yıldız	-	East Mediterranean	-	-
GERANIACEAE					
<i>Geranium robertianum</i> L.	-	-	-	-	-
FAGACEAE					
<i>Castanea sativa</i> MILLER	Kestane	-	Euro-Siberian	-	-
<i>Quercus frainetto</i> TEN.	Macar meşesi	-	Euro-Siberian	-	-
<i>Quercus cerris</i>	Saçlı meşe	-	Mediterranean	-	-
<i>Quercus pubescens</i> WILLD.	Tüylü meşe	-	-	-	-
<i>Quercus infectoria</i> OLIVIER subsp. <i>boissieri</i> (REUTER)	Mazı meşesi	-	-	-	-
PINACEAE					
<i>Pinus brutia</i> TEN. var. <i>brutia</i>	Kızılçam	-	-	-	-
<i>Pinus nigra</i> J. F. ARNOLD subsp. <i>nigra</i> var. <i>caramanica</i>	Karaçam	-	-	-	-
<i>Pinus sylvestris</i> L. var. <i>hamata</i> STEVEN	Sarıçam	-	-	-	-
POACEAE					
<i>Aegilops triuncialis</i> L. subsp. <i>triuncialis</i> L.	-	-	-	-	-
<i>Poa angustifolia</i> L.	-	-	-	-	-
<i>Triticum</i> sp.	Yabani buğday	-	-	-	-
<i>Avena</i> sp.	Yabani yulaf	-	-	-	-
<i>Hordeum pusillum</i>	Yabani arpa	-	-	-	-
ASTERACEAE					
<i>Anthemis auriculata</i> BOISS.	Papatya	-	East Mediterranean	-	-
BRASSICACEAE					
<i>Eruca sativa</i> MILLER	Roka	-	-	-	-
<i>Alyssum minus</i> (L.) ROTHM. var. <i>minus</i> (L.)	-	-	-	-	-
<i>Capsella bursa-pastoris</i>	Çoban çantası	-	-	-	-
FABACEAE					
<i>Astragalus hamosus</i> L.	Deli Çöven	-	-	-	-
<i>Genista anatolica</i> BOISS.	-	-	East Mediterranean	-	-
MYRTACEAE					

PLANT TYPES (FAMILY/SPECIE	TURKISH NAME	ENDEMIS M	PHYTOGOGRAH ICAL REGION	IUNC RED LIST	BERN CONVENTION
<i>Eucalyptus sp.</i>	Okaliptus	-	-	-	-
BORAGİNACEAE					
<i>Heliotropium dolosum</i> DE	Siğil otu	-	-	-	-
<i>Myosotis cadmaea</i> BOISS.	Boncuk otu	-	East Mediterranean	-	-
ZYGOPHYLLACEAE					
<i>Peganum harmala</i> L.	Üzerlik	-	-	-	-
RANUNCULACEAE					
<i>Ranunculus arvensis</i>	Düğün çiçeği	-	-	-	-
ROSACEAE					
<i>Potentilla recta</i> L.	-	-	-	-	-
<i>Pyrus communis</i> L. subsp. <i>communis</i> L.	-	-	-	-	-
<i>Rubus caesius</i> L.	-	-	-	-	-
OLEACEAE					
<i>Olea europaea</i> L. var. <i>europaea</i> L.	Zeytin	-	Mediterranean	-	-
<i>Phillyrea latifolia</i> L.	Akç akes me	-	Mediterranean	-	-
TYPHACEAE					
<i>Typha latifolia</i>	Sazlık ka mışı	-	-	-	-
CORNACEAE					
<i>Cornus mas</i> L.	Sarı çiçekli kızılcık	-	Euro-Siberian	-	-
<i>Cornus sanguinea</i> L.	Kırmızı me yvalı kızılcık	-	-	-	-
SALICACEAE					
<i>Salix caprea</i> L.	Keçi söğüdü	-	Euro-Siberian	-	-
<i>Salix alba</i> L.	Ak Söğüt	-	Euro-Siberian	-	-
ERICACEAE					
<i>Arbutus andrachne</i> L.	Sandal ağacı	-	-	-	-
TAMARİCAEAE					
<i>Tamarix smyrnensis</i> BUNGE	-	-	-	-	-

Endemism Status

- Non Endemic

E - Endemic

Conservation Status (IUCN)

RE - Regionally extinct

CR - Critically endangered

EN - Endangered

VU - Vulnerable
NT - Near threatened
LC - Least concern
DD - Data deficient
NA - Not applicable
NE - Not evaluated

Among the flora species written based on the field and literature studies; there are no plant species which are endemic, rare, endangered and which have to be taken under protection in accordance with the Bern Convention Annex-1. Thus, the species which are specified in the list are not under any threat, they are not harmed by the activity and their generations are not in danger.

Most of the endemic plant species in the province of Aydın are spread on Aydın Mountains, Dilek Peninsula, Karıncalı Mountain and West Menteşe Mountains. The project area is located in the Germencik district of the province of Aydın. The lands located in the boundaries of the Germencik District of Aydın Province are used as large agricultural lands as can be seen from the satellite photographs.

Fauna

The fauna of the study area was extracted according to the literature and observation data. Fauna list is formed as Amphibia, Reptiles (Reptilia), Birds (Aves), Mammals (Mammalia).

Table 17. Types of Amphibia which likely to be present in the Project Area and its Vicinity

FAMILY/SPECIE NAME	TURKISH NAME	ENDEMISM STATUS	IUCN / RED DATA BOOK	POPULATION STATUS	BERN CON V.
SALAMANDRIDAE	SEMENDERLER				
<i>Triturus vulgaris</i>	Pürtüklü semender	-	LC/nt	Rare	ANNEX III
BUFONIDAE	KARA KURBAĞALARI				
<i>Bufo viridis</i>	Gece kurbağası	-	LC/nt	Rare	ANNEX-II
<i>Bufo bufo</i>	Kara kurbağası	-	LC/nt	Rare	ANNEX- III
RANIDAE	SU KURBAĞALARI				
<i>Rana ridibunda</i>	Ova kurbağası	-	LC/nt	Rare	ANNEX-III

Table 18. Possible Types of Reptilia in the Project Area and Its Vicinity

FAMILY/SPECIE NAME	TURKISH NAME	ENDEMISM STATUS	IUCN/ RED DATA BOOK	POPULATION STATUS	BERN CONV.	MAK
TESTUDINIDAE	TOSBAĞAGİLLER					
<i>Testudo graecae</i>	Tosbağa	-	VU/nt	Abund	ANNEX-II	ANNEX-1

FAMILY/SPECIE NAME	TURKISH NAME	ENDEMISM STATUS	IUCN/ RED DATA BOOK	POPULATION STATUS	BERN CONV.	MAK
LACERTIDAE	KERTENKELELER					
<i>Lacerta saxicola</i>	Kaya Kertenkelesi	-	LC/nt	Abundant	-	-
<i>Lacerta trilineata</i>	İri Yeşilkertenkele	-	LC/nt	Abundant	ANNEX-II	ANNEX-I
TYPHLOPIDAE	KÖR YILANLAR					
<i>Typhlops vermicularis</i>	Kör Yılan	-	LC/nt	Rare	ANNEX-III	ANNEX-I
COLUBRIDAE	KIRBAÇ YILANLARI					
<i>Coluber jugularis</i>	Karayılan	-	LC/nt	Rare	ANNEX-III	ANNEX-I
<i>Eirenis modestus</i>	Uysal Yılan	-	LC/nt	Rare	ANNEX-II	ANNEX-I

Table 19. Possible Types of Mammals (Mammalia) in the Project Area and Its Vicinity

FAMILY/SPECIE NAME	TURKISH NAME	ENDEMISM STATUS	IUCN/ RED LIST	POPULATION STATUS	BERN CONV.	MAK
MURIDAE	FAREGİLLER					
<i>Mus musculus</i>	Ev faresi	-	LC/nt	Abundant	ANNEX-III	-
<i>Mus domesticus</i>	Ev faresi	-	LC/nt	Abundant	ANNEX-III	-
<i>Apodemus mystacurus</i>	Fare	-	LC/nt	Rare	ANNEX-III	-
MUSTELLIDAE	SANSARLAR					
<i>Mustela nivalis</i>	Gelincik	-	LC/nt	Abundant	ANNEX-III	ANNEX-II
<i>Martes foina</i>	Kaya sansarı	-	LC/nt	Abundant	ANNEX-III	ANNEX-II
HYSTRICIDAE	OKLU KİRPİLER					
<i>Hystrix cristata</i>	Oklu Kirpi	-	LC/nt	Abundant	ANNEX-II	ANNEX-I
LEPORIDAE	TAVŞANGİLLER					
<i>Lepus europaeus</i>	Bayağı tavşan	-	LC/nt	Abundant	ANNEX-III	ANNEX-II
TALPIDAE	KÖSTEBEKGİLLER					
<i>Talpa europaea</i>	Köstebek		LR/Ic	Rare	-	-
CANIDAE	KÖPEKGİLLER					
<i>Vulpes vulpes</i>	Kızıl tilki	-	LC	Rare	ANNEX-III	ANNEX-II
SUIDAE	DOMUZGİLLER					
<i>Sus scrofa scrofa</i>	Bayağı yaban domuzu	-	LC/Ic	Abundant	ANNEX-III	ANNEX-II

Table 20. Possible Types of Birds (Aves) in the Project Area and Its Vicinity

FAMILY/SPECIE NAME	TURKISH NAME	ENDEMISM STATUS	IUCN/ RED LIST	POPULATION STATUS	BERN CONV.	MAK
COLUMBIDAE	GÜVERCİNGİLLER					
<i>Columba livia</i>	Kaya Güvercini	-	LC	Abundant	ANNEX-III	ANNEX-II

<i>Streptopelia decaocto</i>	Kumru	-	LC/A.3	Abundant	ANNEX-III	ANNEX-II
ALAUDİDAE	TOYGARGİLLER					
<i>Alauda arvensis</i>	Tarla kuşu	-	-	Rare	ANNEX-III	ANNEX-II
HİRUNDİNİDAE	KIRLANGIÇGİLLER					
<i>Hirundo rustica</i>	Kır kırlangıcı	-	LC/A.4	Abundant	ANNEX-II	ANNEX-I
MUSCİCAPİDAE	SİNEKKAPANGİLLER					
<i>Muscicapa striata</i>	Benekli sinekkapan	-	-	Rare	ANNEX-II	ANNEX-I
TURDİDAE	KARATAVUKGİLLER					
<i>Turdus merula</i>	Karatavuk	-	-	Rare	ANNEX-III	ANNEX-II
<i>Saxicola ruberta</i>	Çayır taşkuşu	-	-	Rare	ANNEX-III	ANNEX-I
SİTTİDAE	SIVACIKUŞUGİLLER					
<i>Sitta krueperi</i>	Küçük Sıvacıkuşu	-	-	Rare	ANNEX-II	ANNEX-I
CORVİDAE	KARGAGİLLER					
<i>Pica pica</i>	Saksağan	-	LC	Rare	-	ANNEX-II
<i>Corvus frugilegus</i>	Ekin kargası	-	-	Abundant	-	ANNEX-II
<i>Garrulus glandarius</i>	Alakarga	-	-	Abundant	ANNEX-III	ANNEX-II
PASSARİDAE	SERÇEGİLLER					
<i>Passer domesticus</i>	Ev serçesi	-	LC	Very Abundant	-	ANNEX-II
FRİNGİLLİDAE	İSPİNOZGİLLER					
<i>Fringilla montifringilla</i>	Dağıspinozu	-	-	Rare	-	ANNEX-II
<i>Fringilla coelebs</i>	İspinoz	-	LC		ANNEX-III	ANNEX-II
<i>Carduelis carduelis</i>	Saka	-	LC/A.4	Rare	ANNEX-II	ANNEX-I
UPUPİDAE	İBİBİKGİLLER					
<i>Upupa epops</i>	İbibik	-	LC	Rare	ANNEX-III	ANNEX-I
PİCİDAE	AĞAÇKAKANGİLLER					
<i>Dendrocopus syrtacus</i>	Alaca ağaçkakan	-	-	Rare	ANNEX-III	ANNEX-I
PHASİANİDAE	SÜLÜNGİLLER					
<i>Alectoris chukar</i>	Kıvalı keklik	-	LC/A.2	Rare	ANNEX-III	ANNEX-II
<i>Coturnix coturnix</i>	Bıldırcın		LC/A.4	Rare	ANNEX-III	ANNEX-II
RECURVİROSTRİDAE						
<i>Himantopus himantopus</i>	Bayağı Uzunbacak	-	LC	Abundant	ANNEX-III	ANNEX-I
RALLİDAE	SUTAVUĞUGİLLER					
<i>Fulica atra</i>	Sakarmeke	-	LC	Abundant	ANNEX-III	ANNEX-II

Conservation Status (IUCN)

RE - Regionally extinct

CR - Critically endangered

EN - Endangered
VU - Vulnerable
NT - Near threatened
LC - Least concern
DD - Data deficient
The Convention on the Conservation of European Wildlife and Natural Habitats (Bern)
ANNEX II: SPFS; Strictly Protected Fauna Species
ANNEX III PFS; Protected Fauna Species
2015-2016 Central Hunting Commission Decisions (MAK)
1: Hunting animals taken under protection by the Central Hunting Commission
2: Game animals allowed to be hunted at certain times by the Central Hunting Commission
Hunting and Wild Animals Species Lists (AYK)
Annex-I List of Wild Animals
Annex-II List of Game Animals
Annex-III List of Wild Animals Taken Under Preservation

II.2.13. Whether or not there are mines and fossil fuel sources in the Project Area or its vicinity (if any, the amount of reserves, current and planned operation conditions, annual production and its importance for the country or local uses and its economic value),

Among the important mineral assets of the province of Aydın are iron, feldspar, quartz, sulfur and brick tiles. 95% of the mineral feldspar produced in Turkey are extracted from the mountainous region between Çine and Milas District of the province of Muğla.

In terms of metallic minerals; gold, copper, lead, zinc, mercury and iron formations are present. Copper, lead and zinc mineralizations are found in the city center, Söke, Çine and Koçarlı districts and they are not economical since they are small size occurrences with low grade. There are small mercury occurrences in Nazilli and Germencik Districts.

In addition to metallic ore deposits, there are rich industrial raw materials deposits. Among these, industrial materials such as barite, diatomite, graphite and quartz as well as mines produced from feldspar beds, which are indispensable for the ceramic industry, are exported to the world market. Our country is the leading the world in albite production. Nearly entire production takes place in Çine - Milas. In this region, there are feldspar enrichment facilities.

Karacasu district has important marble potential. A total of 30 million m³ of marble reserves were identified in the districts of Geyre, Tepecik, Hangediği and Nargedik. These fields are operated by the private sector.

The total lignite reserve (visible + probable) in the province is about 30.383.000 tons, which is extracted corresponding to the fuel need. The total Gritstone reserves (visible + probable) are 9.954.500 tons.

II.2.14. Livestock and aquaculture (species, feeding areas, annual production amounts, place and value of these products in the country economy, fishing and drive-in fishery places within the sphere of influence),

The province of Aydın, where the project is planned to be implemented, has been developed in terms of livestock, vegetation and climate. Pastures in the province are decreasing gradually. Sheep, hair goat and cattle are included into the livestock. Beekeeping is developing and poultry is also important in some regions.

Detailed information on livestock and number of animals in the province and the quantity of aquaculture products are specified in the tables below.

Table 21. The number and species of livestock in Germencik District of the province of Aydın (TURKSTAT 2015)

ANIMAL STOCK	NUM
Cattle	200
Cattle	14.150
Cattle	1.950
Sheep	4.280
Goat (Hair)	2.830
Broiler	600.000
Beekeeping	4.240 (Number of New Hives)
Silk Worm	1 (Village)
Horse	775
Hinny	198
Donkey	395

Table 22. Aquaculture Production Quantity in the Province of Aydın (TURKSTAT 2014)

AQUACULTU	AMOUNT (TONE)
Sea Bream	669
Sea Bass	2.968
Trout (Inland)	2.520

Table 23. Amount of Inland Water Products in the Province of Aydın (TURKSTAT 2014)

INLAND WATER PRODUCTS	AMOUNT (TONE)
Zander	1
Carp Bream	6
Gobies	1
Gray Mullet	2
Cyprinus Carpio	65
Sheatfish	9
European Eel	9

II.2.15. Places with high landscape value and recreation areas,

This project is not involved in areas where places with high landscape value and recreation areas are present. The nearest recreation area is a recreation area located approximately 13.5 km to the south. This area is the Type C Protected Forest picnic area. This area is shown in the Map of Protected Areas in Annex 12.

There is no land with high landscape value in the project area and its vicinity.

II.2.16. State owned lands (military forbidden zones, areas allocated to public institutions and organizations for specific purposes, etc.),

In the project area, there is no state owned lands (military forbidden zones, areas allocated to public institutions and organizations for specific purposes, etc.).

II.2.17. The current pollution load of the project site and the sphere of influence (determination of the current pollution load in terms of air, water, soil and noise, what kind of studies were carried out between the dates when this study was carried out, work methods, specifying the meteorological conditions for the period during which the study was carried out),**Air Quality**

Air pollution, which is the result of the urbanization brought by modern life, has an impact on the global scale as well as local and regional. Since air pollution has important effects on human health, the issue of air quality is of great importance all over the world. In order to confront air pollution problems and to plan abatement strategies, both the scientific community and the relevant authorities have focused on monitoring and analyzing the atmospheric pollutants concentration (*Kyrkilis et.al., 2007*).

Success of a nation to improve air quality depends on the support of its citizens who are well-informed about local and national air pollution (*Sharma et.al., 2003a*). Taking into consideration that the development of an adequate tool to understand pollution levels in an area is of utmost importance. This tool must be as exact as possible to forecast in advance pollutants concentration, so as to be able to inform the citizens about the levels of pollution in an adequate and understandable way but also to be used by the relevant authorities to take a series of predetermined measures to constitute interrelated measure and protect the health of the population (*Kyrkilis et al., 2007*).

For this purpose, the developed standard values can be presented both as stimulant and understandable and to be translated into an index for its usage. In order to characterize the air quality in a certain region, the index is defined as the Air Quality Index (AQI), where the countries are transformed according to their limit values and the pollution classification is made. The index is expressed using different definitions and colors in certain categories and is arranged separately for each pollutant that is measured (*Yavuz, 2010*). Air Quality Index and limit values are given in the tables below.

Table 24. EPA Air Quality Index

Air Quality Index (AQI) Value	Health Concern	Colors	Meaning
When the Air Quality Index is between this	...air quality conditions	...the color symbolizes the	...meaning of the colors
0-50	Good	Green	Air quality is satisfactory and air pollution is not at low risk or no risk at all.
51-100	Moderate	Yellow	Air quality is appropriate; however, for very few people who are unusually sensitive to air pollution, there may be a moderate health concern for some contaminants.
101-150	Sensitive	Orange	Unhealthy for Sensitive Groups. In general, the public is unlikely to be affected.
151-200	Unhealthy	Red	Anyone may begin to experience health effects. There may be serious health effects for sensitive groups.
201-300	Very Unhealthy	Purple	Health emergency may occur. There is a high probability for entire population to be affected.
301-500	Hazardous	Brown	Health alarm: anyone may face serious health effects.

Table 25. Limit Values of Index Calculated Parameter

Parameter	SO ₂ (mg/m ³)	NO ₂ (mg/m ³)	CO (mg/m ³)	O ₃ (mg/m ³)	PM ₁₀ (mg/m ³)
	1 Hour Avg.	1 Hour Avg.	8 Hour Avg.	8 Hour Avg.	24 Hour Avg.
National Limit	440	280	12.000	120	80
EU Member States Limit Value	350	200	10.000	120	50

There is an air quality measurement station in the Center for the measurement of air quality in the province of Aydın. Below is the satellite image of the air quality measurement station.



Figure 47. Satellite Image of the Air Quality Measurement Station of the Province of Aydın (Ministry of Environment and Urbanization).

Table 26. Locations of Air Quality Measurement Station in the province of Aydın and Measurement Parameters (Aydın Provincial Directorate of Environment and Urbanization, 2014)

Locations of the Stations	Coordinates (Latitude, Longitude)	Air Contaminants					
		SO ₂	NO _x	CO	O ₂	HC	PM ₁₀
Aydın Meteorology Station Directorate Garden Çine Bulvarı 1999 No:3 Aydın	37.840436 27.836879	X					X

PM₁₀ and SO₂ measurement values (measurement made on March) in the province of Aydın are given in the table below.

Table 27. Province of Aydın PM₁₀ and SO₂ values on March (Ministry of Environment and Urbanization)

Date	Time	PM ₁₀ (mg/m ³)	SO ₂ (mg/m ³)
01.03.2016	00:00	70	4
02.03.2016	00:00	96	7
03.03.2016	00:00	69	
04.03.2016	00:00	32	9
05.03.2016	00:00	36	9
06.03.2016	00:00	50	9

07.03.2016	00:00	53	10
08.03.2016	00:00	58	11
09.03.2016	00:00	94	13
10.03.2016	00:00	57	7
11.03.2016	00:00	48	8
12.03.2016	00:00	53	9
13.03.2016	00:00	75	12
14.03.2016	00:00	44	8
15.03.2016	00:00	96	14
16.03.2016	00:00	65	15
17.03.2016	00:00	63	17
18.03.2016	00:00	67	19
19.03.2016	00:00	56	10
20.03.2016	00:00	78	15
21.03.2016	00:00	69	13
22.03.2016	00:00	70	13
23.03.2016	00:00	51	14
24.03.2016	00:00	141	12
25.03.2016	00:00	32	11
26.03.2016	00:00	25	10
27.03.2016	00:00	37	12
28.03.2016	00:00	45	17
29.03.2016	00:00	59	18
30.03.2016	00:00	65	15
31.03.2016	00:00	65	16
Average		62	12

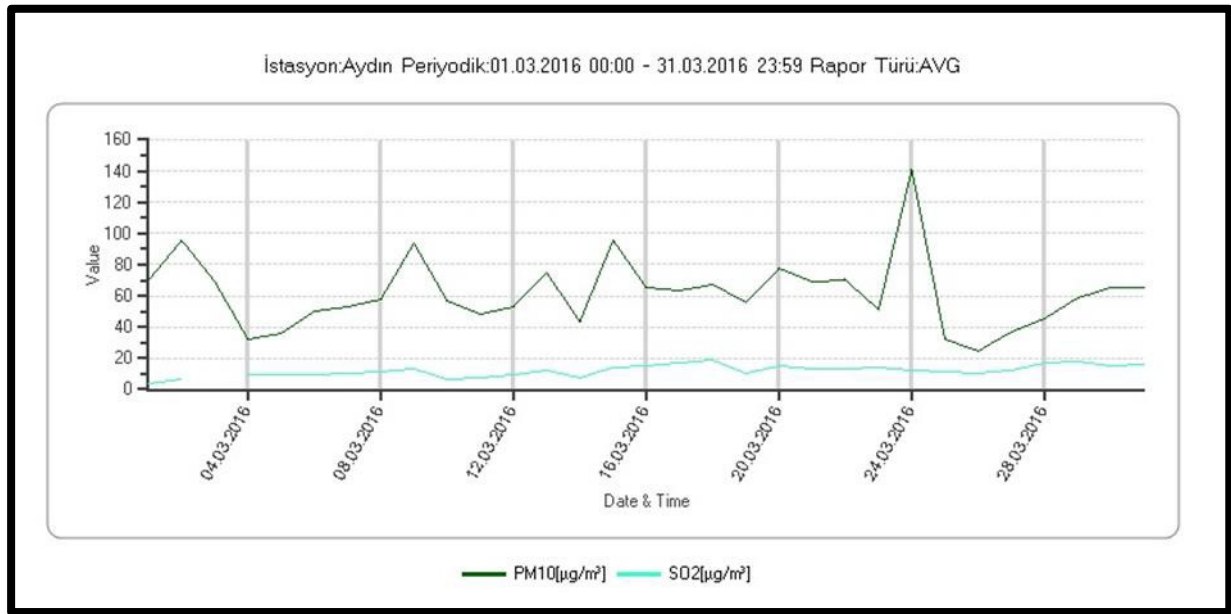


Figure 48. Province of Aydın PM10 and SO2 Graph on March (Ministry of Environment and Urbanization)

According to the results obtained on March in Aydın Province, the average PM10 value was 62 mg/m³ and the mean SO₂ value was 12 mg/m³. In this context, if a general evaluation is made for March, air quality corresponds to yellow color and is suitable according to EPA Air Quality Index. Air quality measurement values performed in 2014 are given in the table below.

Table 28. Monthly Average Values of Air Quality Parameters and Number of Days Exceeding Limit Value in the province of Aydın during 2014 (Aydın Provincial Directorate of Environment and Urbanization, 2014)

MONT	SO ₂	PM10	AGS*
January	6	120	0
February	9	98	0
March	10	63	0
April	6	48	0
May	5	42	0
June	6	53	0
July	5	54	0
August	5	57	0
Septemb	5	51	0
October	6	52	0
Novemb	11	60	0
Decemb	13	86	0
AVERAGE	7	65	0

*AGS: Number of days during which limit values are exceeded

Noise

Due to the fact that industrial facilities are generally located outside the residential areas in the province of Aydın, there is no intense noise pollution.

According to the Provincial Environmental Status Report for the province of Aydın in 2013, 53.5% of the complaints made during the year were for entertainment sources, 25.2% were due to workplace environment and 12.11% were industrial use.

According to the Provincial Environmental Status Report for the province of Aydın in 2014, 42.4% of the complaints made during the year were for entertainment sources, 37.8% were due to workplace environment and 6.1% were industrial use.

According to the statistics made throughout the province of Aydın, it has been observed that the complaints as a result of the noise have decreased over the years, and there have also been obvious decreases in the noise complaints caused by industrial and workplace uses.

Water Quality

The main sources of water pollution in the province of Aydın can be listed as; industrial wastewater, domestic wastewater, black water arising from olive oil production and geothermal waters.

It has been determined that boron is mixed into the irrigation, drinking and domestic water due to the layers they are present or as a result of some industrial wastes.

The information with regards to the water pollution of the province of Aydın and its vicinity has been taken from Aydın Provincial Environmental Status Report. In line with this report, the textile and leather industry, which is concentrated in Denizli and Uşak, causes pollution in the upper basins for the province of Aydın. Therefore, it is one of the main causes of pollution in the streams and groundwater resources passing through the province of Aydın. Information regarding the main streams and their pollution parameters are provided below.

In the Gökpınar Creek, extreme organic matter, nitrogen, pH, heavy metal contamination and oxygen deficiency caused by Denizli,

Salinity problem added to organic matter and nitrogen pollution on Çürüksu Creek, Büyük Menderes River, Denizli-Sarayköy- Kuyucuk line,

In Dokuzsele Stream, extreme organic matter and nitrogen pollution, salinity and oxygen deficiency due to Uşak.

In the province of Aydın, nearly all of the drinking and utility water is met by artesian. Polyculture farming is carried out in the province of Aydın and its districts. Thus, fertilizers and a wide variety of pesticides are used by farmers. As a result of this, due to underground infiltrations, nitrates and various nitrogen compounds have formed pollution in the ground water and in various wells.

Bafa Lake, located between Aydın and Muğla, is a lagoon lake and has a size of 6,400 hectares. Due to the drought in recent years, the water level in the lake has decreased and the salinity rate has increased. In order to increase the water level of the lake, water is supplied to the lake from the Büyük Menderes River. Therefore, the pollution in the river affects the Lake of Bafa. Salinity due to decrease in the water level and the pollution carried by the Büyük Menderes River and improper fishing decreased the efficiency of the lake.

In the method to be used within the scope of the project, it is not possible to discharge any geothermal water source to the receiving environment. The project is not a source of contamination for geothermal water quality throughout the province.

Soil Pollution

With the use of nitrate fertilizers in agriculture, nitrogen concentration in soil increases leading some diseases to be seen in humans and animals. Mining wastes, commercial fertilizers, agrochemicals and chemicals are directly or indirectly mixed into the soil and cause soil contamination. Soils have high buffer strength against various pollutants reaching their bodies and pollution effects occur as a result of long-term and overloading.

Water pollution in the province of Aydın will also cause soil pollution and will directly affect agriculture.

II.2.18. Other issues,

Power Plants in Production: In the province with a high potential for energy, 21 power plants (2 state-owned and 19 private sector owned) with a total installed capacity of 553,48 Megawatts are in production. Of the 21 power plants in production, 6 are hydroelectric power plants, 9 are geothermal power plants, 4 are wind power plants, 1 are natural gas power plant and 1 are biogas power plant. Of the total installed capacity, 25% is hydroelectric, 43,5% is geothermal electricity, 19% is wind, 12% is natural gas and 0,50% is biogas power plant. According to 2014 data, 0.8% (553,48 Megawatt) of the total installed capacity of 69,519.8 megawatts are produced in Aydın.

Turkey's first private geothermal power plant with 8.5 Megawatt installed power was commissioned in 2007 in Salavatlı, Sultanhisar and second geothermal power plant with 47.4 megawatt installed power was commissioned in 2009 in Germencik District. In the following years, 7 geothermal power plants were constructed and commissioned by the private sector.

Wind power plant with a 31.5 MW installed capacity was commissioned in 2009 by the private sector in Didim and a power plant with 24 MW installed capacity was commissioned in 2010 in Çine. Besides, first stage of Çatalbük Wind Power Plant with an installed capacity of 30 MW was commissioned in Söke district in 2012 and Madranbaba WPP was commissioned in 2013 with an installed capacity of 20 MW. In 2013, the investment of a 64 MW natural gas power plant was completed by the private sector and the power plant commissioned in Çine Organized Industrial Zone. In 2013, the investment of a 2,48 MW biogas power plant was completed by the private sector and the power plant commissioned in İncirlioğlu-Sınırtürk village site.

In 2013, a total of 2,041,760,476 kwh electricity was consumed in Aydın. In 2014, 2,104,739,469 kwh electricity was consumed in Aydın. In Aydın, electricity consumption per person is 2.020(2012), 2.061(2014) kwh/person and this figures are below Turkey average which is 2.577(TURKSTAT-2012).⁵

II.3. Characteristics of Social-Economic Environment

The social-economic evaluation of the province of Aydın and Germencik district, where the project area is located, was carried out by using the current TURKSTAT data. In addition, data from the official website of the Governorship of Aydın are included.

II.3.1. Economic characteristics (main sectors that constitute the economic structure of the region, distribution of local labor force to these sectors, the place and importance of sector production of goods and services in the country economy, other information); Income (distribution of income in the region to the business lines, maximum, minimum and average income per capita by business lines); Unemployment (unemployed population in the region and its ratio to the active population),

The province of Aydın has a weight on our region and country in respect of its soil structure. In Aydın, There is 395.494 ha cultivation area among its total surface of 831.900 ha.

The province of Aydın was ranked #22 in socio-economic index of provinces and regions by State Planning Organization in 2003 and thus, considered as one of the developed provinces of Turkey. When the sectoral distribution of the gross domestic product (GDP) of the province as of 2001 is examined, it is seen that the first sector services sector with a share of 62.7% is followed by agriculture (27.2%) and industry (10.2%) sectors. However, with the growth rate of 3.4% during the 1987-2001 period, services were the fastest growing sector of the province.

Agriculture & Livestock

In the province of Aydın, one of the regions with high ratio of cultivation area when compared to regional surface area, the agriculture and livestock sector has recently started to make itself felt throughout the country in terms of product diversity. Among the factors that led to this, smooth terrain structure, the wide area of plains and the widespread use of machinery farming, the ease of transportation in the development of agriculture in the region, the prevalence of irrigation, the overpopulation of the consumer population can be listed. Presence of three different climate types in the region increases the agricultural product variety.

Soil, climate, topographic structure and ecological characteristics of the province of Aydın enable the performance of polyculture agriculture. It has a strong potential enabling the cultivation of each agricultural branch.

The share of the province of Aydın in the agricultural production of the country is around 2.13%. Among the agricultural sector, plant production, livestock and fisheries are important sub-sectors. Fig, olive, chestnut, cotton and citrus are the most important plant production products. In recent years, the province of Aydın has made a breakthrough in livestock. The most grown products in Aydın province; figs, olives, cotton, chestnuts, strawberries, artichokes, peanuts, corn, citrus and almost all kinds of vegetables.

Mining

Among the important mineral assets of the province of Aydın are iron, feldspar, quartz, sulfur and brick tiles.

95% of the mineral feldspar produced in Turkey are extracted from the mountainous region between Çine and Milas District of the province of Muğla. In terms of metallic minerals; gold, copper, lead, zinc, mercury and iron formations are present. The total lignite reserve (visible + probable) in the province is about 30.383.000 tons, which is extracted corresponding to the fuel need. The total Gritstone reserves (visible + probable) are 9.954.500 tons.

Industry

Considering the general structure of the manufacturing industry in the province of Aydın, food and beverage manufacturing, textile products manufacturing, mining and quarrying, and other non-metallic mineral products manufacturing sectors come to the forefront. Food and beverage production sector; TURKSTAT General Industrial Business Census (GSİS) in-province percent and concentration indicators, provincial Chamber of Commerce and Industry preferences showed up through realized preferences. In addition to the fact that the sector is prominent within the province, it is seen that the sectoral share within the province is larger than the sectoral share within the country.

Textile products manufacturing sector; came to the forefront in GSIS export indicators within the province, provincial industrial and trade chambers' preferences and realized incentive investments. In addition, the export rate of textile sector is predominant in the province. Cotton Weaving, Ready Textile Products and Preparation and Spinning of Natural and Synthetic Cotton Fibers sub-sectors are the most important sub-sectors.

Manufacture of other non-metallic mineral products has come to the forefront in the private sector labor productivity and export indicators. The sub-sector of cutting, shaping and using the ornamentation and building block is the sub-sector that brings this sector forward.

Prominent sectors in the province of Aydın:

1. Food and Beverages Manufacture,

- Processing and storage of vegetables and fruits which have not been classified in any other place,
- Manufacture of bread, fresh baked goods and fresh cakes,
- Manufacture of refined oils and fats,
- Manufacture of rusks, biscuits, durable pastry products and durable cakes,
- Manufacture of milled grain products,
- Manufacture of raw oils and fats,

2. Mining and Quarrying,

- Other mining and quarrying businesses which have not been classified in any other place,
- Lignite Mining and Briquetting
- Sand and Gravel Quarry
- Decoration and building blocks quarrying

3. Manufacture of Textile Products

- Manufacture of textile products other than clothes,

- Cotton Weaving,
- Preparation and spinning of natural and synthetic cotton fibers

4. Manufacture of Other Non-Metallic Mineral Products

- Manufacture of refractory ceramic products,
- Cutting, shaping and using the ornamentation and building block and making them usable,
- Manufacture of other ceramic products
- Manufacture of tile, briquette bricks and building materials from baked/fired clay,

II.3.2. Population (urban and rural population in the region, population movements; migrations, population growth rates, average household population, other information),

Project area is located at Aydın Province, Germencik District, Alangüllü Neighborhood, Değirmencivarı Location, parcel no 883 and Ömerbeyli Neighborhood, Öziçi Location, parcel no 603.

The province of Aydın has a 7,943 km² surface area and there is 133 people per square kilometer. Population density of Aydın is 133/km². The population of Aydın is 1,053,506 in 2015.

Table 29. Population of Aydın by Years

YEA	POPULATION OF	MAN	WOMAN
2015	1.053.506	525.267	528.239
2014	1.041.979	519.900	522.079
2013	1.020.957	510.512	510.445
2012	1.006.541	502.337	504.204
2011	999.163	499.194	499.969
2010	989.862	495.363	494.499
2009	979.155	489.857	489.298
2008	965.5	482.434	483.066
2007	946.971	473.481	473.49

Source: TURKSTAT (2015 population statistics)

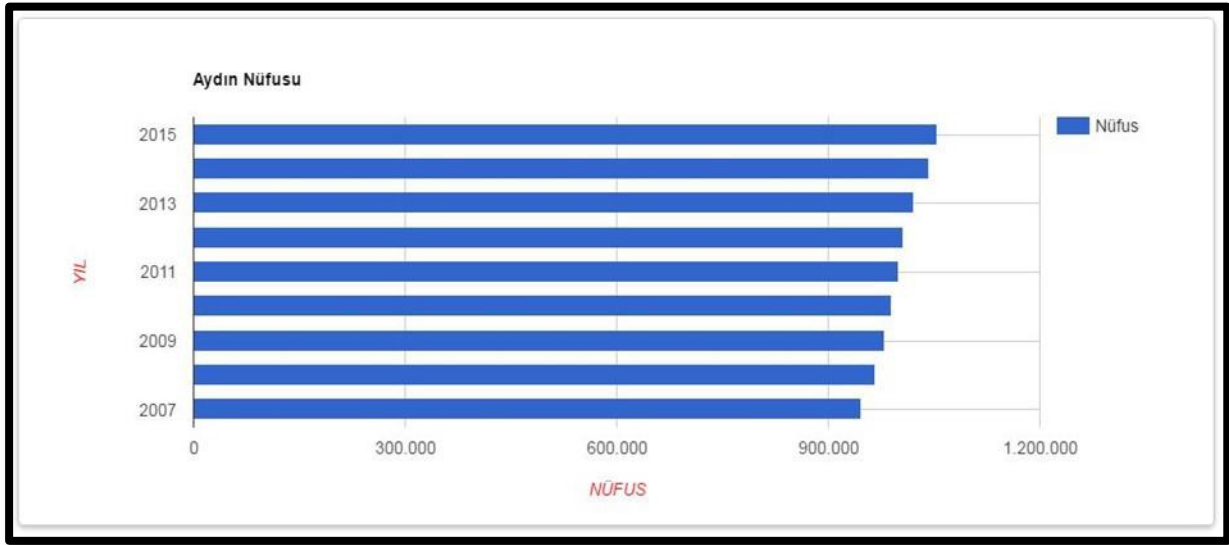


Figure 49. Aydın Population Growth Graph by Years

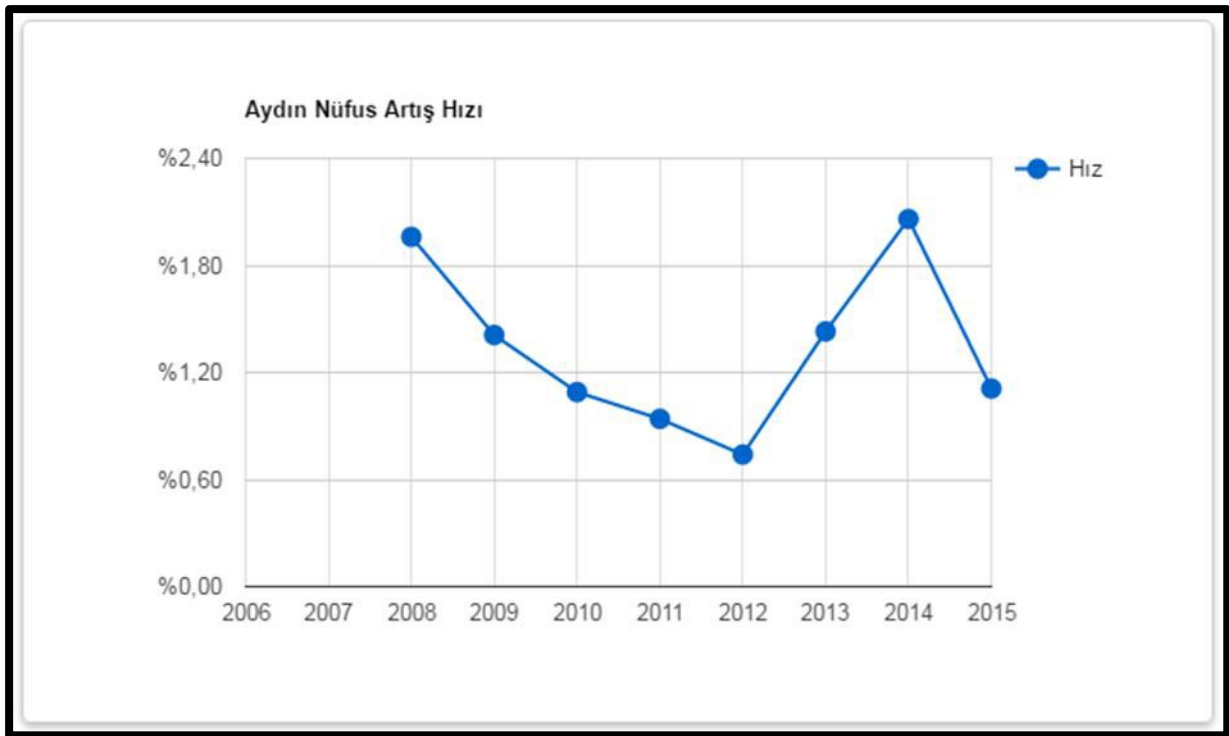


Figure 50. Aydın Population Growth Rate

Table 30. Population of Aydın by Districts

Year	District	District	Population of	Population of	Population
2015	Efeler	277.466	138.132	139.334	26.34%
2015	Nazilli	151.789	74.695	77.094	14.41%
2015	Söke	116.583	58.721	57.862	11.07%

2015	Kuşadası	103.849	52.178	51.671	9.86%
2015	Didim	73.827	37.740	36.087	7.01%
2015	Çine	50.241	24.987	25.254	4.77%
2015	İncirliova	47.475	23.724	23.751	4.51%
2015	Germencik	43.367	21.575	21.792	4.12%
2015	Bozdoğan	34.237	17.151	17.086	3.25%
2015	Kuyucak	27.182	13.401	13.781	2.58%
2015	Köşk	27.039	13.752	13.287	2.57%
2015	Koçarlı	23.422	11.620	11.802	2.22%
2015	Sultanhisar	20.983	10.158	10.825	1.99%
2015	Karacasu	19.162	9.435	9.727	1.82%
2015	Yenipazar	12.937	6.155	6.782	1.23%
2015	Buharkent	12.505	6.153	6.352	1.19%
2015	Karpuzlu	11.442	5.69	5.752	1.09%

Source: TURKSTAT (2015 population statistics)

Table 31. Distribution of Aydın Population by Age Groups

Year	Age Group	Popul	Population Percentage
2015	Age 0-4	67.143	6.37%
2015	Age 5-9	68.65	6.52%
2015	Age 10-14	67.63	6.42%
2015	Age 15-19	79.041	7.50%
2015	Age 20-24	75.088	7.13%
2015	Age 25-29	73.332	6.96%
2015	Age 30-34	77.43	7.35%
2015	Age 35-39	78.744	7.47%
2015	Age 40-44	74.103	7.03%
2015	Age 45-49	69.151	6.56%
2015	Age 50-54	72.395	6.87%
2015	Age 55-59	67.119	6.37%
2015	Age 60-64	57.413	5.45%
2015	Age 65-69	43.977	4.17%
2015	Age 70-74	30.911	2.93%
2015	Age 75-79	24.241	2.30%
2015	Age 80-84	17.004	1.61%
2015	Age 85-89	7.805	0.74%
2015	Age 90+	2.329	0.22%

Source: TURKSTAT (2015 population statistics)

Migration Movement:

Since the 1945s, Aydın has been one of the main migration centers of the Western Anatolia Region along with the İzmir and Manisa and has been subject to significant population flow. In the mid-1950s, the city entered into a significant immigration period. The migration of the province is generally long-distance, definite and family-scale migrations to large metropolises such as Istanbul, Ankara and Izmir. After 1960's,

Along with still-important short distance immigrations, definite family immigrations eliminated this negative impact and the share of 15- 64 age group again rose and increase of active population balanced with general population.

Aydın is the second most important province of the region, after İzmir, in terms of net migration rate. Aydın's tourism movement, which is particularly concentrated in Kuşadası and Didim, has a certain share in the migration. The economic characteristics of the population migrating to Aydın show that the movement is generally at a temporary level of migration that responds to the demand for seasonal labor. The agricultural sector has the highest share in the distribution of migrants by business lines. The fact that the services are in the second place indicates that the employment opportunities created by tourism encourage migration to Aydın.

The seasonal family migration from the neighboring provinces in Aydın has an important place in the migration rates. The presence of large-scale agricultural enterprises in the province and the increase in the construction sector as a result of tourism in particular on the coastal side intensify the use of wage labor. Agricultural sector has the highest share in the distribution of migrants by business lines and the fact that the services are in the second place indicates that the employment opportunities created by tourism encourage migration to Aydın. Although there are no collective residences for migrant families, some of the nomadic workers who come to work in the agricultural sector stay in the shelters that some landowners have built in their own land, and others reside in their own tents.

In the distribution of migrants according to their work places, wage earners have a certain share. The weight bearing of women and unpaid family workers in wage earners is the result of the traditional preference of women and children in collecting products such as cotton and olive. When the migrants are divided according to their main profession, with the scientific and technical staff outside the agriculture, self-employed and personal services employees have significant shares. Although these shares are in conformity with the Turkey-wide distribution, they carry the effect of tourism. The university has a large share in the population increase in recent years. This has also changed the quality of the migrant population.

Table 32. The Province of Aydın Migration Data

Year	Migration	Immigration	Difference
2014	45.842	32.396	13.446
2013	34.688	32.338	2.35
2012	32.412	29.623	2.789
2011	32.077	31.056	1.021
2010	29.971	29.923	48
2009	28.524	27.64	884
2008	34.375	25.577	8.798

Source: TURKSTAT (2013-2014 population statistics)

The migration status of Aydın province, based on the year 2014 by TURKSTAT. Migration to Aydın is 45,842 people, immigration from Aydın is 32,396 people and net immigration is 13,446 people. Our net immigration pace is 13 per thousand. The population growth rate is 2%, corresponding to 21,022 people.

Income (distribution of income in the region to the business lines, maximum, minimum and average income per capita by business lines),

The economic characteristics of the population migrating to Aydın show that the movement is generally at a temporary level of migration that responds to the demand for seasonal labor. The agricultural sector has the highest share in the distribution of migrants by business lines. The fact that the services are in the second place indicates that the employment opportunities created by tourism encourage migration to Aydın. In the distribution of migrants according to their work places, wage earners have a certain share. The weight bearing of women and unpaid family workers in wage earners is the result of the traditional preference of women and children in collecting products such as cotton and olive. Scientific and technical staff outside the agriculture, self-employed and personal services employees has significant shares. Although these shares are in conformity with the Turkey-wide distribution, they carry the effect of tourism.

Table 33. The Distribution of the Workers in the Province of Aydın by Sectors

SECTORS	MAN	WOMA	TOTAL
Information and communication	46	65	111
Other service activities	1.198	1.089	2.287
Education	62	150	212
Electricity, gas, steam and air conditioning production and distribution	32	4	36
Finance and insurance activities	36	16	52
Real estate activities	5	2	7
Activities of households as employers; unexamined goods and services production activities by households for their own use	1	1	2
Administrative and support service activities	909	441	1.35
Manufacturing	1.839	1.906	3.745
Human health and social service activities	259	474	733
Construction	707	113	820
Public administration and defense; compulsory social security	15	2	17
Accommodation and food service activities	2.486	1.338	3.824
Culture, art, entertainment, recreation and sports	43	24	67
Mining and quarrying	91	17	108
Professional, scientific and technical activities	971	255	1.226
Water supply; sewage, waste management and improvement activities	1.303	120	1.423
Agriculture, forestry and fishing	139	229	368
Wholesale and retail trade; repair of motor vehicles and motorcycles	510	874	1.384
Transportation and storage	267	348	615
TOTAL	10.919	7.468	18.387

Source: Aydın Provincial Directorate of Labor and Employment Agency (2015)

Unemployment (ratio of unemployed population in the region to active population)

The labor force participation rate is the ratio of the labor force to the active population in the working age. On the other hand labor force is calculated via; deducting discouraged workers, handicapped people, soldiers, housewives, students and prisoners from the

population at the working age and adding children and elders who are outside of the working age but have to work.

This ratio shows the relative weight of the labor force within the active population. According to the updated 2014 data of the TURKSTAT, the active population constituting the age group of 15-64 is 716.020 people, of whom 360,785 are men and 355.235 are women.

According to October 2015 data of TURKSTAT; the labor force participation rate in Turkey is 51.6%, the unemployment rate is 10.5% and the employment rate is 46.2%. According to 2014 data which comprises the province; the labor force participation rate in Turkey is 53.9%, the unemployment rate is 7.2% and the employment rate is 50%.

Table 34. Basic Indicators According to TURKSTAT Data

PROVI	LABOR FORCE	UNEMPLOYMENT	EMPLOYMENT
AYDIN	55.2	6.9	51.4

Source: TURKSTAT, Basic labor force indicators by province, 2013

Table 35. Unemployment by Age and Gender

Total			15-19 Age Group			20-24 Age Group			25-29 Age Group			30-34 Age Group			35-39 Age Group			40-44 Age Group			45-64 Age Group			65+ Age Group		
Woman	Man	Total	Woman	Man	Total	Woman	Man	Total	Woman	Man	Total	Woman	Man	Total	Woman	Man	Total	Woman	Man	Total	Woman	Man	Total	Woman	Man	Total
16.907	14.337	31.244	492	561	1.053	3.638	3.060	6.698	3.394	2.891	6.285	2.750	1.950	4.700	2.477	1.734	4.211	1.972	1.423	3.395	2.158	2.645	4.803	26	73	99

Source: Aydın Provincial Directorate of Labor and Employment Agency (2015 December)

The highest number of registered unemployed is in the 20-24 age group with 21.3% and 25-29 age group with 20.2% both in males. With respect to women, the highest number of registered unemployed is in the 20-24 age group with 21.5% and 25-29 age group with 20.1%.

In general, the highest number of registered unemployed is in the 20-24 age group with 21.3% and 25-29 age group with 20.25% and 30-34 age group follows these with 13.6%.

Social infrastructure services in the region (education, health, cultural services and utilization of these services),

Education

According to the latest data of Aydın Provincial Directorate of National Education, there are 374 kindergartens, 592 elementary schools, 62 general high schools and 49 vocational high schools in the province of Aydın.

Table 36. Statistical Data for 2014-2015 Academic Year in the Province of Aydın

SCHOOL	NUMBER OF	NUMBER OF	NUMBER OF
PRE-SCHOOL	374	680	13.977
PRIMARY+SECONDARY	592	5.653	111.151
HIGH SCHOOL	62	935	23.390
VOCATIONAL HIGH SCHOOL	49	888	24.097
TOTAL	1.077	8.156	172.615

Adnan Menderes University is the only university that offers undergraduate education in the province of Aydın. As of 2014-2015 academic year, there are 12 Faculties, 3 Institutes and 5 Schools. Besides;

The university has total 2.488 personnel of which 1,571 are academic staff, 917 are administrative staff, and 41.453 students.

Health

According to 2013 research of Turkish Statistical Institute, there are 22 public hospitals, 7 private hospitals and 1 university hospital in Aydın. The total number of beds in these hospitals is 2,728. According to TURKSTAT 2015 data, there are 977 specialist physicians, 635 general practitioners, 229 resident doctors, 295 dentists, 465 pharmacists, 1,882 health officers, 1,871 nurses and 974 midwives.

Culture and Tourism

Beyond its historical, cultural and natural values, Aydın province is located in the middle of western Anatolia where tourism activities are most intense. Moreover, having the most important sea border gate in terms of tourism, has made the province of Aydın one of the most developed provinces of the sector. As the western part of Aydın is opened to the Aegean Sea, Kuşadası and Yenihisar districts are more suitable for all areas of tourism and other districts are more suitable for daily visits in terms of folkloric and archaeological values. For this reason, the investments and prospective demands are concentrated in these two coastal districts.

Another importance of Aydın province is that it is very close to the metropolitan area of İzmir and directly within its sphere of influence. The city center of Aydın, which is 100 km away with a motorway connection to İzmir, is 930 km away to Istanbul and 530 km away to Ankara. The port of Kuşadası is used for sea route and the port of İzmir is used for larger port usage. With regards to railways, along with the Aydın-İzmir line, Turkey's first railway line of Söke extension also passes through the province. Menderes Airport is on the Aydın-İzmir highway and thus, serves to both the provinces of İzmir and Aydın and therefore, Kuşadası and Didim.

The suitability of the climate and the fact that the climatic conditions allow for a long tourism season is one of the most important encouraging factors in Aydın. In the province of Aydın, which is dominated by the Mediterranean climate, hot months dominates. At the same time, the temperature of the sea water in between May-October, half of the year, enables performance of water sports and swimming. In addition, people coming from the settlements within the province and those coming from the neighboring provinces benefit from the public

beaches. This kind of use is quite common due to transportation comfort and climate characteristics. This demand is mainly from Söke, Nazilli and Aydın cities. There is a great difference between the west and east of Aydın in terms of the tourism sector. The west of the province has brought its sources, which serve in compliance with the domestic and foreign tourism, into service and necessary initiatives have been carried out in order the potential ones to be brought into the service. The east side of the province mostly serves to the domestic tourism.

However, the ruins and the diversity that will be created may cause the concentration of foreign tourism in this area. Due to tour routes comprising Aphrodisias and Pamukkale, the eastern part of the province may be used by foreign tourism. Health tourism (thermal), cultural tourism such as historical and architectural artifacts, historical sites, museums, traditional handicrafts, regional festivals, camel wrestling and sports tourism such as nature walks - trekking, equestrian nature trips, golf, diving, sea and land hunting, swimming, sailing, water sports are the activities that can be developed in the province.

Tourism is the second important source of income after agriculture. In Aydın, there are 8 museums and 21 important ruins, including Aydın Museum and related Yörük Ali Efe Ethnography Museum, Afrodisias Museum and related Karacasu Ethnography Museum, Milet Museum, Çine Kuva-i Milliye Museum, Çine Beekeeping Museum and Nazilli Ethnography Museum (*Governorship of Aydın-03.2016*).

II.3.3. Urban and rural land uses (distribution of settlements, existing and planned use areas, industrial zones, residences, tourism areas etc.); Social infrastructure services in the region (education, health, cultural services and utilization of these services),

The province of Aydın is one of richest archaeological regions of Turkey. About at the end of 4000 BC to the present; the province hosted Hittite, Lydia, Ionian, Roman, Byzantine, Seljuk, Aydınoğulları, Ottomans and Turkish civilizations and thus, has a great potential with regards to domestic and foreign tourism with its ruins and museums.

Tourism

The province of Aydın is very rich in terms of touristic natural resources. These can be examined under two main groups as hot spring type geothermal healing water resources and cultural tourism attractions.

a) Hot Spring Type Geothermal Healing Water Resources:

- Sultanhisar - Salavatlı
- Germencik - Ömerbeyli
- Aydın - Ilıcabaşı
- İmamköy
- Germencik Mud Baths
- Germencik Bozköy
- Germencik – Ortaklar Silver Baths
- Söke – Sazlıköy
- Söke Atburgazı

b) Cultural Tourism:

- Alabanda
- Afrodiasias
- Apollon Temple
- Magnesia
- Alinda
- Gerga
- Harpasa
- Mastaura
- Nysa
- Miletos
- Ahi Bayram Tomb
- Tralleis

Since these tourism activities are not located in the project area and its immediate vicinity, tourism activities will not be affected negatively.

Industrial Zones

There are 7 Organized Industrial Zones in the province of Aydın. Aydın (Umurlu) and ASTİM (Aydın Industry and Trade Business Centers) Organized Industrial Zones are active. Nazilli, Söke, Ortaklar, Çine, Buharkent Organized Industrial Zones and Köşk-Ege Sera Specialized Organized Industrial Zone is still being constructed. Most of the manufacturing industry establishments operating throughout the province of Aydın are directed to the food and weaving sector whose raw materials depend on agricultural production. As of 2008, the number of factories in Aydın and Astim Organized Industrial Zones has increased to 142 while the number of employed persons is estimated to be 5500.

Organized Industrial Zones

- Aydın Organized Industrial Zone
- Aydın ASTİM
- Aydın Ortaklar
- Söke Organized Industrial Zone
- Aydın – Nazilli
- Buharkent
- Çine Organized Industrial Zone

II.3.4. Other issues,

There are no other issues to be specified in this section.

SECTION III. ENVIRONMENTAL EFFECTS OF THE PROJECT DURING THE CONSTRUCTION AND OPERATION PHASE AND MEASURES TO BE TAKEN (**)

(In this section; legal, administrative and technical measures to be taken to prevent, minimize and improve the impact of the project on the physical and biological environment are described separately and in detail for the headings III.1 and III.2.)

III.1. Effects of the Project on Physical and Biological Environment During Land Preparation and Construction Phases and Measures to be Taken,

III.1.1. In the scope of the works to be done for the preparation of the land, where and in what area the excavation and vegetative soil will be formed, the amount of excavation and vegetative soil, the materials to be used, the explosive substances, if any, the information about the blasting, its effects and the measures to be taken, where the excavation residual soil, stone, sand etc. and vegetative soil will be transported and stored, the volume of the area, and the purposes for which it will be used, the arrangement and restoration plan of the excavation material, the opinions to be taken and the characteristics of the temporary storage area,

In project scope; for the installation of the plant units, 0.3 m vegetable soil will be scraped and approximately 1.5 m will be excavated in the area of 10.000 m². Land preparation and excavation operations shall continue about 6 months. The density of the soil and excavation soil to be formed is taken approximately as 1.6 tons/m³. Accordingly, the total amount of vegetative soil to be formed during the construction phase of the project will be 4,800 tons. The total amount of excavation soil to be formed during the construction phase of the project will be 24,000 tons.

The total amount of vegetative soil to be formed during the construction phase of the project;

$$10,000 \text{ m}^2 \times 0.3 \text{ m} = 3,000 \text{ m}^3 = 3,000 \text{ m}^3 \times 1.6 \text{ ton} / \text{m}^3 = 4,800 \text{ ton. The total}$$

amount of excavation soil to be formed during the construction phase of the project;

$$10,000 \text{ m}^2 \times 1.5 \text{ m} = 15,000 \text{ m}^3 = 15,000 \text{ m}^3 \times 1.6 \text{ ton} / \text{m}^3 = 24,000 \text{ ton.}$$

Vegetable soil to be formed within the scope of the project will be collected in a designated area within the area and used in landscaping arrangements.

Some part of the excavation soil will be used for project area filling operations and the portion that is not used for filling shall be sent to Aydın Metropolitan Municipality Excavation Waste Storage Facility.

Table 37. Amount of Excavation and Vegetable Soil that will Form During the Preparation Phase of the Project

Time Periods	Amount of Excavation (m ³)	Amounts of Excavation (ton)
6 Months	18.000	28.800
Monthly	3.000	4.800
Daily	120	192
Hourly	15	24

Within the scope of the project, blasting will not be carried out for foundation excavation operations.

1/5,000 scale topographic map showing the vegetative soil storage area is given in Annex-3C. The coordinate list of herbal soil area is given in the following table.

Table 38. List of Coordinates of the Vegetative Soil Storage Area

COORDINATES OF THE VEGETATIVE SOL STORAGE AREA				
Datum	ED50		Datum	WGS84
Type	UTM		Type	Geographical
Element Order	Easting value, northing value		Element Order	Latitude,
Scale Factor	6 Degrees		Scale Factor	****
Dom	27		Dom	****
Zone	35		Zone	****
Point No.	Y	X	Latitud	Longitude
BT1	555574.760	4193227.302	37.883182	27.631509
BT2	555609.835	4193227.335	37.883181	27.631908
BT3	555604.379	4193210.693	37.883030	27.631845
BT4	555579.085	4193204.059	37.882972	27.631557
AREA	600 m ²			

In all phases of the project; provisions of regulation on excavation, construction, ruin waste control shall be followed.

III.1.2. Transportation, storage and use of flammable, explosive, hazardous, toxin and chemical substances to be used during preparation of land and construction of units, tools and machinery to be used for these works; types and properties of fuels to be used in these tools and machines, emissions and measures to be taken,

No flammable, explosive or hazardous materials shall be used during the excavation work to be carried out during the project land preparation and construction phase.

Within the scope of the project, it is planned to use 1 loader, 1 excavator, 2 trucks, 1 street sprinkler and 1 mobile crane. The features of these machines are given in the table below.

Table 39. Machinery to be Used and Properties

Machine Type	Quantity	Power
Loader	1	110 HP
Excavator	1	150 HP
Truck	2	110 HP
Street sprinkler	1	100 HP
Mobile Crane	1	110 HP

Diesel oil shall be used for these machines. Fuel shall be needed for the machines which are to be used in site and diesel oil shall not be consumed for heating purposes. The following table shows the characteristics of the diesel oil to be used.

Table 40. Properties of Diesel

PROPERTIES	DIESEL
CONSISTENCY	VERY FLUID
TYPE	DISTILLED
COLOR	AMBER
DENSITY (15oC-gr/cm3)	0.8654
VISCOSITY (38oC)	2.68
POUR POINT (0oC)	-18
HEAT OF ATOMIZATION (0oC)	ATMOSPHERIC
PUMPING TEMPERATURE (0oC)	ATMOSPHERIC
CARBON DEPOSITS (%)	TRACE
SULFUR (%)	0.4-0.7
OXYGEN-NITROGEN (%)	0.2
HYDROGEN (%)	12.7
CARBON (%)	86.4
WATER AND DEPOSIT (%)	TRACE
ASH (%)	TRACE
HEATING VALUE (Kcal /lt)	9.387

Source: Air Pollution Control and Inspection, Chamber of Chemical Engineers, May, 1991

Within the scope of the planned project, the average amount of fuel to be used in the activities to be carried out in the field during the construction period will be 50 lt. The unit values of the contamination generated by the vehicles are given below.

Table 41. Diffusion Factors of Contamination Emitted by Diesel Vehicles

CONTAMINANTS	DIESEL (gr/lt)
Carbon monoxide	9.7
Hydrocarbons	29.0
Nitrogen Oxides	36.0
Sulfur Oxides	6.5
Dust	18.0

Source: Principles of Air Pollution and Its Control, 1991

Table 42. Values of Contaminants Arising From the Construction Machines to be Used

Carbon monoxide	9.70 gr/lt * 50 lt/h / 1000 gr/kg = 0,42 kg/h
Hydrocarbons	29.0 gr/lt * 50 lt/h / 1000 gr/kg = 1,25 kg/h
Nitrogen Oxides	36.0 gr/lt * 50 lt/h / 1000 gr/kg = 1,56 kg/h
Sulfur Oxides	6.50 gr/lt * 50 lt/h / 1000 gr/kg = 0,28 kg/h
Dust	6.50 gr/lt * 50 lt/h / 1000 gr/kg = 0,78 kg/h

During the construction phase of the project; in order to minimize vehicle emissions, in accordance with the article 7 of "Regulation on Exhaust Gas Emission Control and Gasoline and Diesel Quality" which entered into force after being published in Official Gazette no.28837 dated 30.11.2013; routine inspections of the tools and equipment will be made, vehicle requiring maintenance shall be maintained and different vehicles shall be used until maintenances are completed. In addition, they will be warned to work in accordance with the Traffic Law and especially to load the vehicles in accordance with the loading standards.

III.1.3. Transportation infrastructure plan within the scope of the project, distance of the project area to highways, access roads, measures to prevent damage to existing roads to be used for transportation and measures to be taken in terms of traffic safety (opinions and permits to be taken in this context),

The traffic volume maps of the D550 and E87 highways in the project area are given in the following figures. According to the measurements of 2014 and values measured at the Incirliova location of the E87 motorway, 11183 light vehicles, 4453 heavy vehicles and a total of 15636 vehicles were counted. According to the traffic volume measurements at D550 State road Germencik Location, 10483 cars, 781 medium commercial vehicles, 48 buses, 970 trucks, 353 Trucks + Trailers, Towing + Side Trailer and thus, total of 12635 vehicles were counted. D550 Highway shall be used within the scope of the project.

The vehicle load due to the vehicles to be used during the construction phase of the project is given in the table below.

Table 43. The Vehicle Load due to The Vehicles to be Used During the Project

Vehicle Type	The Value Taken as Base in the Traffic Volume	Number of Vehicles to be Used for the Operation	% increase of Vehicle Load
Car	10483	-	-
Medium Commercial Vehicle	781	-	-
Bus	48	-	-
Truck	970	2	0.2%
Trucks + Trailers, Towing + Side Trailer	353	-	-
TOTAL	12635	2	-



Figure 51. Highways 2nd Zone 2014 Highways Traffic Volume Map

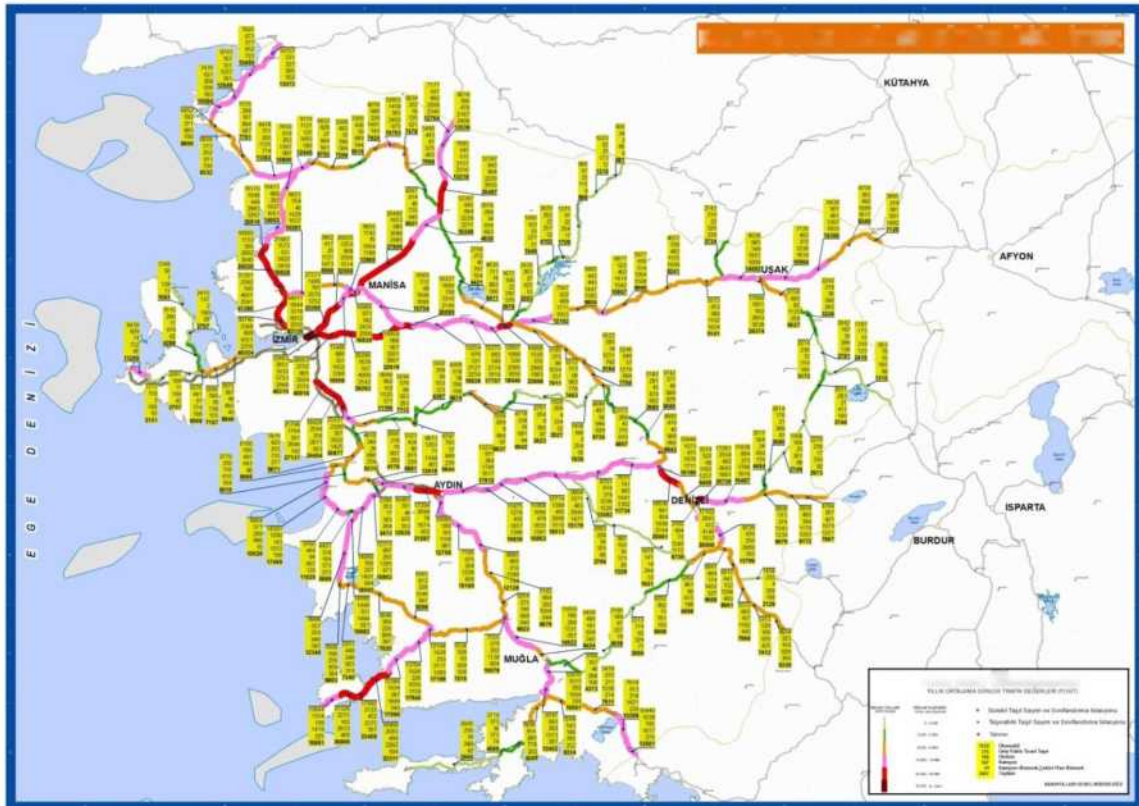


Figure 52. Highways 2nd Zone 2014 State Roads Volume Map

No hazardous goods shall be transported within the scope of the project. If hazardous substance has to be transported, provisions of "Regulation on Highway Transportation of Hazardous Substances" which entered into force after being published in Official Gazette no.28801 dated 24.10.2013.

The map showing the access to the project area is given in the figure in Section II. The project area is accessed by the road connecting the İzmir-Aydın (D550) road. Existing roads will be used for access to the project area. No new access roads will be constructed within the scope of the project. During the construction and operation phases, the ingress and egress will be provided by the existing intersections.

Stabilized and soil roads in the project area will be watered by street sprinkler to prevent dust formation.

In case of damage to the facility area access roads as a result of the transportation of materials to the facility area during the construction and operation phase of the project, all damage will be covered by the Contractor within the framework of the protocol to be made with the 2nd Regional Directorate of Highways.

To prevent damage to the highway; blow-out preventive technical measures will be taken on the new well which are to be opened and in order to prevent any possible ground subsidence in the long term, extreme extraction shall not be made and operating rate shall be followed during operation.

In case the pipeline to be used for the transportation of geothermal fluid crosses the highway or if there are longitudinal transitions parallel to the highway, the techniques and methods to be applied within the framework of the protocol to be made with the 2nd Regional Directorate of the Highway will be determined and followed.

During the construction and operation phases of the project, all laws and regulations with regards to the Highway Traffic Law no.2918 and all laws related to the Highways shall be followed.

In the letter no.86141515-755.01/E.162733 dated 01.07.2016 of 2nd Regional Directorate of Highways, which is related to the project, it is specified that "EIA report submitted by the *Gürmat Elektrik Üretim A.Ş.* with regards to "Efe 6 Geothermal Power Plant" which is planned to be constructed on Alangüllü and Ömerbeyli Neighborhood, Germencik District, Aydın is reviewed. EIA report regarding the "Efe 6 Geothermal Power Plant" which is planned to be constructed on Alangüllü and Ömerbeyli Neighborhood, Germencik District, Aydın is reviewed and this operation does not prevent the investments of our institution in any way."

There shall be no damage to the roads and related facilities during the transportation of the materials during the construction and operation phase and otherwise, all damage will be covered within the framework of the protocol to be made with the 2nd Regional Directorate of Highways.

III.1.4. Possible effects on physical environment as a result of the drilling of geothermal resource, the number of wells to be opened and how many of them will be used for reinjection, installment of the drilling equipment, access road to the wells and the necessary infrastructure in the vicinity of the well, and the effects of the operations which are to be carried out during installment of necessary infrastructure around the well on surface morphology and measures to be taken,

A total of 10 wells will be used for production and reinjection within the scope of the project. Nine of them are existing wells. Only piping works will be done on the existing wells and only one well will be opened.

The drilling rig related to the drilling operations of the new well shall be on approximately 1,500 m² area and this area shall be covered with concrete. During the drilling, formation chips and drilling mud from the well will be collected in the mud pool with dimensions of 30 m length, 4 m width and 4 m depth. Drilling mud and formation chips shall be solidified after drilling process and shall be removed from the drilling site. The depth of the wells shall be between 1500-2500 m. During the drilling of the wells, only a few excavation waste will arise. Generated excavation shall be accumulated at a point of drilling area. After the drilling process is completed, part of the excavation will be used for filling the mud pool. If any, excavation wastes that cannot be used shall be transported to the Soil Recycling Sites which are developed in accordance with the article 26 of Germencik Municipality or Aydın Metropolitan Municipality Excavation Regulation and shall be disposed there. Wellheads shall be accessed over the existing roads.

A stabilized filling infrastructure shall be made around the concrete area around the well. Before installment of such infrastructure, vegetative soil shall be taken out in about 15 cm depth and instead, mechanical material shall be laid. After the process is completed, this mechanical material shall be removed and vegetative soil shall be spread back to the same area. Thus, surface morphology shall be prevented.

Information about the wells to be included in the project is given in the table below.

Table 44. Information about the wells to be included in the project is given in the table below.

No	Name of	Intended Use	Status
1	OB 71	RE-INJECTION	EXISTING WELL
2	OB 71A	RE-INJECTION	EXISTING WELL
3	OB 71B	RE-INJECTION	EXISTING WELL
4	OB 71C	RE-INJECTION	EXISTING WELL
5	OB103A	PRODUCTION	EXISTING WELL
6	OB103B	PRODUCTION	EXISTING WELL
7	OB 86	PRODUCTION	EXISTING WELL
8	OB 86A	PRODUCTION	EXISTING WELL
9	OB 96	PRODUCTION	EXISTING WELL
10	OB 96A	PRODUCTION	HAS NOT DRILLED YET. SHALL BE IN THE SAME PARCEL WITH OB 86

Table 45. List of Coordinates of the Wells of the Project

No	Name of the Well	Y	X
1	OB 71	553280	4193248
2	OB 71A	553289	4193248
3	OB 71B	553297	4193248
4	OB 71C	553305	4193248
5	OB103A	554497	4192490
6	OB103B	554497	4192482
7	OB 86	556643	4192554
8	OB 86A	556650	4192547
9	OB 96	556727	4192215
10	OB 96A	Shall be Opened	Shall be Opened

Within the scope of the project, a total of 6 production and 4 reinjection wells are planned to be used. Among the wells specified in the table above, the OB 96A has not been opened yet. Only piping operation shall be made for the other wells.

The depth of the production and re-injection wells shall be between 1500-2500 m. Production flow rates of production wells shall be 250-250 tons/hour and wellhead production temperatures shall be between 190-210 °C. The depth of the re-injection wells shall also be between 1500-2500 m. Reinjection flows shall be between 150-600 tons/hour. Reinjection temperature is planned to be 95 °C.

The distance between the production and reinjection wells to the roads in vicinity are given in the table below.

Table 46. The distance of Project Area and Wells to D550 Highway and E87 Motorway

	E-87 Distance (m)	D-550 Distance (m)
Project Area	1130	1320
OB 71	620	1230
OB 71A	620	1230
OB 71B	620	1230
OB 71C	620	1230
OB 103A	210	580
OB 103B	210	580
OB 86	750	870
OB 86A	750	870
OB 96	430	540

All areas where the wells are located are registered to Gürmat Elektrik Üretim A.Ş. The title deeds of the areas where the wells are located are provided in Annex 15B.

III.1.5. Potential impacts to groundwater during opening of geothermal wells and construction of other units, measures to be taken to prevent mixing of underground waters and drilling liquids while passing through the aquifers,

During drilling and the construction of all units, mixing of the groundwater with the drilling fluid is not possible if suitable productions are made. In addition, during drilling, the drilling fluid will form an impermeable layer of cake by plastering the wall of the hole. Thus, generation of a status which will cause collapse in the hole shall be prevented. During drilling operations, the casing pipes inserted into the well will be cemented to the top of the reservoir and thus, the drilling liquid or geothermal fluid is unlikely to mix with the groundwater.

Necessary measures shall be taken in order not to damage the cold underground water aquifers during the drilling of wells and construction of all units.

III.1.6. The amount of mud to be formed during drilling, how it is to be disposed after use, the cleaning of this mud and the process of separation from the liquid,

There will be no use of bentonite in the project. In order to collect the waste mud and geothermal fluids that may be generated during drilling operations, the mud pool which are made impermeable on the ground shall be generated at the edge of the well locations.

After the drilling operations are completed in the well, short term (2-3 days) test studies are carried out in production/reinjection wells to determine the physical/chemical properties and reservoir parameters of the geothermal fluid that is planned to be produced from the well are performed between "November 1st-March 31st".

During these short term tests, the wells will be put into production in total for approximately 24 hours. The geothermal fluid produced from the wells during the 24-hour production test will be passed through the "silencer-sluiice" system, which is included in the test system, and will be taken to the mud pools called "Mud Pit". Mud pits to be used during drilling operations will be at an adequate size to store the geothermal fluid that will accumulate during the test.

The geothermal fluid accumulated in the mud pits will be re-injected, if appropriate, to the fluid deposition pools opened for existing geothermal plants. Otherwise, the geothermal fluid accumulated in the mud pits shall be analyzed in accordance with the WPCR Table 9.5, and the analyzes shall be discharged to the appropriate place in accordance with the conditions determined by the relevant institution.

Drilling mud accumulated in the mud pit shall be disposed in accordance with the "Regulation on Regular Storage of the Wastes" after determining the waste type through carrying out the necessary analysis in line with the provisions of Circular on the disposal of wastes resulting from physical processing of drilling mud and chrome mine no.2012/15 (which take part in the writing of Ministry of Environment and Urbanization no.8865 dated 04.07.2012) and "Regulation on Regular Storage of the Wastes" which entered into force after being published in Official Gazette no.27533 dated 26.03.2010.

III.1.7. Operations related to the installment of the pipeline to be used in the transportation of geothermal fluid and its effects to the surface, measures to be taken,

The pipelines shall be placed onto the ground one in each 10 m. in a way not to affect irrigation channels and shall be mounted on minimum 90 cm diameter stands. Since these lines will run along the boundaries of the cadastral roads and parcels, and will use only a maximum of 0.75 m² space at one each 10 m, their impact on land use will be minimal. The necessary special passages will be made to prevent these lines from obstructing the passages of both pedestrians and animals.

III.1.8. Where and how the transactions related to the flood survey, flood prevention and drainage of the Project area will be carried out; actions to be taken to ensure ground safety (earthquake, landslide, avalanche, flood, rock fall in the form of uniqueness of the plant's carrying power, measures to be taken, safety stress, seating accounts)

There is no stream drainage in and around the project area. Apart from the risk of earthquake, there are no risks such as landslide, avalanche, flood and rock fall in the region. Surface and underground waters in the region are brought under control by drainage and irrigation canals and they are poured into the Büyük Menderes River, which passes about 8.5 km to the south.

In order to prevent project area to be affected during extreme rainfall, surface water drainage measures shall be taken in project area and its vicinity, waste materials shall not be thrown away to the stream beds and no intervention shall be made. In order to ensure that the foundations of the building are not affected by surface water, excavations will be carried out in dry season where the ground is not saturated with water and the superstructure foundation elevations and drainage systems shall be completed before the start of rainy seasons.

Geothermal resources in the region are the sources which generated as a result of tectonics. Geothermal sites are generally under the risk of earthquake. The facilities shall be constructed according to these risks and they shall be earthquake resistant structures.

The project area is in the first-degree seismic zone according to the "Seismic Zones Map of Turkey" prepared by abolished Ministry of Public Works and Settlement. All construction works within the scope of the project shall be carried out in accordance with the provisions of "Regulations for the Structures to be Built in Disaster Areas" which entered into force after being published in Official Gazette no.26582 dated 14.07.2007 of abolished Ministry of Public Works and Settlement.

Besides, the Geological-Geotechnical Survey Report of the project is given in Annex 19.

III.1.9. Dust spreading processes such as crushing, grinding, washing-screening, transportation and storage during construction, cumulative values, measures to be taken,**Dust Emission**

In project scope; for the installation of the plant units, 0.3 m vegetable soil will be

scraped and approximately 1.5 m will be excavated in the area of 10.000 m². Land preparation and excavation operations shall continue about 6 months. The density of the soil and excavation soil to be formed is taken approximately as 1.6 tons/m³. Accordingly, the total amount of vegetative soil to be formed during the construction phase of the project will be 4,800 tons. The total amount of excavation soil to be formed during the construction phase of the project will be 24,000 tons.

Following are the operations that shall cause dust emissions during the construction phase of the project;

- Foundation excavation,
- Loading removed materials onto the trucks,
- Material transportation by trucks,
- Transportation of excavation material,
- Unloading of vegetative soil.

No dust formation is expected during the drilling works to be carried out on the new well.

The activities to be carried out during the construction phase will last approximately 3 months and will be carried out by working 8 hours a day, 26 days a month.

Dust emission factors to be used in the calculation of dust emissions are given in the table below. (Emission factors SKHKKY Annex-12 were taken.)

Table 47. Dust Emission Factors Used in Dust Calculations

Sources	Emission Factors kg/ton	
	Uncontrolled	Controlled
Blasting	0.080	-
Removal	0.025	0.0125
Loading	0.010	0.005
Transportation (round trip total distance)	0.7	0.35
Unloading	0.010	0.005
Storage	5.8	2.9
Primary Breaker	0.243	0.0243
Secondary Breaker	0.585	0.0585
Tertiary Breaker	0.585	0.0585

The Dust Amount Which may Occur During Excavation:

Uncontrolled $\Rightarrow 24 \text{ ton/hour} * 0,025 \text{ kg/ton} = 0,60 \text{ kg/hour}$ dust shall occur.

Controlled $\Rightarrow 24 \text{ ton/hour} * 0,0125 \text{ kg/ton} = 30 \text{ kg/hour}$ dust shall occur.

The Dust Amount Which may Occur During Loading of Excavation Soil:

Uncontrolled $\Rightarrow 24 \text{ ton/hour} * 0,010 \text{ kg/ton} = 0,24 \text{ kg/hour}$ dust shall occur. Controlled

$\Rightarrow 24 \text{ ton/hour} * 0,005 \text{ kg/ton} = 0,12 \text{ kg/hour}$ dust shall occur.

The Dust Amount Which may Occur During Transportation of Excavation Soil: The

Dust Amount Which may Occur During Transportation of Excavation Soil:

The majority of the excavated soil as a result of the foundation excavation will be used in the field surveying of the project area. Unused portion will be sent to the Aydın Metropolitan Municipality Excavation Waste Storage Facility. Two trucks (20 ton capacity) shall be used during transportation of the excavation that occur within this scope.

In this context, it is assumed that the total excavation soil will be transported within the area of approximately 80 meters (estimated distance to be covered in the field).

The trucks are planned to transport the possible 192 ton of daily excavated soil with a total of 2 voyages per hour. The amount of dust generated during transportation: Uncontrolled $\Rightarrow 0,7 \text{ kg/km-vehicle} * 0,08 \text{ km (round trip)} * 2 \text{ voyage-vehicle/hour} = 0,11 \text{ kg/hour}$ Controlled $\Rightarrow 0,35 \text{ kg/km-vehicle} * 0,08 \text{ km (round trip)} * 2 \text{ voyage-vehicle/hour} = 0,06 \text{ kg/hour}$

The Dust Amount Which may Occur During Unloading of Vegetative Soil onto the Project Area: Uncontrolled $\Rightarrow 4 \text{ ton/hour} * 0,010 \text{ kg/ton} = 0,040 \text{ kg/hour}$ dust shall occur. Controlled $\Rightarrow 4 \text{ ton/hour} * 0,005 \text{ kg/ton} = 0,020 \text{ kg/hour}$ dust shall occur.

Calculations regarding the dust emission to occur during the preparation and construction phase of the project are provided above in a way to be both controlled and uncontrolled and total values are given in the table below separately for controlled and uncontrolled.

Table 48. Total Dust Emission During Construction Operations

OPERATION	Dust Emission Amount (kg/hour)	
	Uncontrolled	Controlled
Material Removal	0.60	0.30
Loading Materials onto the Trucks	0.24	0.12
Material Transportation	0.11	0.06
Material Unloading	0.04	0.02
TOTAL	0.99	0.50

Total dust flow during operation is calculated as 0.99 kg/hour using uncontrolled emission factors; 0.50 kg/hour using controlled emission factors. Since hourly mass flow rate (kg/h) calculated for uncontrolled and controlled situations are not over the mass flow (kg/h) rates (1 kg/h) which is given for Normal Operating conditions and operating hours on weekly working days in Annex-2 Table 2.1 of "Control of Industrial Air Pollution Regulation" published in Official Gazette No.27277 dated 03.07.2009 (amendment no. 29211 dated 20.12.2014), no modeling is carried out.

During the operation phase of the project no dust emitting process will be carried out but if any dusting occurs in the area during the operation phase, it will be minimized by watering (street sprinkler, fountain, pulverize etc.) according to the activity that will form the dust. In this context, the provisions of the Regulation on the Control of Industrial Air Pollution will be followed.

III.1.10. During the preparation and construction phase of the land, to obtain the necessary land, the size of agricultural land which shall be disposed of, usage capabilities and types of agricultural products, evaluation of agricultural land within the scope of information regarding use of these for non-agricultural purposes, distance to agricultural areas if all or part of the project area is outside the agricultural areas, evaluation of the effects, measures to be taken,

The parcel no.603 which shall be used for the power plant and all of its units is registered under the name of Gürmat Elektrik Üretim A.Ş., owner. Parcel no.883 again is registered under the name of Miraj Turizm ve Ticaret A.Ş., one of the company owned by owner. Additionally, areas where production and reinjection wells are located are also registered under the name of the owner. Samples of the title deeds are given in Annex 15 and the deed of consent is given in Annex 22.

In order to establish the facility, a portion of 17.098 m² in parcel no.883 and a portion of 20.461 m² in parcel no.603 shall be used. Necessary permissions regarding these areas shall be obtained from Governor of Aydın Provincial Directorate of Food, Agriculture and Livestock.

For all operations to be carried out in site during each phase of the project, principles of Pasture Law no.4342 and "Soil Conservation and Land Use Law" no.5403 shall be followed. Before commencement of the construction, all kinds of permits shall be obtained within the scope of laws no.5403 and no.3573.

III.1.11. In the preparation and construction phase of the land, whether to cut any trees in order to obtain the necessary land, if yes, the types and numbers of trees to be cut, the type of stands, its soil coverage level, the effects on the forest ecosystem in the region; the distance of the project area to the forest areas in case the whole or part of the project area is outside the forest area, assessment of impacts, measures to be taken,

The parcel no.603 which shall be used for the power plant and all of its units is registered under the name of Gürmat Elektrik Üretim A.Ş., owner. Parcel no.883 again is registered under the name of Miraj Turizm ve Ticaret A.Ş., one of the company owned by owner. Samples of the title deeds are given in Annex 15 and the deed of consent is given in Annex 22. The project area is located on an agricultural land and no cutting down is planned.

The closest forest area to the project is shown in the figure below. The nearest forest area is the forest located at 600 m north and which is classified as degraded forest lands. The nearest scrub area is located 3 km to the south, and there is a forest area which is classified as a bosket, 6.5 km to the north.

Within the scope of the project, no negative impacts are expected on forests.

III.1.12. Water supply plan, where the water shall be supplied; types and amounts of waste waters, disposal methods, environments to which they shall be discharged,

Water is only needed for workers - drinking and domestic water - who shall be employed for construction and operation phases of Efe 6 Geothermal Energy Power Plant and periodic watering of the roads on which the vehicles pass.

Wastewater shall be generated by the personnel who shall be employed in the construction period of the project and who shall work in the operation period of the power plant.

In the planned project, 50 personnel is planned to be employed during the construction phase. Average daily water consumption per capita is taken as 203 liters (Daily Water Consumption Per Capita TURKSTAT, 2014) necessary amount of drinking and domestic water is calculated below.

Amount of water consumption by personnel = Water consumption per capita x number of personnel

$$= 203 \text{ liters/day} * 50 \text{ persons} = 10.150 \text{ liters/day.}$$

Considering 100% of the water used shall become waste water, the amount of domestic waste water shall be 10,15 m³/day.

Table 49. Daily Water Need During Construction Phase

INTENDED USE	AMOUNT (m ³ /day)
Drinking and Domestic Water (for 50 personnel)	10.15
Water to be Used to Prevent Dust Generation	5.00
TOTAL	15.15

Drinking water of the personnel planned to be employed during construction and operation phases shall be procured through purchasing carboys which are produced in accordance with "Regulation related to Making Amendments on Regulation Concerning Water Intended For Human Consumption" which entered into force through being published in Official Gazette no.29272 dated 19.02.2015.

Domestic wastewater, which shall arise during the land preparation, construction and operation phases, will be disposed here by connecting to the treatment facility in the other facility which is adjacent to the planned plant area and belonging to the owner. In case the capacity of the existing treatment plant is not sufficient, an additional treatment plant with a capacity of 10 m³/day shall be constructed and project approval file shall be prepared for this facility and submitted to Provincial Directorate of Environment and Urbanization. Water produced as a result of treatment will be used for garden irrigation. The project approval letter of the mentioned treatment plant is given in Annex 23.

III.1.13. Types and quantities of solid wastes to be generated, where these wastes are to be transported or for which purposes they will be used, methods of disposal,

Domestic Solid Wastes and Packaging Wastes

There shall be domestic solid wastes and construction wastes from personnel who will work during the construction of the project.

50 people shall be employed during the construction phase of the facility within the scope of the project. Domestic solid wastes of these personnel shall be taken as 1.08 kg/day (daily average amount of municipal solid waste per person, TURKSTAT, 2014)

and total amount of solid wastes are calculated as follows.

$$50 \text{ persons} \times 1,08 \text{ kg/day-person} = 54 \text{ kg/day}$$

These solid wastes shall be collected in the closed garbage bins in the areas to be used as construction sites. Solid wastes to be collected in the containers shall be transported and disposed to the 2nd Class Solid Waste Landfill Site of the Aydın Metropolitan Municipality through solid waste collection system of the Municipality of Germencik.

It is estimated that 12% of domestic solid wastes during the construction phase of the project will be packaging waste. So, the amount of packaging waste expected to occur is;

$$54 \text{ kg/day} \times 12\% = 6.48 \text{ kg/day.}$$

Domestic solid waste generated by personnel during the construction phase of the activity; shall be collected separately in accordance to their nature (organic, glass, plastic, paper, metal etc.) in the closed containers to be placed at various points within the site to be used as construction site and collected in such a way that they will not pollute the environment in terms of appearance, dust, odor and similar factors. Solid wastes to be collected in the containers shall be transported and disposed to the 2nd Class Solid Waste Landfill Site of the Aydın Metropolitan Municipality through solid waste collection system of the Municipality of Germencik.

Recyclable wastes which occur in the project area shall be collected separately from the other solid wastes and within the scope of "regulation on packaging waste control" which entered into force through published in Official Gazette no.28035 dated 24.08.2011; shall be delivered to a company with packaging waste collection license periodically in line with a contract to be signed with that company.

All solid wastes that shall arise during the construction phase shall be disposed of in accordance with the "Waste Management Regulation" which entered into force after being published in Official Gazette no.29314 dated 02.04.2015.

Excavation Wastes

In project scope; for the installation of the plant units, 0.3 m vegetable soil will be scraped and approximately 1.5 m will be excavated in the area of 10.000 m². Land preparation and excavation operations shall continue about 6 months. The density of the soil and excavation soil to be formed is taken approximately as 1.6 tons/m³. Accordingly, the total amount of vegetative soil to be formed during the construction phase of the project will be 4,800 tons. The total amount of excavation soil to be formed during the construction phase of the project will be 24,000 tons. Vegetable soil to be formed within the scope of the project will be collected in a designated area within the area and used in landscaping arrangements. Some part of the excavation soil will be used for project area filling operations and the portion that is not used for filling shall be sent to Germencik Municipality's or Aydın Metropolitan Municipality's Soil Recovery Sites which is prepared in accordance with article 26 of Excavation Regulation.

Medical Wastes

In the scope of the project, in the event there shall be any health problem occur on the personnel working in the facility during the construction phase, the personnel will be transferred to the nearest health facility and the necessary intervention will be made in the health institution and there will not be any medical waste generated due to the personnel in the facility. In the event that any medical waste occurs in the facility for any reason, provisions of "Regulation related to Making Amendments on Medical Waste Control Regulations" which entered into force through being published in the Official Gazette no.28948 dated 21.03.2014 shall be followed, these wastes shall be collected and stored in accordance with the provisions of relevant regulation and these wastes shall be disposed of by means of licensed medical waste transportation vehicles to the medical waste sterilization facility operated by the Germencik Municipality.

Vegetable Waste Oils

In this project, the food need of the personnel employed during the construction phase shall be met by the food producer companies and there shall be no vegetable waste oil shall occur in the facility.

In the event of generation of vegetable waste oil in the project area; they shall be collected in impermeable packages within the scope of "Regulation on Control of Vegetable Waste Oils" which entered into force through being published in the Official Gazette no.29378 dated 06.06.2015 and then, they shall be sent to licensed disposal facilities.

Waste Oils

Within the scope of the project, maintenance and repair of construction equipment that shall be used during construction and equipment installation shall not be carried out at the project site but in the nearest authorized services and/or gas stations. Therefore, during the construction phase, no machinery origin wastes such as waste oil and filter will be formed in the project area.

Waste Battery and Accumulators

Accumulator changes of the vehicles to be used in construction period of the project shall be carried out by authorized services. Therefore, on the scrap heap batteries shall be taken by the authorized service side. However, if vehicle accumulators have to be replaced in the work area, the waste accumulators obtained as a result of such replacement shall be handled as follows; "Regulation on Control of Waste Batteries and Accumulators" which entered into force after published on Official Gazette No. 25569 dated 31/8/2004; Pursuant to Obligations of Consumers Article 13- Consumers of batteries and accumulators, the consumers are obliged to;

a) collect waste batteries separately from domestic wastes and deliver waste batteries to collection points that will be created by enterprises or municipalities that distribute and distribute battery products,

b) hand over the old accumulator of their vehicles free of charge to the temporary storage places that operate the distribution and sales of the accumulator products and to the temporary storage locations of the vehicle maintenance-repair places, and to pay the deposit if the new accumulator is taken without delivering the old ones,

c) not to wait more than ninety days on a sealed surface inside the factory site until the accumulators used in the production facilities of the consumer industry, such as looms, plants, forklifts, towers and other vehicles, power supplies and transformers used in the transformers, have been turned into waste,

In accordance with the abovementioned provisions, waste accumulators and batteries shall be stored in a closed environment where ground sealing has been made and shall hand over these to a licensed recovery company for disposal.

Worn Out Tires

Maintenance and repair of vehicles and work machines to be used in land preparation, construction and operation phases of the Efe 6 Geothermal Power Plant project shall be carried out at authorized service centers. If vehicle tires are needed to be replaced at the project site, the worn out tires shall be sent to the facilities that obtained environmental license or operation approval from the Ministry in accordance with "article-24 Tires that are contaminated with hazardous materials and waste and tire wastes" of Regulation on Control of Worn Out Tires" which entered into force through published in Official Gazette no.26357 dated 25.11.2006, and they shall be disposed of at these facilities.

Hazardous and Other Wastes

In case of occurrence of any hazardous waste or other wastes which are contaminated by these in the geothermal power plant during the installation of the equipment and during the operation of the plant, these wastes shall temporarily be stored in sealed containers on the leak-proof ground in such a way that prevent contact with the soil. These wastes shall be stored in impermeable sealed drums and will be sent to licensed disposal facilities by licensed carriers.

All possible hazardous wastes that shall arise during the construction phase shall be disposed of in accordance with the "Waste Management Regulation" which entered into force after being published in Official Gazette no.29314 dated 02.04.2015.

III.1.14. Vibration, sources and level of noise, cumulative values, measures to be taken,

The engine power of the machinery and equipment to be used during the construction phase of the project is given in the table below. Accordingly, the sound power levels of the noise sources were calculated by using the motor powers given in the table and the formulas given below.

Noise will be generated by the construction equipment to be used in the construction phase of the project. The level of sound powers of the construction equipment to be used at this phase, are calculated with the help of the formulas given according to the engine power levels defined in the table given in article 5 of "Regulation on Noise Emission of the Equipment used in Outdoor Environment" which entered into force after published in Official Gazette no.26392 dated 30.12.2006 and prepared by Ministry of Industry and Trade. The following table shows the formulas given in the relevant regulation.

Table 50. Equipment Type and Sound Power Level of These Defined in Accordance with Their Net Power Level

Equipment Type	Net installed power P (kW)	Permissible sound power level	
		as from 03.07.2004	as from 03.01.2006'dan
Wheel dozers, Wheel loaders, Wheel Excavators-Loaders, Dumper Truck, Graders, Loader Type Soil Filling Tampers	Application mass (m)		
	$P \leq 55$	104	101
	$P > 55$	$85 + 11 \log P$	$82 + 11 \log P$
	$P \leq 15$	99	97
Compressor	$P > 15$	$97 + 2 \log P$	$95 + 2 \log P$
	$P \leq 55$	106	103
Pallet dozers, pallet loaders, pallet excavator loaders	$P > 55$	$87 + 11 \log P$	$84 + 11 \log P$
	$m < 55$	107	105
Hand-held concrete breakers and drillers	$15 < m < 30$	$94 + 11 \log m$	$92 + 11 \log m$
	$m > 30$	$96 + 11 \log m$	$94 + 11 \log m$

Loader:

$$P = 110 \text{ HP}$$

$$1 \text{ HP} = 0,746 \text{ kW so } 110 \times 0,746 \text{ kW} = 82,06 \text{ kW}$$

$$\text{If } P > 55 \text{ kW, permissible sound power level is; } L_w = 82 + 11 \log P$$

$$L_w = 82 + 11 \log (82,06) = 103,05 \text{ dB} \approx 103 \text{ dB}$$

Excavator

$$P = 150 \text{ HP}$$

$$1 \text{ HP} = 0,746 \text{ kW so } 150 \times 0,746 \text{ kW} = 111,9 \text{ kW}$$

$$\text{If } P > 55 \text{ kW, permissible sound power level is; } L_w = 82 + 11 \log P$$

$$L_w = 82 + 11 \log (111,9) = 104,5 \text{ dB} \approx 105 \text{ dB}$$

Truck

$$P = 110 \text{ HP}$$

$$1 \text{ HP} = 0,746 \text{ kW so } 110 \times 0,746 \text{ kW} = 82,06 \text{ kW}$$

$$\text{If } P > 55 \text{ kW, permissible sound power level is; } L_w = 82 + 11 \log P$$

$$L_w = 82 + 11 \log (82,06) = 103,05 \text{ dB} \approx 103 \text{ dB}$$

Street sprinkler

$$P = 100 \text{ HP}$$

$$1 \text{ HP} = 0,746 \text{ kW so } 100 \times 0,746 \text{ kW} = 74,6 \text{ kW}$$

$$\text{If } P > 55 \text{ kW, permissible sound power level is; } L_w = 82 + 11 \log P$$

$$L_w = 82 + 11 \log (74,6) = 102,6 \text{ dB} \approx 103 \text{ dB}$$

Mobile Crane:

$$P = 110 \text{ HP}$$

$$1 \text{ HP} = 0,746 \text{ kW} \text{ so } 110 \times 0,746 \text{ kW} = 82,06 \text{ kW}$$

If $P > 55 \text{ kW}$, permissible sound power level is; $L_w = 82 + 11 \log$

$$P$$

$$L_w = 82 + 11 \log (82,06) = 103,05 \text{ dB} \approx 103 \text{ dB}$$

Table 51. Preparation of Land in the Site and Noise Levels of Machinery and Equipment to be Used in Construction Phase

EQUIPMENT TYPE	QUANTITY	ENGINE POWER		Sound Power Level
		HP	kW	
Excavator	1	150	111.9	105
Loader	1	110	82.06	103
Truck	2	110	82.06	103
Street sprinkler	1	100	74.6	103
Mobile Crane	1	110	82.06	103

$$L_{port} = 10 \log (\sum_{i=1}^n 10^{L_{pi}/10})$$

$$L_{port} = 10 \log (5 \times 10^{103/10} + 10^{105/10})$$

$$L_{port} = 111 \text{ dBA}$$

Sound Pressure Level in the Field (dB);

Is calculated via this formula $L_p = L_w + 10 \log$

$(Q/4\pi r^2)$ (Q: Coefficient of orientation. For free sites

$$Q = 1)$$

Accordingly, the sound pressure levels which will be formed according to the distances during the preparation of the land and in case all the resources are working at the same time in the construction phase are calculated and the results are given in the table below.

Table 52. Sound Pressure Level in the Field (During Land Preparation and Construction Phase)

DISTANCE (m)	50	100	250	500	1000	1200	1500	2500	3000
L _{pt} (dBA)	66	60	52	46	40	39	37	32	31

"Regulation on Assessment and Management of Environmental Noise" no.27601 dated 04.06.2010 Annex-1 Noise Indicator; Day-Evening-Night (Gündüz-Akşam-Gece) Level L_{gag} has been shown with the following formula.

Day-evening-night levels as L_{gag} = Desibel A (dBA)

$$L_{gag} = 10 \log [1/24 ((12 \times 10^{L_{gündüz}/10}) + (4 \times 10^{(L_{akşam}+5)/10}) + (8 \times$$

$$10(L_{gece}+10)/10)]$$

According to the formula given above, the $L_{gündüz}$ value is calculated according to the distances and given in the table below.

Table 53. $L_{gündüz}$ Values According to Distances (During Land Preparation and Construction Phase)

DISTANCE (m)	50	100	250	500	1000	1200	1500	2500	3000
L_{pt} (dBA)	63	57	49	43	37	36	34	29	28

$L_{gündüz}$ distribution graph of the tools and equipment to be used in the "Preparation and construction of the land" phase is given as follows.

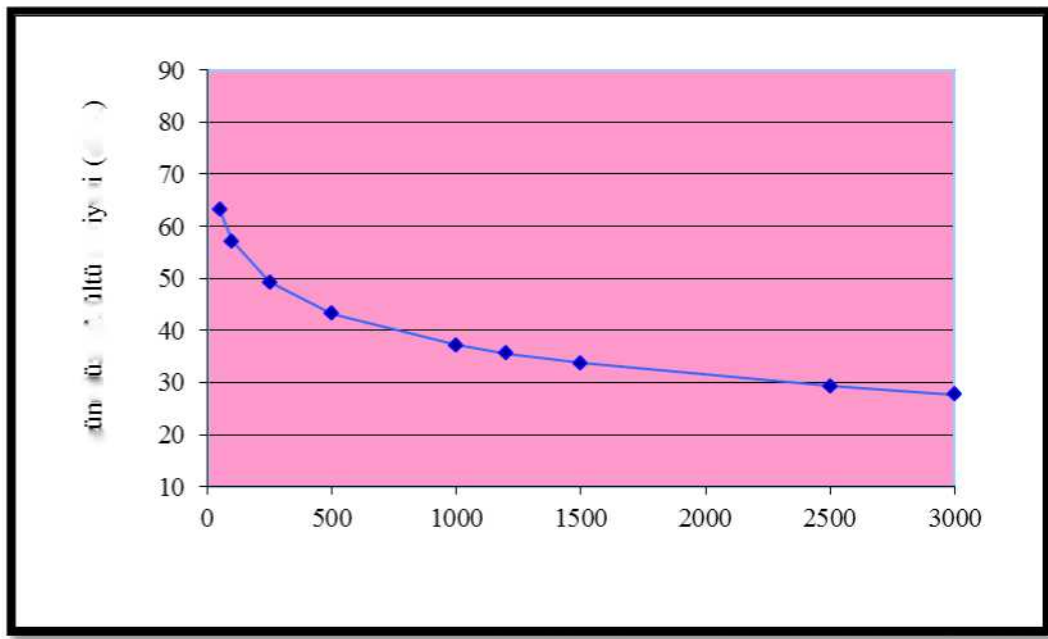


Figure 53. $L_{gündüz}$ distribution graph according to distance (During Land Preparation and Construction Phase)

After 10 meters of distance, $L_{gündüz}$ value originating from construction machinery to be used in the construction phase of the project remain below the 70 dBA limit value specified in Article 23 of "Regulation on Assessment and Management of Environmental Noise" no.27601 dated 04.06.2010 and Annex-VII Table-5. The closest residential areas to the project area are the Alangüllü District which is located 1.200 m to the northwest and the Kızılcagedik District which is 1.250 m to the northeast. The noise occurring during the construction phase of the project in question shall not adversely affect these two settlements.

Since no blasting operation shall be carried out during the construction phase of the project, vibration formation is not expected.

III.1.15. Where and how to provide housing and other technical/social infrastructure needs of the personnel and relevant population shall be procured,

It is planned that 50 personnel to work during construction phase and 40 personnel to work during operation phase.

During the construction phase, it is planned that employees to work as 12 months/year, 26 days/month and 8 hours/day. Employees shall be employed around the region as much as possible. Shuttle service shall be provided in order employed personnel to go their homes. Thus, accommodation problem shall be prevented. For other personnel, adjacent geothermal power plant's social facilities shall be used. If accommodation need cannot be met from there, a place shall be found in neighboring residential areas and in case this is also not possible, accommodation need shall be met from Germencik and İncirliova Districts and Aydın city center.

III.1.16. Operations that pose risk and hazard to human health and environment, measures to be taken

There is no hazardous situation arising from the project. Since the geothermal resource used is re-pumped into the reservoir in a completely closed cycle, there is no risk for human health and the environment.

Water shall not be taken from the channels under the responsibility of DSI (state hydraulic works) 21st Regional Directorate without the permission of the relevant institution. Process water, waste water arising from the operation and fluid to be used in the power plant during operation shall not be discharged into the facilities of DSI (irrigation and drainage channels, river beds).

The appropriate health protection strip within the project area will be left at the final project stage. Within the scope of Ministry of Health's "Directive on the Determination of the Distance of the Health Protection Strip to be Enclosed around Non-Sanitary Facilities that shall Negatively Affect Environment and Community Health" no.6359 dated 17.02.2011, for EIA area, The Distance of Health Protection Strip shall be determined via assessment to be made "Regulation on Establishment of Workplace and Working Licenses" and adequate area shall be left for health protection strip in accordance with the risk factors within the boundaries of the license.

Pursuant to Article 16 of "Regulation on Establishment of Workplace and Working Licenses", health protection strip has to be determined by the review boards by taking into account the harmful effects on the environment and community health of the facilities and the pollutants. Within the scope of the project, the works to be carried out at the drilling locations and the power plant area include risky and hazardous elements for human health and the environment and the measures to be taken in this regard are listed below. The health protection strip to be approved by the competent authorities shall be covered in the zoning plan and the Project site must not remain within the health protection strip of another facility approved by the Ministry of Health.

III.1.17. Determination of the effects on flora / fauna and measures to be taken,

There are geothermal power plant and agricultural areas in the planned area and its vicinity. Due to human activities, flora and fauna are disrupted. This situation shall be minimized through measures taken.

The area of activity is in the Mediterranean phytogeographical area. The project area is mostly covered with a vegetation of field crops. Single-year plants are seen on irrigation channels and water drainage. The region lost its natural vegetation due to agricultural activities.

In the works to be carried out during the construction period in the region,

the vegetative soil will be scraped and stored in such a way as to be used in landscape arrangements.

A pipeline will be installed for the transportation of the geothermal water which is required for energy production. The pipeline shall consist of a fully enclosed system and shall be located at a high point above the ground so as not to contact directly with the earth. No excavation is planned throughout the pipeline route. No negative effect is expected on flora and fauna.

There are no plant species that are considered endangered in terms of biodiversity in and around the area of activity.

2015-2016 Central Hunting Commission Decisions shall be followed. Effects such as hunting, deliberate killing of these species or detention, damage to their eggs are beside the point.

Map showing hunting areas are specified in Annex 13.

III.1.18. Determination of possible impacts on underground and underground cultural and natural assets (traditional urban texture, archaeological remains, natural values to be protected) and measures to be taken,

During land preparation and construction works of Efe 6 geothermal power plant project, no flammable and explosive materials shall be used and only construction equipment shall be used.

The most important impact that may arise from these studies is dust emission from excavation works and it is aimed to eliminate this effect by taking measures such as irrigating the land and covering the materials. Therefore, it is not expected that there will be any negative impact on the possible cultural and natural assets both above and below the ground.

The project site is not covered by the Law no. 3386 and 5226 and the Law No. 2863 on the "Protection of Cultural and Natural Assets". If any archaeological remains are encountered in the works which shall be carried out during the land preparation and construction phase, the works shall immediately be stopped and the relevant institution shall be informed.

Given in Annex-5 of the EIA Regulation within the project area and its immediate vicinity;

1. Areas to be Protected According to the National Legislations

a) There are no "National Parks", "Nature Parks", "Natural Monuments" and "Natural Conservation Areas" which are defined in the 2nd article of National Parks Law and specified in the 3rd article of the same Law.

Nature parks closest to the project area are "Virgin Mary Natural Park" which is located 26 km air distance West and "Lake Bafa Natural Park" which is located 39 km air distance Southwest.

b) There are no "Wildlife Conservation Areas, Wildlife Development Areas and Wild Animal Settlement Areas"

Which are specified in Land Hunting Law.

c) There are no areas which are defined as "Cultural Heritage", "Natural Heritage", "Protected Area" and "Conservation Area" in the 1st, 2nd, 3rd and 5th sub-paragraphs of Article 3(1)(a) of the Law on the Protection of Cultural and Natural Assets and areas that are determined and registered in accordance with the relevant articles of the same Law and Law No. 3386 dated 17/6/1987 (Law on Amendment of Some Articles of Protection of Cultural and Natural Assets no.2863 and Addition of Some Articles to the Same Law).

ç) There are no Aquaculture and Reproduction Sites, which are within the scope of "Fisheries Law".

d) There are no areas defined in articles 17, 18, 19 and 20 of the Water Pollution Control Regulation.

e) There are no areas defined in the Regulation on Air Quality Assessment and Management.

f) There are no areas identified and announced as Special Environmental Protection Zones according to Article 9 of the Environmental Law by the Council of Ministers.

g) There are no protected areas according to the Bosphorus Law. ğ) There are

no forest areas according to the Forest Law.

h) There are no areas for which a construction ban has been introduced in accordance with the Coastal Law.

ı) There are no areas specified in the "Reclamation of Olive Cultivation and Budding the Wild Olives Law".

i) There are no areas specified in the Pasture Law.

j) There are no areas specified in the Regulation on the Protection of Wetlands.

2. Areas to be Protected in accordance with International Conventions

a) There are no areas which are taken under preservation according to "Convention on the Conservation of European Wildlife and Natural Habitats" (BERN Convention) such as 1st and 2nd Protection Zones specified in "Important Sea Turtle Reproduction Areas" and "Life and Reproduction Areas of Mediterranean Monk Seal".

b) There are no areas which are taken under preservation according to "Convention for the Protection from Marine Pollution of the Mediterranean" (Barcelona Convention).

1) There are no areas which are determined as "Specially Protected Area" in our country in accordance with "Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean".

2) There are no areas which have been included into the list of "100 Coastal Historic Sites of Common Mediterranean Interest" published by United Nations Environment Program selected in accordance with Genoa Declaration.

3) There are no coastal areas which are included into the "living and feeding environment of the endangered marine species of the Mediterranean" which is specified in article 17 of Genoa Declaration.

c) There are no cultural, historical and natural areas to which "Cultural Heritage" and "Natural Heritage" status has been awarded and taken under preservation by Ministry of Culture pursuant to Articles 1 and 2 of the "Convention on the Protection of the World Cultural and Natural Heritage".

ç) There are no areas which are taken under preservation pursuant to "Convention on Wetlands of International Importance especially as Waterfowl Habitat" (RAMSAR Convention).

d) There are no areas which include in the European Landscape Convention.

3. Protection Areas in the Project Site and Surroundings

a) In approved environmental plans, there are no areas where the existing characteristics have been designated as the protection areas and which have the structuring ban (areas natural characteristics of which are to be protected, biogenetic reserve areas, geothermal areas and so on).

b) Agricultural lands: Agricultural development areas, areas which are irrigated and possible to be irrigated, areas which have I, II, III and IV class of landuse capability, areas of I. and II. class which are used in agriculture depending on the rainfall and all of the special crop plantation areas are located within the agricultural lands of the Project site. Required permits shall be obtained from the Provincial Directorate of Food, Agriculture and Livestock of the Governorship of Aydın regarding these areas to be used.

c) Wetlands: All the waters, whether natural or artificial; permanent or temporary; with still water or flowing water; fresh, salty or brackish; covering depths not exceeding 6 meters in the ebb tide; being of high importance as the habitat of all animals, especially of water birds, marshes, reeds and turbaries as well as ecological wetlands from the coastal lines of these areas to the land sides,

The closest water area to project site is Alangüllü Creek, located approximately 600 m. away from the project site. Construction and operation phases of the project will have no pollutant impact on Alangüllü Creek.

ç) There are no lakes, rivers, underground water management areas.

d) There are no habitats for the species which are important for scientific researches and/or for endangered species and for the species which are endemic to our country; and there are no biosphere reserve areas, biotopes, biogenetic reserve areas or areas of geological and

geomorphological formations with unique characteristics.

However; if it is realized that there are sensitive areas which are determined by the relevant institutions and organizations, processed or approved in the current database, then necessary information and explanations will be delivered, and necessary protection measures will be taken.

III.1.19. How and where to carry out field arrangements in the project site (forestation and / or green area arrangements etc.) for the purpose of creating landscaping elements or other purposes; and types of plants and trees to be selected,

The increase in the number of population leads to the need for energy. Projects to meet this need have negative impacts on natural landscaping. Within the scope of the project works, field arrangements and environmental protection studies will be carried out in order to regulate the negativities that will occur in natural landscaping during and after construction period. Measures will be taken to minimize the damage during the studies.

Vegetable soil will also be scraped and stored in the vegetable soil storage area during the studies. Then, this soil will be used in landscaping works.

All the personnel will be informed to minimize the damage caused in natural landscaping through trainings and banners.

Landscaping arrangements will be made in a way that each temporary working area in the project site will be restored after the works.

Plants which will be used during the landscaping works will be suitable for the region to survive in the region conditions. Maintenance processes of the plants will be performed in regular periods.

III.1.20. Impacts on Biodiversity and Ecosystem; and measures to be taken,

In the areas which are excavated during the activity, there is a risk for soil and plant erosion, indirectly posing a risk for biodiversity and ecosystem. Excavation area will not cover a large area and the landscaping arrangements to be made after the excavation will help to minimize the impacts. In addition, the geothermal system has a closed operation. So that there will be no release to the receiving environment.

Impacts on fauna and flora during the construction phase and measures to be taken are indicated in III.1.17.

III.1.21. Other issues,

There are no other issues in this section.

III.2. Impacts on Physical and Biological Environment in Operational Phase of the Project and Measures to be taken,

III.2.1. Specifications of all the units within the project, the units where the activities will be performed, their capacities, energy amounts to be produced, transmission of the energy to be produced and running hours of the plants,

Efe 6 Geothermal Power Plant will run on a dual-fluid (Binary) system. The system is based on the basic principle of the Rankine cycle. The organic fluid used in the heat cycle in the system is n-Pentane, a hydrocarbon type. Pentane absorbs the heat of the geothermal fluid. Thus, it causes the evaporation of pentane. Evaporated pentane goes into the turbine. By the transformation of the kinetic energy which is obtained as a result of the expansion of the pentane, rotary shaft power is produced. The expansion process of the pentane is carried out with the geothermal fluid (water and steam) which is energized within the coil heat exchangers (vaporizer, preheater).

Geothermal hot water coming into the parts of evaporator heat exchanger (vaporizer) transfers some of its energy and evaporates the pentane. Here, the evaporator heat exchanger goes into the hot water sections. Evaporator heat exchanger vaporizes the pentane together with the steam that goes into the steam chamber. Geothermal water which leaves the evaporator heat exchanger by transferring some of its energy is separated into the preheater tubes. This geothermal water converges at a point and goes to the re-injection system by leaving the power plant. Condensed steam is pumped out of the head of the evaporator heat exchanger and connected to the re-injection line to be sent to the re-injection well.

The feed pumps take the pentane from the condenser and pump it into the walls of the preheaters. The pentane is heated in the preheaters and then flows through the evaporator wall. The pentane is heated to the boiling point in the evaporator and then evaporated. The pentane moves towards the steam inlet, then enters and expands. Rotary shaft power is produced in this transition of pressure and temperature. The low pressure pentane steam, whose energy is converted in the turbines, goes into the air-cooled condenser and then liquefies. The liquefied pentane is pumped into the preheaters again.

The heat exchange of this pentane at both levels is a closed cycle. It's completely independent of each other. System is impermeable and without any leakage during normal operation.

Electrical energy which will be produced by the binary system within the scope of Efe 6 Geothermal Power Plant will be transferred to 154 kV Gürmat I Feeder from the switchyard to be located on 883 No parcel.

Installed capacity of the power plant has been determined as 22,6 MWe. Within the scope of the project, annual energy production is expected to be approximately 180.800.000 kW.

The facility will be operated 365 days a year and 24 hours a day in 3 shifts.

Facility units and their descriptions are given below.

Turbines, Generator:

High-pressure secondary work fluid (pentane) in the gas phase coming into the turbines

goes into the turbines and enables the rotation of turbine blades; and the kinetic energy which is produced in this way is converted into electrical energy in the generator. Each turbine inlet will be equipped with control valves and system control will be provided. Cooling water system that enables cooling of the bearings and oil in the system will also provide cooling of bearing components and oils of the turbine and generator.

Production and Injection System:

In this system, geothermal fluid is collected from the production wells and transported to the separation station. Geothermal fluid in gas and liquid state which is separated from each other is sent to the evaporator.

The evaporator is also used to heat the secondary work fluid (pentane). The liquid geothermal fluid coming out of the evaporator is sent to the preheaters and the secondary work fluid (pentane) transits to the gas phase. The liquid geothermal fluid coming out of the preheater is transmitted to the injection wells by means of the reinjection pumps and is re-injected to the reservoir.

Noncondensing Gas Outlet System i:

Noncondensing gases coming out of the evaporator are removed from the system by means of a silencer on the air cooled condenser.

Air Cooled Condenser:

This system is intended to cool the secondary work fluid (pentane) coming out of the turbine and convert it into a liquid phase.

Recirculation Pump and Recuperator:

The secondary work fluid (pentane) in the liquid phase coming out of the air-cooled condenser is pumped to the recuperator by means of the recirculation pumps and continues to flow towards the preheater by charging the heat energy of the secondary work fluid (pentane) in the gas phase which has been directed to the air-cooled condenser within recuperator.

Auxiliary Systems:

In addition to the specified main systems, this system has been designed to provide the necessary system for supplying tap water required for the plant site and fire protection of the plant equipment. It consists of tap water supply, fire response systems and fire water storage tank.

Plant Instrument Control System:

It is a system which is composed of plant control and protection system, monitoring instruments control valves and panels, and which has been established for the protection, automation and management of the plant system from the control room.

Air System:

It's a system which is composed of compressors, dryers and tanks and has been established

to supply the compressed air required for the control valves.

Wellhead Systems:

It is composed of tubular materials and brackets, which are used in the structures of geothermal wells, wellhead valves, which are located in wellhead and will be used for controlling and regulating the flow, inhibitor systems, which prevent pipe crustation, control valves, silencers and weirs which are used for test processes.

III.2.2. Geothermal resource amount required for the project, auxiliary product amount, where and how to procure it, transportation, storage, impacts during transportation and storage, measures to be taken,

Geothermal resource which will be used within the scope of the project will be supplied from 5 existing wells and 1 well that is planned to be drilled newly. All of the areas where the wells, from which geothermal resources will be supplied, are located are private-registered lands on behalf of the owner, and the required geothermal fluid will be brought to the facility through a pipeline which will be constructed in a way that it follows the cadastral road in the region.

Pentane will be used as work fluid within the scope of the project. Pentane, which will be used within the scope of the project, is supplied from abroad and transported to the facility area with special containers.

Pentane, which will be used as work fluid, is stored in special containers and it is brought to the facility with lorry or truck by taking private security measures. The pentane which is brought to the plant is not in contact with the wells in any way and is transferred to the power plant through closed system pipes.

Pentane will not be kept in the construction site for a long time and will be delivered to the system in maximum 1 week. Only a small amount of pentane, which is called as make-up, will be reserved in the plant area.

Pentane which will be used within the scope of the project will be stored in 2 tanks of 120 m³ and approximately 200 tons of pentane will be kept in the facility.

Chemicals which will be used as anti-crustation will be brought to the geothermal wells in special containers and will be used as specified in the safety data sheets. Safety data sheets of the chemicals to be used are given in Annex 20.

III.2.3. Hazardous, toxic, flammable and explosive substances which will be used during production in projects units, their transportation, storage and measures to be taken,

Hazardous, toxic, flammable and explosive materials will not be used during the production in geothermal power plant units that are planned to be installed and operated. Insulation oils are used in the transformer inside the power plant area. It is required to pour such absorbents as sand, pebble or sawdust on the insulation oil which is spilled or flowed into the environment in case of large-scale failures in the plant, as a result of accidents or during the oil transfer process, so that any leakage will be prevented and then this mixture will be taken to

the barrels.

In case of having and/or storing any hazardous, toxic, flammable and explosive substances other than insulation oils, the procedures shall be applied in accordance with the provisions of "Regulation on Measures to be Taken in Workplaces and Works which are Engaged with Flammable, Explosive, Hazardous and Harmful Substances" which came into force by being promulgated in the Official Gazette No. 7551 dated 27.11.1973.

III.2.4. Measures to be taken against heavy metals and toxic chemicals contained by geothermal fluid (arsenic, lead, zinc, boron as well as substantial quantities of carbonate, silica, sulphate, chloride etc.) and such gases as carbondioxide, hydrogen sulfide

While there are no significant differences in heavy metals, toxic chemicals and the types of gases in the content of geothermal fluids, there may be changes in the ratios depending on the location of the reservoir.

Chemical dosing devices shall be installed as preventive equipment for the delivery of an appropriate inhibitor inside the pipe at each well or mechanical cleaning of the pipes in order to eliminate any operational problems which may be caused due to calcification and to prevent possible environmental problems because the calcite layer, which is likely to be formed (due to carbonate and sulphate formation) on the pipes which are used during the transportation of geothermal fluid to the plant to be used for the purpose of power generation and on the surfaces where the fluid comes into contact, may lead to the narrowing of the pipe diameter and limiting of the geothermal flow. It will be possible to prevent the corrosion on the pipes and contact surfaces with the help of the system to be installed in each well, so that both the environmental problems and operational problems will be prevented. The selection of the cleaning methods, completion of the well tests and details will be determined in project planning.

Within the scope of the project, approximately 1.5 tonnes of CaCO₃ (GS8466) and approximately 1.5 tonnes of Silica (GS5195) inhibitors will be used per week in order to prevent sedimentation in downhole and surface geothermal pipelines, valves, HP and LP separators and reinjection lines.

Since the chemical which is contained by geothermal fluid and externally dosed will be transported in a closed cycle system with the injection system technology to be used in Efe 6 Geothermal Power Plant which is planned to be operated, its interaction with the external environment and its potential environmental impacts will be prevented. This injection system is a process which is preferred because it prevents the interaction of the geothermal fluid with the environment (no contact / no discharge) during the operation in drilled productions which are made from geothermal reservoirs, it feeds the reservoir for the purpose of sustainable use of the source and it can be returned to the underground after its function has been completed.

Geothermal fluids contain heavy metals and chemicals as well as non-condensable gases in variable amounts depending on reservoir conditions. These gases are kept in the reservoir under a certain pressure, so they are dissolved in the geothermal fluid. Since the fluid loses pressure and temperature during the conversion of the pressure and temperature of the geothermal fluid into electrical energy in the operation phase of Geothermal Power Plant, the content of non-condensable gases released is CO₂, N₂, CH₄, NH₃, H₂S, O₂ and H₂; and CO₂ in the ratio of approximately 99% by volume is of higher importance compared to other gases.

Regulation on Amending the Regulation on Control of Industrial Air Pollution which came into force by being promulgated in the Official Gazette No. 29211 dated 20.12.2014 regarding these gases which will be released will be disposed in a way that will provide the limit values specified in Annex-2, Table 2.

III.2.5. Specifications and quantities of the machines, vehicles, tools and equipment to be used in project units,

Operational phase of the project is based on the principle of transmitting and separating dual-phase fluid, which is obtained from the production wells by means of collection lines, to the pressure separators (separator), converting the mechanical energy, which is generated by the rotating effect as a result of the turbine of the steam obtained there, to electrical energy through generators and finally sending it to the switchyard area and then to transmission lines.

In addition to the equipment required during the production phase, a sufficient number of vehicles will also be used in order to ensure transportation of the personnel who will work in the operation phase.

Places where production wells, reinjection wells and power plant will be installed within the scope of the project are different. Different machines and equipment will be used in each unit.

Machines and equipment which will be used in the wellhead plant of a production well are inhibitor dosing system, wellhead control valves, separator, balance tank, filters, pumps, measuring equipment, manual valves, safety equipment, compressor, driver boards and automation panel.

Machinery and equipment which will be used in the wellhead plant of reinjection wells are reinjection pumps, manual valves and check valves, measuring equipment, safety equipment, driver boards, automation panels, frequency controller board, break chambers and transformer.

Machinery and equipment which will be used in the plant are heat exchangers, recuperators, turbines, and transformer.

III.2.6. Systems for recycling or disposal of geothermal source after being used, number, depth and capacity of reinjection wells to be drilled,

Reinjection will be performed in order to prevent loss of the amount, pressure and heat of geothermal source. So that there will be no waste water released. Plant will not run if reinjection system is not activated.

It is planned to use 4 reinjection wells within the scope of the project. Reinjection wells are already available. It is not planned to drill a new reinjection well.

Depth and capacity of the reinjection wells within the scope of the project are indicated in the table below:

Tablo 54. Reinjection Wells Info

NO	REINJECTION WELLS		
	Name of the Well	Depth (m)	Flow (ton/hour)
1	OB-71	225	40
2	OB-71A	148	50
3	OB-71B	214	20
4	OB-71C	164	10

Depths of reinjection wells which are planned to be used in the project are between 1450 m and 2250 m. Flows of the wells are between 100 tons/hour and 500 tons/hour.

III.2.7. Potential impacts on underground water during the production and transportation of the source as a result of the use of geothermal source, measures to be taken,

Geothermal system is widely used in order to describe the heat transfer system in the earth's crust where heat is transmitted from a heat source in the upper mantle to the surface. Geothermal energy (also referred to as hydrothermal energy) is the internal heat of the earth. In other words, it is defined as the type of energy contained in the heated fluids within the reservoirs which are formed by permeable rocks in accessible depths within the earth's crust.

Through this system which uses geothermal sources, discharged geothermal fluid will be pumped back to the geothermal reserve in order to be able to define Geothermal Power Plant as sustainable and protect the reserve (basin).

In case of any problem in reinjection wells, the existing 12.000 m³ pool will be used. The volume of this pool is adequate. In case of any problems related to the power plant, there will be an approximately 7,500 m³ storage pool which will be made of 1 concrete in the plant site against any possibility of plant deactivation. This pool will be used to store the geothermal fluid until the problem is solved. After the problem has been solved, the water accumulated in the pool will be returned to the re-injection system without being discharged to any receiving environment.

12.000 m³ pool, flow:1.400 tons/hour; in this case, pool is filled in 7 hours 40 minutes. (fluid density =899 kg/m³)

7.500 m³ pool, flow:1.400 tons/hour; in this case, pool is filled in 4 hours 45 minutes. (fluid density =899 kg/m³)

Pools which will be used for reinjection and separation are the pools which will be used in case of malfunction and emergency in the plant. 12.000 m³ pool is capable of storing 10.788 tons of fluid while 7.500 m³ pool is capable of storing 6.742.5 tons of fluid. Therefore, it will be adequate even in bad scenarios.

In 12.000 m³ pool, waterstops have been used in horizontal and vertical cold joints (construction joints) during the production of reinforced concrete; and again, waterstops will be used during the construction of 7,500 m³ pool as well. Drawing of the pool is indicated in Annex 26.

There will be no significant impact while preserving the geothermal reserve (basin) during the production with the technology to be used.

III.2.8. Impacts on other geothermal resources/basins in the region depending on the use of geothermal source and measures to be taken (Cumulative Assessment),

Other geothermal resources in the region within the project are detailed in II.2.6.

Geothermal Resources No. J-553 of Efe 6 Geothermal Power Plant will make production through injection system process in Operating Licence Area for Natural Mineral Water. Through this system which uses geothermal sources, discharged geothermal fluid will be pumped back to the geothermal reserve in order to be able to define Geothermal Power Plant as sustainable and protect the reserve (basin).

The existing production and reinjection wells will be used within the scope of the project. In addition to the existing wells, 1 additional well will also be drilled. Relevant chemical analyses have been performed for the production wells No. ÖB-86 and ÖB-96; and the results of the analyses have been given in Annex 24. Since the other wells which will be used within the scope of the project are located in the same reservoir, analysis values will be very close to each other. It is observed that the wells to be used within the scope of the project are suitable for usage and if they are used, there will be no risks for the other geothermal resources in the surrounding. As a result of the isotope analyses, it can be said that the recharging is caused by surface water and fed from the surrounding environment, and that the geothermal source will not be effective on the whole basin.

There will be no significant impact on the geothermal reserve (basin) during the production with the technology to be used.

III.2.9. Potential impacts on top soil as a result of the use of geothermal source, assessment of the risks of slide, sinkhole etc.,

With the help of the technology to be used within the scope of the project, there will not be any continuous drawing from the existing underground water; and the project will operate in closed cycle system. Underground water will be in minimum level when considering the other losses, which will eliminate such risk factors as slide or sinkhole. No sinkhole formation is expected.

In case of any problems related to injection or power plant during operation phase, the emergency pool which will be established at the plant site against any possibility of plant deactivation will be used in order to store the geothermal fluid until the problem is solved. After the problem has been solved, the water accumulated in the pool will be returned to the re-injection system without being discharged to any receiving environment. In this way, environmental discharge will be prevented.

With the help of the technology to be used and measures to be taken, the physical structure of the soil will not deteriorate as a result of the use of geothermal resources. Provisions which are stated in the "Regulation on the Control of Soil Contamination and Point Source Contaminated Sites" which came into force after being promulgated in the Official

Gazette No. 27605 dated 08.06.2010 shall be applied in order to eliminate any soil contamination which may occur within the scope of the project even if no impact is expected.

III.2.10. Impacts which may emerge during the studies of cleaning the existing wells or reproduction of unused wells and measures to be taken,

Geothermal fluid is not disposed in the environment during the works of cleaning or re-use of unused wells. In case of any problem in reinjection wells, 12.000 m³ pool will be used as the emergency pool. Geothermal fluid will be stored until the system is activated again; and pumped back to the reservoir through injection wells without being discharged into any receiving environment and without any interaction with underground water as soon as the system is activated. In case of any problems related to the power plant, there will be an approximately 7,500 m³ storage pool which will be made of 1 concrete in the plant site against any possibility of plant deactivation. This pool will be used to store the geothermal fluid until the problem is solved. After the problem has been solved, the water accumulated in the pool will be returned to the re-injection system without being discharged to any receiving environment.

Production capacity will increase if production is made from a new well in addition to the wells to be used. Therefore, if there are wells that are thought to be put into production again, the adequacy of the injection system capacity will be evaluated before making production from this well. In this case, in case of capacity increase and / or planning of a new well in the project, it will be evaluated within the scope of EIA Regulation and transactions will be performed in accordance with the legislation.

III.2.11. Amount of the water to be used in project units, the processes for which it will be used, specifications of the waste water and its disposal,

There will not be any use of water except for the potable water and drinking water which is needed by the personnel to be employed in the construction works that are planned to be carried out in Efe 6 Geothermal Power Plant and in operational period as well as the water required for watering the roads where vehicles periodically pass by.

Waste water will be formed due to the personnel who will work during the construction period of the project and who will be employed in the operational period of the power plant.

It is planned to employ 40 people during the operational phase of Efe 6 Geothermal Power Plant. The average daily water consumption per person is accepted as 203 liters (Daily Water Consumption Per Person, TÜİK, 2014) and the required drinking and potable water requirement has been calculated as below.

$$\begin{aligned}\text{Water Use Amount of the Personnel} &= \text{Water use amount per person} \times \text{number of person} \\ &= 203 \text{ lt/day} \times 40 \text{ persons} = 8.120 \text{ litre/day.}\end{aligned}$$

With the assumption that 100 % of the water to be used is returned as waste water, domestic waste water amount will be 8,12 m³/day.

Since there will be no production in operational phase except for the energy, there will be no industrial waste water in the facility, either.

Drinking water of the personnel who are planned to be employed during the construction and operation phases will be supplied by purchasing galloons which are produced in accordance with the standards of the " Regulation on Amending the Regulation on the Water for Human Consumption" which came into force by being promulgated in the Official Gazette No. 29272 dated 19.02.2015 and bringing them to the project site.

Domestic waste water which will be formed during the operation phases of the project will be disposed in the treatment facility at the other plant which belongs to the owner of the operation and which is adjacent to the planned plant area after making the relevant connections. In case the capacity of the existing treatment plant is not enough, an additional treatment plant which has a capacity of 10 m³/ day will be constructed; a project approval file will be prepared for this plant and then submitted to the Provincial Directorate of Environment and Urbanization. Water which is formed as a result of treatment will be used in garden irrigation. Project approval letter of the said treatment plant is given in Annex 23.

During the disposal of the liquid wastes that will occur during the construction and operational phases of the project, transactions will be carried out in accordance with all the issues that are specified in the Regulation on Control of Water Pollution which came into force by being promulgated in the Official Gazette No. 25687 dated 31.12.2004.

III.2.12. Amount and specifications of solid waste during the operation of the plant, disposal works and measures to be taken,

Domestic and Packaging Waste

Amount of domestic solid waste which will be generated by 40 personnel who will work in the operational phase in Geothermal Power Plant within the scope of the project has been calculated as follows with the assumption that there will be a waste of 1.08 kg / day per person (daily average amount of municipal solid waste, TÜİK, 2014).

$$40 \text{ persons} * 1,08 \text{ kg/day-person} = 43,2 \text{ kg/ day.}$$

It is estimated that 12% of domestic solid wastes likely to be generated during the operational phase of the project will be packaging waste. With this assumption, the amount of packaging waste which is expected to be generated during this period will be;

$$43,2 \text{ kg/ day} * \%12 = 5,18 \text{ kg/ day.}$$

Domestic solid wastes which will be generated by the personnel who will be employed in operational phase of the activity shall be collected separately in closed containers which will be placed at various points within the construction site depending on their qualities (organic, glass, plastic, paper, metal etc.) and collected in such a way that they will not pollute the environment with regard to appearance, dust, odor and similar factors. These solid wastes which will be deposited in containers will be disposed by garbage trucks of Germencik Municipality in the 2nd Class Solid Waste Storage Area of Aydın Metropolitan Municipality in regular periods.

Within the framework of Regulation on Control of Packaging Wastes" which came into force by being promulgated in the Official Gazette No. 28035 dated 24.08.2011, recyclable

wastes will be collected separately from other solid wastes and will be delivered to the company at regular intervals within the scope of the contract to be signed with the company which is the holder of the licence for collection of packaging waste.

Provisions of "Waste Management Regulation" which came into force by being promulgated in the Official Gazette No. 29314 dated 02.04.2015 shall be applied for the disposal of all solid wastes which will be generated during the construction and operational phase.

Medical wastes

In case of any health problem of the personnel who will work in the plant during the operational phase within the scope of the project, he/she will be sent to the nearest health facility and the necessary intervention will be delivered and there will not be any medical waste generation caused by the personnel in the facility. In case of any medical waste in the facility, provisions and amendments in "Regulation on Control of the Medical Wastes" shall be applied for the collection and storage of the wastes; and these wastes will be disposed by being sent to the medical waste sterilization facility which is operated by the contracted firm of Germencik Municipality in licenced medical waste transport vehicles.

Vegetable Waste Oils

Food need of the personnel who will be employed during the operational phase of the project that is planned to be carried out will be met by the food producer companies and there will be no vegetable waste oil in the facility.

In case of any vegetable waste oil in the project site, it will be accumulated in impermeable packages and sent to licensed disposal facilities within the scope of "Regulation on Control of Vegetable Waste Oils" which came into force by being promulgated in the Official Gazette No. 29378 dated 06.06.2015.

Waste oils

Waste oil may be generated in the operational phase of the planned Efe 6 Geothermal Power Plant.

Provisions and amendments in the "Regulation on Control of Waste Oils" which came into force by being promulgated in the Official Gazette No. 26952 dated 30.07.2008 and "Waste Management Regulation" which came into force by being promulgated in the Official Gazette No. 29314 dated 02.04.2015 shall be applied for the waste oils which will be generated as a result of maintenance and repair works.

If it is required to carry out maintenance and repair works of the vehicles to be used within the scope of the project in the field, the vehicles will be brought to an impermeable area and the maintenance and repair works will be carried out here. Provisions of the "Regulation on the Control of Soil Contamination and Point Source Contaminated Sites" which came into force by being promulgated in the Official Gazette No. 27605 dated 08.06.2010 shall be applied during these works.

Waste batteries and Storage batteries

Storage batteries of the vehicles which will be used during the operational phase of the project will be changed by the authorized services. Therefore, worn-out storage batteries will be taken to the authorized services. However; when it is required to change storage batteries

of the vehicles in the working area in the facility, the waste storage batteries which will be generated as a result of these activities will be kept in an impermeable and closed environment within the project site and disposed in order to be delivered to a licensed recycling company in accordance with the following provisions of Article 13-Consumers' Obligations of the "Regulation on Control of Waste Batteries and Storage Batteries" which came into force after being promulgated in the Official Gazette No. 25569 dated 31.08.2004 as: Consumers of Batteries and Storage Batteries are obliged

a) to collect waste batteries separately from domestic wastes; to deliver waste batteries to the collection points which will be created by municipalities or enterprises distributing and selling battery products,

b) to deliver the old storage batteries, when changing the storage batteries of the vehicle, to temporary storage places which are created by the enterprises distributing and selling storage batteries and by the operators of vehicle maintenance and repair places; to pay a deposit if they purchase a new storage battery without delivering the old one,

not to keep any storage batteries which are used in counters, facilities, forklifts, towers and other vehicles used in production phases of the industrial organizations, which are the consumers, as well as any storage batteries which are used in power supplies and transformers in an impermeable ground within the project site more than ninety days until being delivered to the manufacturer after becoming waste.

Worn-Out Tires

During the operational phase of Efe 6 Geothermal Power Plant project, maintenance and repair of vehicles and work machines will be performed by authorized services. Waste tires which are likely to be generated in case of changing the tires at the project site will be disposed by being sent to the facilities that have obtained environmental license or operation approval from the Ministry in accordance with the "Regulation on Control of Worn Out Tires" Article 24- Types of tires and tyre wastes contaminated with hazardous materials and wastes, which came into force after being promulgated in the Official Gazette No. 26357 dated 25.11.2006.

Hazardous and Other Wastes

In case of any hazardous wastes or any other wastes which are contaminated with these hazardous wastes during the installation of the equipment at Geothermal Power Plant and during the operation of the plant, these wastes will temporarily be stored in closed containers to prevent any contact with the soil on an impermeable ground. These wastes shall be disposed in accordance with the provisions of "Waste Management Regulation" which came into force after being promulgated in the Official Gazette No. 29314 dated 02.04.2015.

III.2.13. Amount and specifications of gas waste during the operation of the plant, impacts on air quality of the region, disposal works and measures to be taken,

Greenhouse gases are compounds that are available in the atmosphere, support greenhouse effect and have the highest level of heat retention. CO₂, CH₄, N₂O, O₃ and CFC which are available in the atmosphere are known as natural greenhouse gases and create a natural habitat on the earth's surface.

The Earth's atmosphere consists of various gases. There are also some inert gases in small quantities. The rays from the sun (heat rays / short-wave rays) heat the earth by passing the atmosphere. Gases in the atmosphere retain some of the heat on the earth and prevent the heat loss of the earth. The atmosphere has the ability to conduct light and retain heat. The temperature of the water remains stable thanks to the ability of the atmosphere to retain heat. So that, freezing of the rivers and oceans is prevented. Heating and insulation effect of the atmosphere, which is formed in this way, is called as "Greenhouse effect".

The main gases which lead to greenhouse effect in the world are 36-70% aqueous vapor, 9-26% Carbon dioxide, 4-9% Methane and 3-7% Ozone. Some of the greenhouse gases are formed by themselves, while others are produced by humans. Greenhouse gases which are naturally generated include aqueous vapor, carbon dioxide, methane, nitrous oxide and ozone. As a result of human activities, there are additions to these gas levels; and so, greenhouse effect is observed.

Global warming, which is an important environmental problem, increases further as a result of the accumulation of greenhouse gases in the atmosphere. Today, most of the energy needs are met by using fossil fuels. Fossil fuels release large amounts of CO₂ to the atmosphere. In order to prevent this, energy needs must be met from renewable energy sources.

Wind, solar, hydraulic, geothermal, wave, tidal and biomass energies are used as renewable energy sources.

Since there is no greenhouse gas release during the production of electrical energy in geothermal power plants, an environmentally friendly energy production is able to be performed which does not cause any acid rain and atmospheric heating, which reduces CO₂ emission and saves fossil fuel without having any radioactive effect.

This project is not considered within the scope of the "Regulation on Control of Odor-Emitting Emissions" which came into force after being promulgated in the Official Gazette No. 28712 dated 19.07.2013.

III.2.14. Vibration, noise sources and levels within the scope of the project and measures to be taken,

No works that will cause high level of noise will be carried out in operational phase.

Such equipment as pumps, generators etc. which will be used within the scope of the project will be kept in a closed area; so, they will not cause any noise to disturb the project site and surroundings.

Machines and equipment which will be used in wellhead systems will also run in closed cycle; so, they will not cause a noise level to disturb the project site and surroundings.

III.2.15. Amount and specifications of radioactive wastes and measures to be taken,

After the geothermal resource, which will be used within the scope of the project, is used in closed cycle, it will be fed back to the source through reinjection wells. No radioactive substance is expected within the scope of the project.

III.2.16. Impacts on forest lands and measures to be taken,

The Project site is not located in the areas that are regarded as forest lands. It is stated that the nearest forest land to the project site is 600 meters away. Necessary measures against possible negative impacts on forest lands are listed below;

- Fire and Emergency Plan shall be applied against possible forest fires.
- Upon the request of the nearest Forest Management Directorate to the project site, the existing workers and work machines at the plant will be used to intervene in a possible fire.
- The personnel to be employed at the facility will be warned against the fire.
- The personnel will be informed about the forest fire report line.
- The personnel will be prevented from burning fire in the field and throwing flammable substances to the field.

III.2.17. Impacts on agricultural lands and measures to be taken,

The geothermal fluid used in the operational phase will complete the process in a closed cycle through the reinjection system and will not interact with the soil. In this way, the geothermal source will not cause soil pollution. Moreover; geothermal fluid will not be disposed in the environment during the works of cleaning or re-use of unused wells. In case of any problems in reinjection wells, the existing 12.000 m³ pool will be used as the emergency pool. In case of any problems related to the power plant, there will be an approximately 7,500 m³ storage pool which will be made of 1 concrete in the plant site against any possibility of plant deactivation. This pool will be used to store the geothermal fluid until the problem is solved. After the problem has been solved, the water accumulated in the pool will be returned to the re-injection system without being discharged to any receiving environment.

Thanks to the technology to be used and the measures to be taken, the physical and chemical structure of the soil will not deteriorate as a result of the use of geothermal source; and there will be no negative impact on vegetation in the agricultural lands.

III.2.18. Impacts on flora/fauna and measures to be taken,

Noise during operation may have a negative impact on the fauna. Noise reduction measures may be taken to prevent this. For example; machinery and equipment to be used in the facility will be state-of-the-art technology. Their maintenance will be done in a timely manner and, if necessary, research will be conducted on different technologies to reduce noise.

Since the system will operate in a closed cycle within the scope of the project, there will not be any discharge to the receiving environment.

Plant area will be fenced with wire mesh etc. to prevent the entry of fauna elements.

Environment Law No. 2872, the regulations which have been issued pursuant to this Law and the provisions of Berne Convention shall be applied in all stages of the project. Special attention will be paid to the nesting and sheltering areas of the protected species in the fauna list, no contact will be made and their natural habitats will not be changed if such

species are seen.

Resolutions of Central Hunting Commission in 2015-2016 shall be followed. There are no such effects as hunting, deliberately killing or detaining these species, or damaging to the eggs.

III.2.19. Determination of the impacts on cultural and natural properties over and under the ground and measures to be taken,

No works will be performed by using flammable and explosive materials in the preparation and construction work within the scope of Efe 6 Geothermal Power Plant project, only work machines will be used.

The most important impact which may arise out of these works is the emission that will be generated due to excavation works; and it is aimed at removing this impact by taking such measures as land irrigation and covering top of the materials. Therefore, it is not expected that there will be any negative impact on the possible cultural and natural properties over and under the ground.

Project site is not within the scope of Law on the Conservation of Cultural and Natural Properties No. 2863 amended by the Laws No. 3386 and 5226; excavation works will immediately be stopped and the relevant institutions will be informed in case of observing any archaeological remains during the preparation and construction works.

Determination of the impacts on cultural and natural properties over and under the ground and measures to be taken is indicated in III.1.18 in detail.

III.2.20. Where and how to supply housing and other social/technical infrastructure needs of the personnel to work in the project and their family members; amounts and disposal of drinking and tap water wastes; amounts, specifications and disposal of these wastes,

Following the commencement and operation of the construction works of the project, new employment opportunities will be created for local people. It is planned to employ 50 people during the preparation and construction phase and approximately 40 people during the operational phase; personnel needs will primarily be met from the settlements located in the project site and surroundings.

Since the daily commercial needs of the workers will be met from the settlements located in the vicinity of the project site, this will also be an additional source of income for the local community. In addition, it is foreseen that employment sources will be created for local people in consideration of the fact that various investments will be made in the region upon the execution of the project.

Social needs of the personnel will be met from the power plant building. Technical needs will be met from the settlements located in the vicinity of the project site (Germencik and İncirliova districts) or, otherwise, from Aydın and / or Denizli Province.

Control and audit tracking analyses of drinking and tap water which will be needed by 40 personnel maximum who will work in the operational phase of the project will annually and regularly be performed in the laboratories that are authorized and accredited by the

Ministry of Health in accordance with the criteria specified in the "Regulation on Amending the Regulation on Water for Human Consumption" which came into force by being promulgated in the Official Gazette No. 29272 dated 19.02.2015; and analysis reports will be kept. With the assumption that all the water that is used will be turned into waste water, 8,12 m³ domestic waste water will be generated daily. It is detailed in III.2.11. Solid wastes generated by the personnel are detailed in III.2.12.

Potential waste water which will be generated during the construction and operational phases of the project will be disposed in the treatment facility at the other plant which belongs to the owner of the operation and which is adjacent to the planned plant area after making the relevant connections. In case the capacity of the existing treatment plant is not enough, an additional treatment plant which has a capacity of 10 m³/ day will be constructed; a project approval file will be prepared for this plant and then submitted to the Provincial Directorate of Environment and Urbanization. Water which is generated as a result of treatment will be used for garden irrigation.

Domestic solid wastes which will be generated by the personnel within the project shall be collected separately in closed containers which will be placed at various points within the construction site depending on their qualities (organic, glass, plastic, paper, metal etc.) and collected in such a way that they will not pollute the environment with regard to appearance, dust, odor and similar factors. These solid wastes which will be deposited in containers will be disposed by garbage trucks of Germencik Municipality in the 2nd Class Solid Waste Storage Area of Aydın Metropolitan Municipality in regular periods.

III.2.21. Activities which are risky and dangerous for human health and environment in the operational phase of the project,

Vehicles operating in the field within the scope of the project constitute a danger for human health and a risk of accident. Maintenance of the vehicles will be carried out periodically, all kinds of environmental measures will be taken and necessary warning signs will be placed within the site in order to minimize the risk of accidents.

There is a risk of occupational accidents for human health due to the works in the operational period of the project. If solid and liquid wastes are not disposed properly and if necessary precautions are not taken for noise and air emission, risky and dangerous situations may arise with regard to the environment.

In order to prevent all possible risks to human health at all stages of the project, all health and safety rules determined by the regulations and the relevant legislations of the Occupational Health and Safety Law No. 6331 shall be applied with regard to the worker's health and occupational safety. Furthermore; Public Health Law No. 1593 and any codes and regulations which have been and will be issued thereto as well as the relevant legislations shall be applied within the scope of the project.

Through the measures to be taken, it is aimed at performing risk free activities for human health and environment within the scope of the project.

III.2.22. Assessment of the existing pollution load of the region and potential impacts of the plant as well as other geothermal plants which are installed and/or planned to be installed in the same region (species, air, water, soil),

Existing pollution load of the region is indicated in II.2.17. Geothermal plants and their potential environmental impacts are indicated in III.2.23. and III.2.18.

III.2.23. Impacts on bio diversity and eco system, and measures to be taken,

Although geothermal power plants are energy generation forms which have the lowest level of direct or indirect pollution to the environment, they still have some negative impacts on the environment. However; there will be no discharge to the receiving environment during the activities. There will be no important impact on ecosystem thanks to landscaping works.

Since geothermal resource will be reinjected, there will be no slides in the area of activity.

Impacts on flora and fauna during the operational phase and measures to be taken are indicated in III.2.18.

III.2.24. Other specifications,

There are no other issues in this section.

III.3. Impacts of the Project on Socio-Economic Environment and Measures to be taken**III.3.1. Income increases, employment opportunities, population moves, immigrations and services for education, health, culture and other social and technical infrastructure (agriculture, livestock, tourism, greenhouse works etc.) which are expected with the execution of the project; and utilization of these services,**

As a rapidly developing and industrialized country, Turkey is in need of uninterrupted, high-quality, reliable and affordable energy today. In order for our country to make industrial investments to a large extent, it is required to provide the necessary energy infrastructure for new investments in addition to meeting the current consumption demand.

Electrical energy which will be generated by the plant will play an important role in meeting Turkey's growing electricity needs. Sustainable, reliable and high-quality electricity will contribute to the industrial growth of the country and play a role in increasing per capita income by creating new job opportunities in private sector.

Within the scope of the project, it is stated that 50 people will be employed in all units during the land preparation and construction phases and approximately 40 people will be employed in the operational phase. Considering that unqualified personnel and permanent staff will be employed among local people as much as possible and operational period of the project is planned as 29 years, it is seen as a contribution to both the country's economy and the local economy.

When the project starts operation and energy generation, new investments will be provided both in Germencik District and Aydın Province. Therefore, it means new employment opportunities for local people, and it can be considered as a long-term secondary contribution.

It can be said that this project, which is expected to supply the required materials from the facilities in the region and to meet the fuel and mineral oil needs of the construction machines and vehicles as well as technical, social and daily needs of the personnel to be employed from the district / province, will give an acceleration to the economic activities in the region.

Piping plan to be constructed within the scope of the project will be carried out in such a way that it does not interfere with the roads, field passages and animal passages. Area which will be used for the project is the private-registered land of the owner. There is no installation of any facilities other than these areas. Piping works will be done at the road boundary of the parcels in the region. So that, there will be no unnecessary land use for the pipes. In this way, the impacts on the surrounding agricultural lands will be reduced.

III.3.2. Environmental benefit-cost analysis,

Geologically located in the Alpine-Himalayan mountain formation zone, our country is rich in geothermal resources due to its highly fractured structure and volcanic activities during the young tectonic period. There are about 1000 hot water and natural mineral water sources. We can briefly express this richness scientifically as "potential" and the revealed part as "capacity". Geothermal heat potential of our country is around 31,500 MW thermal. Geothermal energy studies in Turkey were started by the General Directorate of MTA about 45 years ago; and 190 geothermal fields have been discovered thanks to the studies that have been carried out so far. 79% of these areas are located in Western Anatolia, 8.5% in Central Anatolia, 7.5% in Marmara Region, 4.5% in Eastern Anatolia and 0.5% in other regions. 94% of our geothermal resources are low and medium temperature and suitable for direct applications (heating, thermal tourism, mineral production, etc.) while 6% are suitable for indirect applications (electrical energy production). As a result of drilling surveys in these discovered areas, 3881 MWt heat energy was revealed which is approximately 12,3 % of the heat potential of our country.

Approximately 30% of this heat energy is used for residential and thermal plant heating of such settlements as İzmir, Gönen, Simav, Kırşehir, Kızılcahamam, Central Afyon, Sandıklı, Kozaklı, Diyarbakır, Salihli, Edremit, Sarayköy, Bigadiç (equivalent of approximately 100,000 residents), greenhouse fields (approximately 1000 acres) and health and thermal tourism fields (215 plants) (MTA).

It is planned that "Efe 6 Geothermal Power Plant" project will be executed and operated by Gürmat Elektrik Üretim A.Ş. within the boundaries of Aydın Province, Germencik District, Alangüllü Quarter in order to generate electrical energy from the geothermal resource having an installed capacity of 22.6 MWe. Annual production of 180.800.000 kW within the scope of the planned project will make a significant contribution to the amount of renewable and clean energy generated in Turkey.

Benefits and Costs of the Project

- Being a renewable source and being installed in a region having this potential,
- Using the drilled water only for generating electricity, enabling it in a closed cycle, minimizing the external interaction,
- Being environment-friendly and clean compared to other fossil fueled power plants,
- Improving the infrastructure and roads within the project site and surroundings,
- Noise, vibration and dust emission costs in the land preparation phase of the project,
- Cost of measures to be taken against environmental impacts,
- Socio-economical benefits in the project site.

Environmental impacts which may be generated during the project will be minimized with the help of the measures specified in Section III.

III.3.3. Expropriation and/or resettlement

Parcel No. 603 which will be used for the plant and all of its units is registered to Gürmat Elektrik Üretim A.Ş., the owner of the activity. Parcel No. 883 is registered to Miraj Turizm ve Ticaret A.Ş., one of the companies of the owner of the activity. Letter of consent dated 01.12.2015 for the Parcel No. 883 is indicated in Annex 22. Moreover; applications of these parcels are indicated in Annex 16.

Since these parcels belong to the investor company, there will be no expropriation work.

SECTION IV. PUBLIC PARTICIPATON

IV.1. Determination of the relevant public which is likelt to be impacted by the project (how to notify the locals) and methods which are suggested for reflecting the public opinions on the study of environmental impact assessment (reflecting the relevant public opinions and explanations on EIA Report)

As described in “Public Participation Meeting” Section in Article 9 of EIA Regulation which came into force by being promulgated in the Official Gazette No. 29186 dated 25.11.2014 within the scope of the project, it is required to announce the place and date of the meeting as well as the agenda of the project on national and/or local newspapers publicly.

In this regard, Public Participation Meeting was announced on Türkiye Newspaper which is published in national level in 13.02.2016 and in SES Newspaper which is published in Aydın Province in 13.02.2016 by indicating the places and dates of the meetings. Moreover; announcements were published on the boards in the meeting places and neighbourhood units. All other necessary announcements were also made as in the following national and local newspapers.



Figure 54. Local Newspaper-Announcement Page



Figure 55. National Newspaper-Announcement Page

Public Participation Meeting was held in Aydın Province, Germencik District, Ömerbeyli Quarter Wedding Hall on 25.02.2016 at 14:00. An adequate level of participation was ensured in the meeting, and the public generally raised such issues as air pollution due to geothermal plants in the region and damages which are given to the agricultural lands in the surrounding. Furthermore, they stated that they are disturbed by the steams coming out of the chimneys of the power plants in the region and raised some questions about the operation of the plant which will be installed within this project. Images from the meeting in Germencik District are as above.



Figure 56. Images from Public Participation Meeting

IV.2. Other parties which are expected to deliver opinions

Opinions and permits which are required for this project shall be taken from the relevant institutions and parties within the framework of the legislations in force upon the request of the Commission which is established by the Ministry of Environment and Urbanization.

SECTION V. IMPACTS AFTER THE SHUT DOWN OF THE OPERATIONS OF THE PLANT AND MEASURES TO BE TAKEN AGAINST THESE IMPACTS

V.1. Studies of Rehabilitation and Reclamation

When Efe 6 Geothermal Power Plant obtains "EIA Positive" decision, regular maintenance of the equipment will be performed; worn-out equipment will be renewed and re-commissioned in order to ensure the usability of the project throughout its economic life. At the end of the license period of the project, depending on the conditions, the project can be used for energy purposes again with the revisions to be made in operational department.

When it is planned to reuse the project site and facilities for similar purposes, it will be appropriate to carry out environmental impact assessment studies again in order to examine the impacts of the project on the ecosystem during the 29 years that the project was executed, to reveal the difference from the present conditions and to create new measures.

Natural landscaping arrangements will be made in the areas surrounded by the facilities. After the operation is completely shut down, the units will be dismantled, the wells will be closed and land reclamation will be carried out. These arrangements will be made in accordance with the projects and plans of landscaping repair and rehabilitation which will be prepared by considering the conditions of the post-operation period (land, climate, geomorphological conditions etc.).

Furthermore, the purpose of the reclamation works is not only to plant the field, but also to make the land suitable for its natural structure and to ensure that it is used for the most suitable purposes after the operation. In this context, the main purpose should be to restore the nature to its former structure while at the same time to bring the land use classes to the field depending on the socio-cultural and economic needs of the people in the surroundings.

V.2. Impacts on the existing water resources and measures to be taken

Hydrothermal eruptions in uncontrolled geothermal wells are potential environmental destruction elements. However; since no geothermal resource will be extracted and all the wells will be closed safely after Efe 6 Geothermal Power Plant has been shut down, there will not be such any situations and thus there will not be any negative impact on the existing water resources.

V.3. Impacts on the underground and measures to be taken

Geothermal reserves are naturally formed in areas where seismic movement occurs. Therefore, the presence of seismic movements in these regions is not due to the planned project but a natural process and micro-earthquakes are likely to happen.

Within the scope of Efe 6 Geothermal Power Plant project, no project-based seismic impacts are expected in the phases of land preparation, construction and operation as well as at any stage of the project after the shut-down.

SECTION VI. PROJECT ALTERNATIVES

(Choice of location, technology, measures to be taken, comparison of the alternatives and order of preferences will be detailed in this section.)

When choosing the location for Geothermal Power Plant, it is a requirement that the place to be selected for the plant has to be at the place where the raw material is located with regard to the feasibility of the investment. Here, the parameter which will be used for the assessment of the alternatives should be technology and the method of preventing environmental impacts.

Many places and technology alternatives have been evaluated as a result of the studies carried out and it has been confirmed that Efe 6 Geothermal Power Plant Project, which is based on the reinjection system that is planned after the feasibility reports are prepared, is the most accurate project because the annual net benefit (income) and the profitability of the project is considerably high.

Geothermal resource area which is located within geothermal resources No. J-553 and Operating Licence Area for Natural Mineral Water is utilized for energy purposes. The real power of the field has been expected to contribute to the economy for many years, and this power plant-based project will bring this power to the country's economy and achieve this goal at the highest level.

SECTION VII. OBLIGATION TO GIVE INFORMATION ABOUT THE DEVELOPMENTS IN INITIAL AND CONSTRUCTION PERIODS

(Program, environmental management plan and emergency plan regarding the obligation to give information proposed for the construction period; transactions which will be executed within Notification of Competency in case of obtaining EIA Positive Certificate)

“Notification Forms” will be submitted pursuant to the provision of Article 27/B of the Regulation on Amending the Regulation on Environmental Impact Assessment which came into force by being promulgated on the Official Gazette No. 29619 dated 09.02.2016: “(1) Project owner is, after obtaining “EIA Positive” decision, obliged to notify any progress during the investment process to the Ministry through institutions/organizations which are accredited by the Ministry in the intervals defined by the Commission within the initial and construction period of the investment”.

Emergency Plan

Emergency plans which have been prepared for all kinds of situations which may emerge during the project are indicated in Annex 25.

Table 55. Notification Schedule

No	Subject	Timing / Monitoring	Potential Impact	Action (Mitigation Measures)	Environmental Risks Responsibilities	Legal Requirements / Best Practices	Parameters to be followed, if any	Remarks
1.1.	Air Quality	During the construction period / Observational During the construction period / Observational	Dust emission arising out of excavation works	- Limiting and stopping the activities which may cause dust or taking necessary measures thereof in order to prevent dust formation and dispersal in the windy weather (covering top of the lorries with a canvas or moistening top of the materials etc.) - Moistening the soil and the masses by water spraying, when necessary, in order to prevent dispersal during the loading and unloading of the materials in rainy and moisture-free weather. - The materials that will cause dust formation will be loaded and unloaded without being winnowed to the air. - During material transfer operations, the unloading height will be reduced as much as possible. - Inland and on-site access roads will be regularly moistened with a sprinkler when necessary. - Vehicle speed limit will be 30 km / h on earth roads. - Dust concentration in the field and the nearest sensitive receptors will be monitored by measurements in case of any complaint.	Preventing the dust formation which negatively affects the health and daily lives of the people living nearby as well as flora/fauna elements during the construction works.	Regulation on Control of Excavation Soil, Construction and Wreckage Wastes Regulation on Control of Industrial Air Pollution	PM10 and Settled Dust	In case of any complaints during the excavation works, PM10 and settled dust measurements can be performed by an Accredited Environmental Laboratory in the closest settlement areas and areas where excavation works are carried out.

			Emissions of construction equipment	- All the tools and equipment to be used will routinely be inspected, vehicles will be repaired when required, and other tools and vehicles will be used until their maintenance is finished. - The vehicles will not be left running unnecessarily and will be turned off when not in use.	Diminishing the primary air pollutants which negatively affect the people and flora/fauna elements around the construction site. Possibility of monitoring greenhouse gas emissions which negatively affect the air quality around the construction site	Regulation on the Control of Exhaust Gas Emission and Regulation on Gasoline and Diesel Quality	-	-
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1.2.	Environmental Noise	During the construction period	Noise arising out of construction machines and equipment	- Vehicles which will be used during the construction phase will regularly be maintained, it will be aimed at avoiding disturbing the workers and the inhabitants of the region. - The number of vehicles to be used during the construction phase will be kept as low as possible and potential traffic noise will be reduced. - All the vehicles at the construction site will be used carefully and their speed will be less than 30 km / h. maximum. - Personal protection equipment will be provided to the field staff and they will be prevented from being exposed to high noise levels. - The field staff will be trained about the correct use of tools and equipment and the placement of machines in order to minimize the impact of noise on the nearby settlements.	Mitigating noise level and preventing the noise level disturbance	Regulation on the Assessment and Management of Environmental Noise	Environmental Noise	In case of any complaints during the excavation works, Environmental noise measurements can be performed by an Accredited Environmental Laboratory in the closest settlement areas and areas where excavation works are carried out.
1.3.	Landscaping & Erosion and Sedimentation	During the construction period	Slides and erosion on the surface of excavated soil	- In the excavation processes to be performed for the Project Site, vegetable soil will be scraped from the soil surface and used for creating green spaces in landscaping transactions in the areas, the construction works of which have been completed. - Excavation waste to be extracted within the scope of basic excavation operations will be used for filling and land grading operations in the area within the scope of the project.	Preventing landslides and erosion; and preserving vegetable top soil.	Regulation on Control of Excavation Soil, Construction and Wreckage Wastes	-	-
1.4.	Waste Management	During the construction and operation period	Waste water	- Waste water generated by the personnel who will work in the site will be disposed in the treatment facility at the other plant which belongs to the owner of the operation and which is adjacent to the planned plant area after making the relevant connections. - In case the capacity of the existing treatment plant is not enough, an additional treatment plant which has a capacity of 10 m3/ day will be constructed; a project approval file will be prepared for this plant and then submitted to the Provincial Directorate of Environment and Urbanization.	Preventing the impacts of waste water on the quality of soil, surface water and underground water	Regulation on Control of Water Pollution	Waste water analyses	
			Nonhazardous	- Waste Management Plan will be prepared	Waste	Waste Management	-	Field observation

			Solid Wastes (organic and recyclable) in order to minimize the generated wastes to ensure the reuse of the wastes and the application of recycling methods, - Solid wastes to be generated within the scope of the project will be collected in the closed garbage bins placed at various points within the project site; recyclable wastes will be collected in separate containers and given to recycling companies. - Non-recyclable organic wastes will be collected in closed garbage bins placed at various points and disposed by being given to the 2nd Class Solid Waste Storage Area of Aydın Metropolitan Municipality through solid waste collection system of Germencik Municipality. - Applicable waste prevention, reduction, reuse and recycling measures will be adopted. Waste materials shall properly be cleaned and disposed; and shall be prevented from affecting human health and environment adversely. - Such wastes as packing paper, plastic bottle, glass bottle etc. will be collected separately from other wastes, regardless of its content material and source, and will be given to licensed recycling companies.	Minimization, resource preservation and effective waste management	Regulation Regulation on Control of Packaging Wastes		Construction notification reports Disposal contracts will be signed with the licensed companies for all kinds of wastes required; and the records will be available on site. (Amount of wastes which are formed, recycled and disposed)
	During the construction and operation period	Hazardous wastes (Waste oil, waste batteries and storage batteries, medical wastes etc.)	- Maintenance and repair of vehicles will be carried out at the nearest authorized service center and therefore no waste oil will be generated from the vehicles. - Waste oil will be generated as a result of routine maintenance of the turbines which will be performed once a year and any repair works in case of malfunctions. - Hazardous wastes will be stored separately from non-hazardous wastes and will be prevented from damaging human health, safety and the environment. - A "Hazardous Waste" label shall be affixed on all containers containing hazardous wastes; and this label will also bear information regarding the amount of waste and time of storage. Hazardous solid wastes which are generated during the construction period shall be kept on concrete floor and properly labeled.	Maintaining a proper waste management for preventing the soil, surface water and underground water pollution	- Regulation on Control of Waste Oils - Regulation on Control of Worn Out Tires - Regulation on Control of Waste Batteries and Storage Batteries - Regulation on Control of Medical Wastes - Waste Management Regulation	-	Field observation Construction notification reports Amount of wastes which are formed and hauled (Waste notification forms and National Waste Hauling Forms)

				- Hazardous wastes will be stored in undamaged, impermeable and safe containers which are in conformity with the national standards; and these containers shall be kept on concrete floor. - Containers which contain hazardous wastes shall be kept closed and wastes shall be prevented from any chemical reactions. - Hazardous liquid wastes shall be collected in metal or plastic barrels and shall be kept on concrete floor within an appropriate bank structure. Thus, potential risk of contamination, spill and leakage will be prevented for soil and underground water . - Hazardous wastes will be transported by licensed persons and organizations; and appropriate vehicles will be used for transportation. Hazardous wastes will be disposed within the framework of the protocol which will be signed with licensed disposal facilities. Medical wastes will be collected separately from other wastes and the provisions of the regulations on separation and collection of medical wastes shall be fulfilled.				
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1.5.	Hazardous Waste Management	During the construction and operation period	Impacts arising out of chemical wastes/leakage in soil and underground water	- Containers / barrels which contain such chemicals as diesel fuel or hazardous liquid waste will be placed to minimize the risk of contamination of soil and underground water and water pollution. - All chemicals shall be stored according to their suitability and reactivity. - All chemicals and fuels shall be stored on suitable floors (concrete etc.) within appropriate bank structures and drip trays. - Spill kits, absorbent pads, sand and materials will always be kept available in the chemical storage area to be used when necessary. - All spills which may come out as a result of construction activities will be monitored and controlled. - Waste materials that are not suitable for re-use in the field will be sent to licensed storage areas.	Proper use of the chemicals for preventing the soil, surface water and underground water pollution.		-	Field observation Construction notification reports
1.6.	Ecology	Prior to / During the construction period	Impacts on Terrestrial Flora and Fauna	- The studies to be carried out within the scope of the project will be performed within a small area and it is foreseen that there will be no negative impact on the ecological basis.	Preserving the ecosystem	Resolutions of Central Hunting Commission, Land Hunting Law No . 4915, Berne Convention	-	Field observation Construction notification reports
1.7.	Visual	Prior to and during the construction period	Visual impacts in surroundings	- The storage area for project equipment will be kept in a regular order to prevent negative visualization. - Construction site where the facility will be installed and equipment areas will be turned to their original state after construction.	Minimizing the visual impacts	-	-	Field observation Construction notification reports
1.8.	Traffic	During the construction period	Impacts of traffic on the environment	- Drivers of all the vehicles to be operated within the scope of the project will be warned to work in conformity with the Traffic Law, obey to Traffic Rules and comply with the loading standards. - Safety and traffic signs will be placed visibly in the access roads near and around the project site. - Traffic planning will be made in places where applicable and it will be avoided to drive in local traffic during the periods of heavy traffic.	Maintaining effective traffic management and minimizing the risks which threaten public health and security	Traffic Law	-	Field observation Construction notification reports

				- All drivers will be provided with road safety trainings and it will be ensured that they obey to speed limits. - Roads which will be used for construction traffic, especially for tanker, truck and special load traffic (heavy and wide loads), will be determined together with the relevant institutions. - Existing roads will be used as much as possible; and the road will be designed to provide an easy visibility and not to prevent traffic if new service roads will be opened.				
1.9.	Historical, Cultural and archeological properties	During the construction period	Destruction, disposal, etc.	In case of finding any archaeological remains in all the land preparation and construction works to be carried out within the scope of the project, officers of the Provincial Directorate of Culture and Tourism will be notified and their permits will be taken.	Preventing the potential risks regarding cultural and archeological resources	-	-	Field observation Construction notification reports
1.10.	Public Security	During the construction period	Impacts on the habitants around the site arising out of traffic, use of hazardous substance, noise and vibration	- Within the scope of the project, signboards will be hanged in the site during construction works to give information about the construction and free entrance to the construction area will be prevented. - Helmets and goggles, if required, will be given to the visitors during the visits. - A grievance mechanism will be developed to take all kinds of complaints, opinions and suggestions of the people affected by the project as well as managing these complaints. - Equipment and materials will be transported in the most appropriate way. - Speed limits will be determined for all roads within the project site. - Maintenance of the project vehicles and equipment shall be carried out regularly and it will be ensured that vehicles in the project traffic shall not exceed the specified speed limits.	Maintaining effective social management and minimizing the risks which threaten public health and security	Regulation on the Assessment and Management of Environmental Noise (ÇGDYY)	-	Field observation Construction notification reports Complaints during the construction

1.11.	Occupational Health and Safety (OHS)	During the construction and operation period	Impacts on the health and safety of project personnel	- Information signs will be hanged regarding the cases which threaten public health and emergency contact information will be kept available at the project site. - Clear signs, flags and warnings will be placed around the project site where necessary. - A Risk Management and Emergency Plan will be established regarding the worker's health and occupational safety for land preparation and construction works. - General occupational health and safety measures are listed below: - Hazardous chemicals that will be used shall be stored in designated protected areas and storage outside these areas shall not be permitted. - These areas will always be kept locked in such a way that only authorized persons can enter. - Materials will be stored in shelves in closed containers that will not be mixed with each other in the warehouse. - Warning signs shall be hanged on these shelves and warehouse entrances to indicate the material specifications, quantities and usage risks. - It will be ensured, as far as possible, that the shelf system will not be above the average head height. - If the chemical substances are required to be stored above this height, there will be a ladder and the containers in this area will be able to be removed with one hand. - Material Safety Data Sheets (MSDS) will be hanged at a place where everyone can easily see it in order to give instructions in case of any emergency (material leakage, material contamination, skin contact, etc.). - The storage areas of the materials shall be composed of an impermeable floor. - It is also required to pay attention that the concrete or stone floor will be inclined from the door side towards the inside in order to avoid any spills. So that outward flow will be prevented. - It will be placed in such a way that it will not be overheated with the solar heat in the outdoor storage.	Minimizing the health and safety risks against the workers Mitigation measures for the Occupational Health and Safety risks of the workers	Occupational Health and Safety Law Worker's Health and Safety Statute	-	Number of accidents and near miss incidents Construction notification reports
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				- All personnel who will work in the project during the construction period will be provided with the training on occupational health and safety and environmental management, including the issues of working with chemical substances and storage. - Safety belt shall be used in all cases where there is a danger of falling. - A safety hook will be used in addition to safety belt at the descent, ascent and tower stairs. - During the construction and operational periods of the proposed project, all necessary measures related to working at height will be taken and implemented. - The project will comply with all Occupational Health and Safety Regulations. - Workers will be provided with ear phones and ear plugs for using while working in noisy areas. - The key staff will be subjected to first aid training and the participants will be certified. - First aid box will be placed in the facility areas to be used in small injuries. - In order to protect the drivers, the windows and doors of the heavy machines which are used during the construction will be insulated with good rubber. -Employees will be trained on the use of fire extinguishing systems and equipment. - OHS plans shall be prepared in accordance with the relevant Occupational Health and Safety Regulations before the construction phase. -These plans will be shared with the contractor who will work within the scope of the project.				
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1.12.	Human Resources	During the construction and operation period	Impacts on the works and working conditions	- Workers will be provided with the documents which include authorizations, working conditions, working hours, overtime arrangements and overtime remuneration or benefits. - Human resources policies which are appropriate for labour force will be applied. - During the employment and recruitment phases, such personal characteristics as gender, race, nationality, ethnic origin, religious belief, disability, age or sexual orientation which are not related to the requirements of the job will not be a criterion.	Improvement of working conditions and development of good working relations	Labour Act No. 4857	-	Complaints from the workers
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SECTION VIII. RESULTS

(Summary of all the explanations so far, a general overview to list the fundamental environmental impacts of the project and to state the possibility of achieving to avoid adverse environmental impacts in case of execution of the project, selection of the alternatives within the scope of the project and the reasons thereof)

It is planned that "Efe 6 Geothermal Power Plant" project will be executed and operated by Gürmat Elektrik Üretim A.Ş. within the boundaries of Aydın Province, Germencik District, Alangüllü Quarter in order to generate electrical energy from the geothermal resource having an installed capacity of 22.6 MWe. It is planned to generate 180.800.000 kW production annually within the scope of the planned project.

This project shall be executed within the boundaries of Aydın Province, Germencik District, Alangüllü Quarter, Değirmencivarı Region, Parcel No.883 and Ömerbeyli Quarter, Öziçi Region, Parcel No. 603. Parcel No.883 has a surface area of 25.051 m² and the area of 17.098 m² within the parcel has been defined as 1st Polygon. Parcel No. 603 has a surface area of 20.270 m² and purchase surface of 20.839 m². The area of 20.461 m² within the parcel has been defined as 2nd Polygon.

Parcel No. 603 which will be used for the plant and all of its units is registered to Gürmat Elektrik Üretim A.Ş., the owner of the activity. Parcel No. 883 is registered to Miraj Turizm ve Ticaret A.Ş., one of the companies of the owner of the activity.

Electrical energy which will be generated through a binary sistem within the scope of Efe 6 Geothermal Power Plant shall be transferred from the switchyard on Parcel No. 883 to 154 kV Gürmat I Feeder.

This report has been prepared by considering this project within the scope of Article 44-Extracting and Using Geothermal Source (Thermal capacity: 20 MWe and more) of "Environmental Impact Assessment Regulation Annex-I" which came into force by being promulgated in the Official Gazette No. 29186 dated 25.11.2014.

Regarding Efe 6 Geothermal Power Plant project, a "Production Licence" has been obtained from Energy Market Regulatory Authority in order to be able to make production for a period of 29 years with the Licence No. EÜ/4165-16/2491 dated 13.12.2012 in accordance with Electricity Market Law No. 4628 and the relevant legislation.

Project site is located approximately 19 km west from the city center of Aydın and approximately 2,5 km. beeline from the district center of Germencik. Being located approximately 1.2 km. northwest in beeline, Alangüllü Quarter is the nearest settlement to the plant area. Moreover; Kızılcagedik Quarter is located approximately 1.25 km northeast to the project site while Ömerbeyli Quarter is located approximately 2,4 km east. Project site can be accessed through İzmir-Aydın Highway (D 550).

Geothermal energy will be generated by using binary system technology in the project. This system has been developed in order to generate electricity from medium-low temperature sources and recycle the waste heat by increasing the use of thermal resources. Binary systems use a secondary work fluid having a low level of boiling temperature and a high level of steam pressure in low temperatures. This secondary work fluid works in conformity with a conventional Rankine cycle.

Fluid coming from geothermal resource (production wells) will firstly be separated into gas and liquid phases. Then, this geothermal fluid will be sent to the evaporators (heat exchangers) and convert the secondary work fluid (pentan) in liquid state into gas state without any physical integration. This secondary work fluid (pentan) which is converted into gas state will be sent to the turbine and energy will be generated with the help of the generator in the turbine. Secondary work fluid (pentan) in exhaust gas state coming out of the turbine will firstly enter into the heat exchanger called as recuperator that recycles the heat. This equipment is located between the turbine and cooling water and here, liquid and gas phases of the secondary work fluid (pentan) pass through in separate lines. Some of the secondary work fluid (pentan) in gas state will be transferred to the liquid phase within the recuperator and then to the cooling tower. After then, it will be condensated and sent to the preheater through recirculation pump.

In total, 10 wells will be used for production and reinjection purposes within the scope of the project. 9 wells are existing wells. Only piping works will be carried out in the existing wells. And 1 new well will be drilled. It is planned that 6 wells will be used for production purposes while 4 wells will be used for reinjection purposes.

As for the drilling works for the new well, drilling rig will be constructed on an area of approximately 1,500 m² and this area will be covered with concrete. During drilling works, a stilling pond will be constructed on the floor and the excavated material will be taken here. There will be very little excavation waste during drilling works. The exposed excavation will be collected at one point of the drilling area. Moreover, a mud pond will be constructed in order to store the waste sludge that will be formed during the drilling process. After the drilling process is completed, a part of the excavation will be used for filling the mud pond. Excavation wastes which cannot be recycled, if any, will be disposed at the excavation dump site of Germencik Municipality or Aydın Metropolitan Municipality. Transportation to the wellhead will be provided by the existing roads.

Total dust flow which will be caused in the construction phase of the project has been calculated as 0,99 kg/hour by using uncontrolled emission factors; and as 0,50 kg/hour by using controlled emission factors. It is not required to make modeling for the calculated uncontrolled and controlled cases, because hourly mass flow value (kg/ hour) is not above the mass flow values (kg/ hour) under normal operation conditions and for operation hours in weekly working days (1 kg/ hour) as indicated in Table 2.1 of Annex-2 of "Regulation on Control of Industrial Air Pollution" which came into force by being promulgated in the Official Gazette No.27277 dated 03.07.2009 (Amendment: No. 29211 dated 20.12.2014).

There will be no dust spreader work in the operational phase of the project.

It is planned to employ 50 people in the construction phase and 40 people in the operational phase of the planned project. Waste water which will be generated by the employees will be disposed in the treatment facility at the other plant which belongs to the owner of the operation and which is adjacent to the planned plant area after making the relevant connections. In case the capacity of the existing treatment plant is not enough, an additional treatment plant which has a capacity of 10 m³/ day will be constructed; a project approval file will be prepared for this plant and then submitted to the Provincial Directorate of Environment and Urbanization. Water which is formed as a result of treatment will be used in garden irrigation.

Domestic solid wastes which will be generated by the personnel who will be working at the site shall be collected in closed containers within the construction site sent to the 2nd Class Solid Waste Storage Area of Aydın Metropolitan Municipality in regular intervals.

Approximately 4.800 tons of vegetable soil and 24.000 tons of excavation soil will be formed in the foundation excavation of the plant units during the construction phase of the project. Vegetable soil will be collected in an area that will be specified within the construction site and used for landscaping works. Some of the excavation soil will be used for filling works within the project site while the other part of it will be sent to Storage Facility for Excavation Wastes of Aydın Metropolitan Municipality.

There will be no sick room within the project site, so it is not expected to generate any medical wastes.

Maintenance and repair of vehicles and work machines will be performed by authorized services in the land preparation, construction and operational phases within the scope of Efe 6 Geothermal Power Plant project. Waste tires which are likely to be generated in case of changing the tires at the project site will be disposed by being sent to the facilities that have obtained environmental license or operation approval from the Ministry in accordance with the "Regulation on Control of Worn Out Tires" Article 24- Types of tires and tyre wastes contaminated with hazardous materials and wastes, which came into force after being promulgated in the Official Gazette No. 26357 dated 25.11.2006.

In case of any hazardous wastes or any other wastes which are contaminated with these hazardous wastes during the installation of the equipment at Geothermal Power Plant and during the operation of the plant, these wastes will temporarily be stored in closed containers to prevent any contact with the soil on an impermeable ground. These wastes will be stored in closed and impermeable barrels and sent to licensed disposal facilities through licensed carriers.

Hazardous wastes which may be generated during the construction phase will be disposed in accordance with "Waste Management Regulation" which came into force by being promulgated in the Official Gazette No. 29314 dated 02.04.2015.

Lgündüz value which is caused by the machines to be used in the construction phase of the project is below 70 dBA limit value given in Annex-VII Table-5 and Article 23 of the "Regulation on Assessment and Management of Environmental Noise" No. 27601 dated 04.06.2010 after a distance of 10 m. The closest settlements of Project site are Alangüllü Quarter located 1.200 m northwest and Kızılcagedik Quarter located 1.250 m northeast. Noise which will occur during the construction phase of the project will not adversely affect these two settlements. There will be no works that will cause high levels of noise during the operation. Such equipment as pump, generator etc. which will be used within the scope of the project will be kept in a closed area, so it will not cause any disturbing noise in the Project site and its surroundings. Machine-equipment to be used in wellhead systems will be used in a closed system so they will not cause any noise at the level that will disturb the environment either. Since the blasting process will not be performed during the construction and operational phases, no vibration formation is expected.

Within the scope of the project, all necessary measures will be taken against environmental impacts and all the phases will be in conformity with

Environment Law No. 2872 and all the regulations issued thereof.

NOTES AND SOURCES:**(Sources referred in the preparation of the report)**

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Aydın Provincial Environmental Status Report, 20